

Remedial Investigation Work Plan

**CTI Agri-Cycle
308 and 311 Belle Road
Buskirk, New York**

BCP Site No. C558043

CHA Project Number: 057581.000

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*July 2020
Revised October 2020
Revised November 2020
Revised October 2021*

CERTIFICATION

I, Samantha J. Miller, certify that I am currently a NYS registered professional engineer and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

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

October 26, 2021

Date of Certification

103303

NYS Professional Engineer Registration Number

CHA Consulting, Inc.

Company

Project Engineer IV

Title

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LIST OF ACRONYMS & ABBREVIATIONS

| | |
|--------|---|
| BCA | Brownfield Cleanup Agreement |
| BCP | Brownfield Cleanup Program |
| BGS | Below Ground Surface |
| CAMP | Community Air Monitoring Program |
| CHA | CHA Consulting, Inc. |
| DER | Division of Environmental Remediation |
| DMM | Division of Materials Management |
| ELAP | Environmental Laboratory Accreditation Program |
| FSP | Field Sampling Plan |
| HASP | Health and Safety Plan |
| IDW | Investigation Derived Waste |
| MCL | Maximum Contaminant Level |
| MS/MSD | Matrix Spike/Matrix Spike Duplicate |
| ng/L | Nanograms per Liter |
| NYCRR | New York Code, Rules and Regulations |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| PFAS | Per- and Polyfluoroalkyl Substances |
| PFOA | Perfluorooctanoic Acid |
| PFOS | Perfluorooctanesulfonic Acid |
| PID | Photoionization Detector |
| PPE | Personal Protection Equipment |
| PPT | Parts per Trillion |
| QA/QC | Quality Assurance/Quality Control |
| QAPP | Quality Assurance Project Plan |
| RAA | Remedial Alternatives Analysis |
| RI | Remedial Investigation |
| RIWP | Remedial Investigation Work Plan |
| SPLP | Synthetic Precipitation Leaching Procedure |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| TCLP | Toxicity Leaching Characteristic Procedure |
| USEPA | Environmental Protection Agency |
| µg/kg | Micrograms per Kilogram |
| VOC | Volatile Organic Compound |

1.0 INTRODUCTION

CTI Agri-Cycle entered into a Brownfield Cleanup Agreement (BCA) as a participant in the fall of 2019 with the New York State Department of Environmental Conservation (NYSDEC). The CTI Agri-Cycle facility (the Site) is located at 308 and 311 Belle Road in Buskirk, Washington County, New York. As part of the Brownfield Cleanup Program (BCP), CTI Agri-Cycle will conduct a Remedial Investigation (RI) at the Site.

The purpose of the BCP is to encourage remediation of brownfield sites for reuse and development. This includes conducting a complete characterization of the Site. CHA Consulting, Inc. (CHA) has been retained by CTI Agri-Cycle to conduct the RI, which will identify the nature and extent of contamination in soil and groundwater at the Site.

CHA has prepared this Remedial Investigation Work Plan (RIWP) to be consistent with the guidance provided in the NYSDEC's Division of Environmental Remediation Program Policy 10 (DER-10) "Technical Guidance for Site Investigation and Remediation" (May 2010). This RIWP has been prepared to outline the procedures and protocols that will be utilized to conduct a comprehensive environmental RI that will provide the necessary field data to develop remedial alternatives for the Site that will best address the environmental conditions associated with the Site. The primary objectives of the RI include the following:

- Further define the nature/extent of contamination;
- Identify potential source areas;
- Assess impacts; and
- Provide data necessary to complete a Remedial Alternatives Analysis (RAA).

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 provide the data necessary to develop remedial plans for the Site.

To facilitate performance of the field investigation and Site characterization activities in a manner consistent with NYSDEC protocols, CHA has also prepared the following site-specific documents, which make up the RI Work Plan Documents Package:

1. Field Sampling Plan (FSP) (Appendix A);
2. Quality Assurance Project Plan (QAPP) (Appendix B)
3. Health and Safety Plan (HASP) (Appendix C); and

4. 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 CTI Agri-Cycle facility is located at 308 and 311 Belle Road in Buskirk, Washington County, New York, and consists of three parcels (Tax Map Nos. 271-3-10, 271-3-14, and 280-2-38). Two of the parcels, approximately 185-acres in area, are located north of Belle Road (northern parcels). The third parcel, approximately 49-acres in area, is located south of Belle Road (southern parcel). Site limits are shown on Figure 2. The Site is located in a rural area with a mixture of agricultural land and wooded areas.

2.2 SITE HISTORY

CTI Agri-Cycle is a NYSDEC Division of Materials Management (DMM) permitted compost facility acquired in 2000 from the Wilmot family who operated for many years and were facing revocation of operating permits due to violations of state environmental conservation law. CTI Agri-Cycle began operations in 2001 under NYSDEC Permit #5-532-00022/00003 for yard waste and paper sludge composting under Title 6 of the New York State Codes, Rules, and Regulations (6 NYCRR) Subpart 360-5.

The Site has been historically used for agricultural purposes. Aerial photos dating back to the 1950's show cultivated fields and woodland. Starting from at least 1994, the Site was used to receive residential yard waste and paper sludge from a number of nearby paper mills to create a composted product similar to topsoil. The paper sludge/yard waste mixture is first managed in multiple long, 12-foot tall windrows for approximately 50 days before being spread onto nearby farm fields. The material was placed in one-foot lifts; however, in low lying areas the compost can be up to 5-feet thick and allowed to compost for several years. Grasses are grown on the top, which helps break down the paper sludge and compost materials. Some fields that received multiple application have several feet (reportedly up to an estimated ten feet) of standing compost. An on-site stormwater collection pond constructed prior to 1994, receives runoff from the compost processing yard and windrow management area. The compost material is eventually exported offsite to various end users.

In 2017, the NYSDEC investigated potential contamination in source materials and identified per-and polyfluoroalkyl substances (PFAS), more specifically perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) contamination in both, raw paper sludge and composted material spread on Site fields. PFOA/PFOS contamination was also discovered in Site surface water and groundwater as well as on properties located offsite to the south. During the 2017 investigation it was noted

that offsite distribution of compost material was prohibited by the NYSDEC. In September 2019 CTI Agri-Cycle entered into a BCA.

3.0 SITE SETTING

3.1 SURFACE FEATURES

The Site consists of a mixture of agricultural land and wooded areas. The northern parcels consist of sixteen numbered fields (1 through 8 and 12 through 19) with wooded areas interspersed (Figure 3). Stockpile areas containing paper sludge and yard waste, and a stormwater retention pond are located along the western side of these parcels. Whipple Brook, a NYSDEC Class C stream, passes through a section of the northern parcel and runs adjacent to the east side of the remainder of the Site as it travels north to south across the area. The southern parcel consists of three fields (referred to as fields 9, 10 and 11) and some wooded areas. There is a barn structure and a stockpile area containing paper sludge on the eastern edge of the southern parcel. A dirt road provides access to the fields from Belle Road.

3.2 SITE GEOLOGY/HYDROGEOLOGY

3.2.1 Local Surficial and Bedrock Geology

The Site is located in a hilly area with general drainage into Whipple Brook, which runs along the eastern side of the property, and ultimately to the Hoosick River. Surficial soils at the Site are primarily gravelly or sandy silt loams with small amounts of silts and rocky soils. Site soils are underlain primarily by Netop Formation phyllite with lesser areas of Bull Formation Greywacke and some limestones. Depth to bedrock is unknown.

3.2.2 Local Hydrogeology and Groundwater Flow

Groundwater monitoring during a Site investigation performed by the NYSDEC indicates that depth to groundwater is as little as five to eight feet below ground surface (bgs). Whipple Brook, a tributary of the Hoosick River, flows north to south across the eastern portion of the Site before meeting the Hoosick River south of the Site. An artificial stormwater retention pond is located on the western side of the Site.

3.2.3 Surrounding Properties

Surrounding property uses are primarily agricultural with the Town of Cambridge located approximately 3.0 miles to the northwest.

4.0 PREVIOUS INVESTIGATIONS AND REPORTS

January 2017 Investigation

In January 2017, the NYSDEC investigated potential contamination in source materials through the collection and analysis of paper sludge (1 sample), windrow material (1 sample), yard waste (1 sample), finished compost (1 sample), groundwater (2 samples), surface water (1 sample), and stockpile leachate (1 sample). Laboratory results identified potential PFOA and PFOS contamination in both raw paper sludge and composted material spread on Site fields. Based on the analytical findings from this investigation, the NYSDEC and New York State Department of Health (NYSDOH) determined that additional evaluation was needed.

April 2017 Investigation

On April 19, 2017 the NYSDEC collected samples of material from eight fields at the Site. The material consisted of a mixture of yard waste and paper sludge that was composted in windrows at the facility. The material is applied to fields at thicknesses typically approaching five feet. Though the compost is considered to be “finished” after residing in the fields for approximately five years, CTI Agri-Cycle personnel indicated that at least 95-percent of the product stays on Site and is generally covered with subsequent lifts of more recent material from the composting pad.

The NYSDEC collected samples from eight sampling locations that were selected to represent a range in the age of sampled compost, as well as a relatively uniform areal distribution across the site. Shallow samples were collected at a depth of approximately 12-inches bgs. The target depth of the deep samples was approximately 48-inches bgs. The following samples were collected as part of this investigation:

- Solids consisting of finished compost (1 sample), yard waste (1 sample), and windrow materials (2 samples)
- Waters consisting of surface water from the stormwater pond (1 sample), leachate from the composting pad (1 sample), and surface waters (2) from drainage features on the neighboring property to the south.
- Ten soil samples from field areas upon which the finished materials had been spread in the northern, eastern, and southwestern areas of the Site.

Each of these samples were analyzed for PFOA and PFOS. In addition, an extract of each of the soil samples were analyzed for PFOA and PFOS following a synthetic precipitation leaching procedure (SPLP) extraction.

4.1 SAMPLING DATA

Based on the investigations conducted to date, the primary contaminants of concern for the Site have been identified as PFOS and PFOA. Laboratory results have indicated that PFOA and PFOS contamination was identified in incoming paper sludge, in materials of all stages of compost production, groundwater, surface water, and soils of the Site. In addition, PFOA and PFOS contamination has been identified in downgradient drainage features, indicating that the contamination has moved offsite.

4.1.1 Soils and Solids

A summary of the sample locations and analytical results for the soil and solids (e.g. yard waste, compost, and sludge) samples collected at the Site are presented on the Figures 4 and 5, respectively. In general, PFOA/PFOS were found in Site soils and various solids located across the Site. The contaminants were focused in areas used for the storage and processing of paper sludge material as it was being used in the production of compost. The total PFOA/PFOS concentrations for the soil samples ranged from the highest value of 165.3 micrograms per kilogram ($\mu\text{g/kg}$) in sample AC-041917-8 collected on the western side of the Site to 1.1 $\mu\text{g/kg}$ in sample AC-041719-18 collected on the northeastern edge of the Site and the furthest away from the compost processing area. Total SPLP PFOA/PFOS results for the soil samples ranged from the high of 1,182 nanograms per liter (ng/L) in sample AC-041719-8 to the lowest concentration of 14.9 ng/L in sample AC-041719-18.

Concentrations of PFOA and PFOS were found in the raw paper sludge (16.5 $\mu\text{g/kg}$), piled mixtures of paper sludge and yard waste (3.5 $\mu\text{g/kg}$ and 6.5 $\mu\text{g/kg}$), and in the material spread on fields for the aging process (84 $\mu\text{g/kg}$).

4.1.2 Groundwater

A summary of the sample locations and analytical results for the groundwater samples, as well as other water samples are included on Figure 6. PFOA/PFOS total concentrations in Site groundwater in the northwestern portion of the Site were reported at concentrations of 15 ng/L in monitoring well MW-2 and 160 ng/L in monitoring well MW-3 (in the very northwestern corner of the Site at an upgradient location from the processing area). The NYSDEC has proposed a maximum contaminant level (MCL) for PFOA/PFOS in drinking water of 10 parts per trillion (ppt) and the United States Environmental Protection Agency (USEPA) has established a health advisory level of 70 ppt for PFOS and PFOA individually, as well as combined. Note 1 ng/L is approximately equal to 1 ppt. Therefore, the Site has contaminated groundwater in excess of the NYSDEC drinking water standard and the USEPA health advisory level. Additionally, SPLP analyses have indicated that Site soils/materials have been shown to be capable of

leaching PFOA/PFOS into water at concentrations above the groundwater standard, presenting the potential for increasing levels of groundwater contamination.

4.1.3 Surface Water

Samples were collected from the on-site stormwater pond on two different occasions and were found to contain PFOA/PFOS total concentrations of 248 ng/L and 227 ng/L as shown on Figure 6. Additionally, two samples collected from drainage features located on the southern neighboring property reported total PFOA/PFOS concentrations of 219 ng/L (furthest from the Site) and 219 ng/L (closest to the Site).

4.1.4 Leachate from Composting Pad

A sample of leachate from the composting pad was collected on two separate occasions, in January and in April 2017. Analytical results reported total concentrations of PFOA/PFOS as 420 ng/L and 319 ng/L.

5.0 PROPOSED REMEDIAL INVESTIGATION

The RI will be performed in accordance with this RIWP and will involve the fieldwork necessary to complete the Site characterization. The RI will provide sufficient information to allow for identification of remedial alternatives that satisfy the NYSDEC requirements for the Site based on the continued and future use as a compost facility. Data will be obtained in sufficient quality to support subsequent decisions. The proposed investigation activities to be conducted consist of the installation of a series of soil borings, as well as the collection and analysis of soil, groundwater, and surface water samples for parameters of concern over two phases (Phase 1 – Fall 2021 and Phase 2 – Spring 2022).

The investigation activities are briefly summarized in the following sections and described in further detail in the FSP. Samples will be collected and analyzed in accordance with field sampling procedures and protocols as described in the FSP (Appendix A). Quality Assurance/Quality Control (QA/QC) samples will be collected and analyzed in accordance with the QAPP (Appendix B).

5.1 SURFACE SOIL SAMPLING

A total of twenty (20) surface soil samples will be collected as part of this investigation. Generally, one surface soil sample will be collected from each of the fields. One surface soil sample will be collected from the driveway turnaround and one from the driveway entrance near Belle Road. Three off-site samples will be collected to the west, south and east of the main area of the site on properties where access has been obtained. Fourteen surface soil samples will be collected from the 0 to 2-inch interval for PFOA and PFOS analysis, and six (6) samples will be collected from 0 to 2-inch interval for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, herbicides, polychlorinated biphenyls (PCBs) and metals, as further described in the FSP. Proposed surface soil samples are shown on Figures 7A and 7B.

In addition to the soil samples described above, two duplicate samples and two matrix spike/matrix duplicate (MS/MSD) samples will be collected in accordance with the QAPP.

5.2 SOIL BORING INSTALLATION AND SOIL SAMPLING

As part of the RI, a total of forty-nine (49) soil borings will be installed using a track-mounted Geoprobe® hydraulic-push equipment or equivalent. The borings have been spaced out to evaluate the compost and provide representative samples from each of the former compost fields. Proposed soil boring locations are shown on Figures 7A and 7B. The soil borings will be advanced through the composted material

(generally assumed to be up to 5 feet bgs) to evaluate the thickness of the compost. Additionally, ten (10) of these soil borings will be advanced to native soil which is estimated to be up to 10-feet bgs to evaluate the soil beneath the compost.

Soil samples will be collected continuously from grade to final depth using a Geoprobe® Macro-Core® sampling device or equivalent. Each soil sample will then be screened in the field for visual, olfactory, and photoionic evidence of contamination. Soils will be logged in the field on Soil Probe Logs in accordance with the FSP. Samples of compost will be identified with a “COM” suffix and samples of native soil collected beneath the compost will be identified with a “NAT” suffix.

Immediately upon opening the soil sampler, a photoionization detector (PID) or equivalent meter will be used to obtain readings along the length of the soil sample recovery. Soil from each boring advanced within a field will be composited into one sample that will be submitted to laboratory for a select set of parameters as described in Table 1 (beginning on Page 12). The laboratory will be certified under the a NYSDOH Environmental Laboratory Approval Program (ELAP).

Subsurface soil samples analyzed for the presence of volatile organic compounds (VOCs) will be chosen from the soil exhibiting the most elevated PID readings, collected using a Terra Core® sampler or equivalent, and will not be composited. The sampling device will be inserted into the undisturbed soil from the Geoprobe® MacroCore® liner. The five-gram plug of soil will be capped and sent to the laboratory where it will be preserved, extracted, and analyzed. The remaining sample volume will be homogenized to create a composite sample for the other analyses as described in Table 1. Samples of compost and native soil will not be composited together.

Once initial sample results are received, two representative samples that had the highest results will be submitted for SPLP. If holding times are exceeded, a second round of limited sampling will be conducted in order to complete this analysis.

In addition to the soil samples described above, four duplicate samples and four MS/MSD samples will be collected in accordance with Table 1 and the FSP.

Drill cuttings will be managed as detailed in the FSP and holes will be backfilled with bentonite. CHA will also collect one sample for characterization of soils for determination of offsite disposal requirements of the containerized excess soil collected from the borings. These samples will be analyzed for full toxicity characteristic leaching procedure (TCLP) analyses, total PCBs, reactivity, ignitability, and corrosivity.

5.3 GROUNDWATER INVESTIGATION

There are currently three existing groundwater monitoring wells located along the western side of the Site. In addition to the permanent wells, three temporary monitoring wells will be installed in presumed down-gradient locations to further evaluate potential impacts to groundwater. One additional temporary well will be installed in the northeast corner of the site. Groundwater samples will be collected from each of the permanent and temporary wells for a total of seven groundwater samples (Figures 8A and 8B). Samples will be collected for full TCL/TAL parameters, as further described in Table 1.

In addition to these samples, one duplicate, one field blank, one equipment blank, and one MS/MSD sample will be collected. One trip blank will be sent with each cooler containing samples for VOC analysis. Additionally, one waste characterization samples will be collected from the containerized purge water.

Dedicated/disposable tubing will be installed at each well and a low-flow pump will be used to collect the sample. All non-disposable equipment will be cleaned in accordance with the FSP to minimize the potential for cross-contamination. Bottle requirements and handling procedures are presented in the QAPP. Sampling protocols are presented in the FSP.

5.4 SURFACE WATER/SEDIMENT INVESTIGATION

There is currently one stormwater retention pond along the western portion of the Site, Whipple Brook that runs north to south along the eastern portion of the Site, and an unnamed stream that runs through the middle of the Site. The construction of the detention pond will be described in the RI report to determine if it is a possible migration pathway.

One surface water sample will be collected from the stormwater retention pond, one from the down-stream end of the unnamed stream before it exits the Site, and two samples will be collected from Whipple Brook; one prior to entry on the Site and one downstream, prior to leaving the property. At each location, a corresponding sediment sample will be collected. Surface water and sediment samples will be collected for analysis of complete TCL/TAL parameters, further described in Table 1 and the FSP. In addition to these samples, one duplicate will also be collected for QA/QC purposes.

5.5 PROPOSED SAMPLING AND ANALYSIS

Table 1 presents a summary of the proposed sampling and analysis plan, including the sample identifications, depths (if applicable), analytical parameters, and detailed sampling rationale. QA/QC

samples will be collected according to the QAPP, included as Appendix B. Proposed sample locations are presented on Figures 8A and 8B.

Table 1: Sampling Rationale

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|--|-----------------|---|--|---|
| <i>Surface Soil</i> | | | | |
| SS-001 through SS-004, SS-006, SS-008, SS-10 through SS-15 and SS-17 | 0-2-inches bgs | One sample per compost field, one in the center of the Site, and one in the northwest corner. | PFOA, PFOS | To investigate the extent of surface soil contamination across the Site, focusing on compost fields. |
| SS-005, SS-007, SS-009, SS-16, SS-18, SS-19, and SS-20 | 0-2 inches bgs | Middle of the Site. | 1,4-Dioxane, PFAS, Target compound list (TCL) VOCs, TCL SVOCs, target analyte list (TAL) Metals, PCBs, Herbicides, Pesticides ¹ | To investigate the potential for additional contamination in the surface soils on Site. |
| SS-DUP001 | 0-2-inches bgs | TBD | PFOA, PFOS | Per QAQC procedure, two total blind duplicate samples will be collected with selected soil samples to determine the precision of laboratory analysis. |
| SS-MS001 | 0-2-inches bgs | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SS-MSD001 | 0-2-inches bgs | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|--|---|--|--|---|
| <i>Subsurface Soil</i> | | | | |
| SOIL-001, SOIL-002, SOIL-003, SOIL-004N/S, SOIL-005N/S, SOIL-006, SOIL-007, SOIL-009, SOIL-010, SOIL-011A/B, SOIL-011C/D, SOIL-012, SOIL-013, SOIL-014, SOIL-015, SOIL-016, SOIL-017, SOIL-018N, SOIL-018S (with COM suffix) | 1-5 feet bgs | One composite sample per field corresponding to numbers in the sample ID. Two samples in Field 18. | PFOA, PFOS | To investigate the extent of subsurface soil contamination throughout the first layer of compost on Site. |
| B-001D, B-007D, B-009D, B-018D, B-020D, B-024D, B-037D, B-039D, B-044D, B-047D (with NAT suffix) | Top 2 feet of native soil under compost layer | Varying fields across the Site. | PFOA, PFOS | To investigate and evaluate the extent of subsurface soil contamination underneath the compost. |
| B-024D | Top 2 feet of native soil under compost layer | Field 15 | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To investigate and evaluate the potential for additional subsurface soil contamination underneath the compost. |
| B-029 | 1-5 feet bgs | Field 5N | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To investigate and evaluate the potential for additional soil contamination throughout the first layer of compost. |
| SOIL-DUP001 | 1-5 feet bgs | TBD | PFOA, PFOS | Per QAQC procedure, one blind duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|-------------|---|-----------------|-----------------------|--|
| SOIL-DUP002 | Top 2 feet of native soil under compost layer | TBD | PFOA, PFOS | Per QAQC procedure, one blind duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SOIL-MS001 | 1-5 feet bgs | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SOIL-MS002 | Top 2 feet of native soil under compost layer | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SOIL-MSD001 | 1-5 feet bgs | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SOIL-MSD002 | Top 2 feet of native soil under compost layer | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|--------------------|-----------------|----------------------------|--|--|
| <i>Groundwater</i> | | | | |
| GW-MW-1 – GW-MW-3 | N/A | Permanent Monitoring Wells | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To sample the existing Site monitoring wells for contaminants of concern. |
| TMW-001 – TMW-004 | N/A | Temporary Monitoring Wells | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To sample the Site groundwater for contaminants of concern. |
| GW-DUP001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure one blind duplicate sample will be collected with a selected groundwater sample to determine the precision of laboratory analysis. |
| GW-MS001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure one matrix spike sample will be collected with a selected groundwater sample to determine the precision of laboratory analysis. |
| GW-MSD001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure one matrix spike duplicate sample will be collected with a selected groundwater sample to determine the precision of laboratory analysis. |
| GW-EB001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure, one equipment blank is required for every 20 groundwater samples collected. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|---|-----------------|---------------------|---|---|
| <i>Surface Water/Sediment</i> | | | | |
| SW-001 through SW-004 and SED-001 through SED-004 | N/A | Shown on Figure 8 | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To sample the surface waters associated with the Site. |
| SW-DUP001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure one blind duplicate sample will be collected with a selected surface water sample to determine the precision of laboratory analysis. |
| <i>Waste Characterization</i> | | | | |
| WC-001 | N/A | Excess Soil Samples | TCLP VOC, TCLP SVOC, TCLP Metals, PCBs, TCLP herbicides, TCLP Pesticides, Reactivity, Corrosivity, Ignitability | Characterization of waste to be disposed of offsite. |
| GW-WC-001 | N/A | Purged Water | VOC, SVOC, TAL Metals, PCBs, Herbicides, Pesticides, Reactivity, Corrosivity, Ignitability | Characterization of liquid waste to be disposed of offsite. |

¹ QAQC samples for these parameters are included with subsurface sampling.

5.6 DECONTAMINATION PROCEDURES

Decontamination procedures related to the investigative activities at the Site are described in the FSP, included as Appendix A.

5.7 INVESTIGATION DERIVED WASTE

Investigation Derived Waste (IDW) generated during the investigation will include excess soil samples, purge water and decontamination water, as well as empty soil jars, personal protective equipment (PPE) and other project-related waste. Handling procedures for the IDW has been outlined in the FSP, included as Appendix A.

5.8 REPORTING

Daily field reports will be prepared to summarize any investigation or field work conducted as described in detail in the FSP included in Appendix A. Additionally, a 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. Boring installation and soil and water sampling logs as well as daily logs for all field activities.
2. Tables summarizing the analytical data for soil, surface water, and groundwater samples collected including comparisons to appropriate standards, criteria, and guidance.
3. A discussion regarding the existence or non-existence of contamination.
4. A narrative that summarizes the results of the investigation including a discussion of the physical and analytical results.
5. A characterization of the soil, surface water, and groundwater of the Site to allow for the confirmation of the source(s) of the contamination, movement of the contamination, and possible receptors at risk.
6. Groundwater levels from the three existing on Site monitoring wells.
7. Figures showing the locations of the borings, monitoring wells, and sample locations at the Site.
8. A qualitative exposure assessment for contamination, if any, emanating from the Site.
9. Conclusions and recommendations regarding the environmental status of the Site.

EQuIS deliverables will be provided with the RI Report.

5.9 ADDITIONAL INVESTIGATION

Upon completion of the field work, the data described in this RI Work Plan, will be evaluated. Should the data be consistent in a particular field and across the site, no additional investigation will be completed. However, should the data suggest that there is significant heterogeneity in compost thickness, contaminant concentrations, or in other site conditions where the nature and extent of contamination cannot be clearly defined, additional investigations may be warranted in select areas. The additional investigations may include:

- Test pits and/or soil borings to further characterize and evaluate the compost
- Collection of additional surface soil samples
- Collection of additional subsurface samples from native soils beneath the compost
- Installation of additional groundwater monitoring wells
- Collection of additional groundwater and/or surface water samples
- Collection of additional water level information

The number, location, and type of samples to be added will be determined from a data gap analysis. To facilitate the project schedule, all additional work will be conducted in accordance with the procedures described in this work plan, field sampling plan, and quality assurance project plan.

Compost fields which appear to be highly heterogenous compared to other areas on site will be further evaluated in a grid fashion. The density of the grid will be dependent on the size of the field and will be sized appropriately to fully characterize the field.

6.0 FIELD SAMPLING PLAN

The work described in this Work Plan for the RI will be performed in accordance with the FSP that has been developed for this project. The FSP details the specific sampling objectives, procedures, and protocols associated with this project.

A copy of the FSP is provided in Appendix A.

7.0 QUALITY ASSURANCE PROJECT PLAN

A QAPP has also been prepared for the site investigation activities. The QAPP presents the policies, organization, objectives, functional activities and specific QA and QC activities designed to achieve the specific data quality goals associated with the RI that will be conducted at the Site.

A copy of the QAPP is provided in Appendix B.

8.0 HEALTH AND SAFETY PROTOCOLS

A site-specific HASP was prepared following an assessment of known physical and chemical hazards present at the site and an evaluation of the risks associated with the assessment and remedial actions. Available Site information was examined and adequate warnings and safeguards for field personnel were selected and implemented. All CHA field personnel are required to review and sign the HASP before entering the field. Subcontractors to CHA are required to develop and implement their own HASP.

A copy of the site-specific HASP is provided in Appendix C.

9.0 COMMUNITY AIR MONITORING PROGRAM

A CAMP has been prepared to provide a measure of protection for the downwind community (i.e. offsite 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. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Air monitoring as part of this RI will be conducted during all ground intrusive activities in general accordance with the NYSDOH *Generic Community Air Monitoring Plan*.

A copy of the Site-specific CAMP is provided in Appendix D.

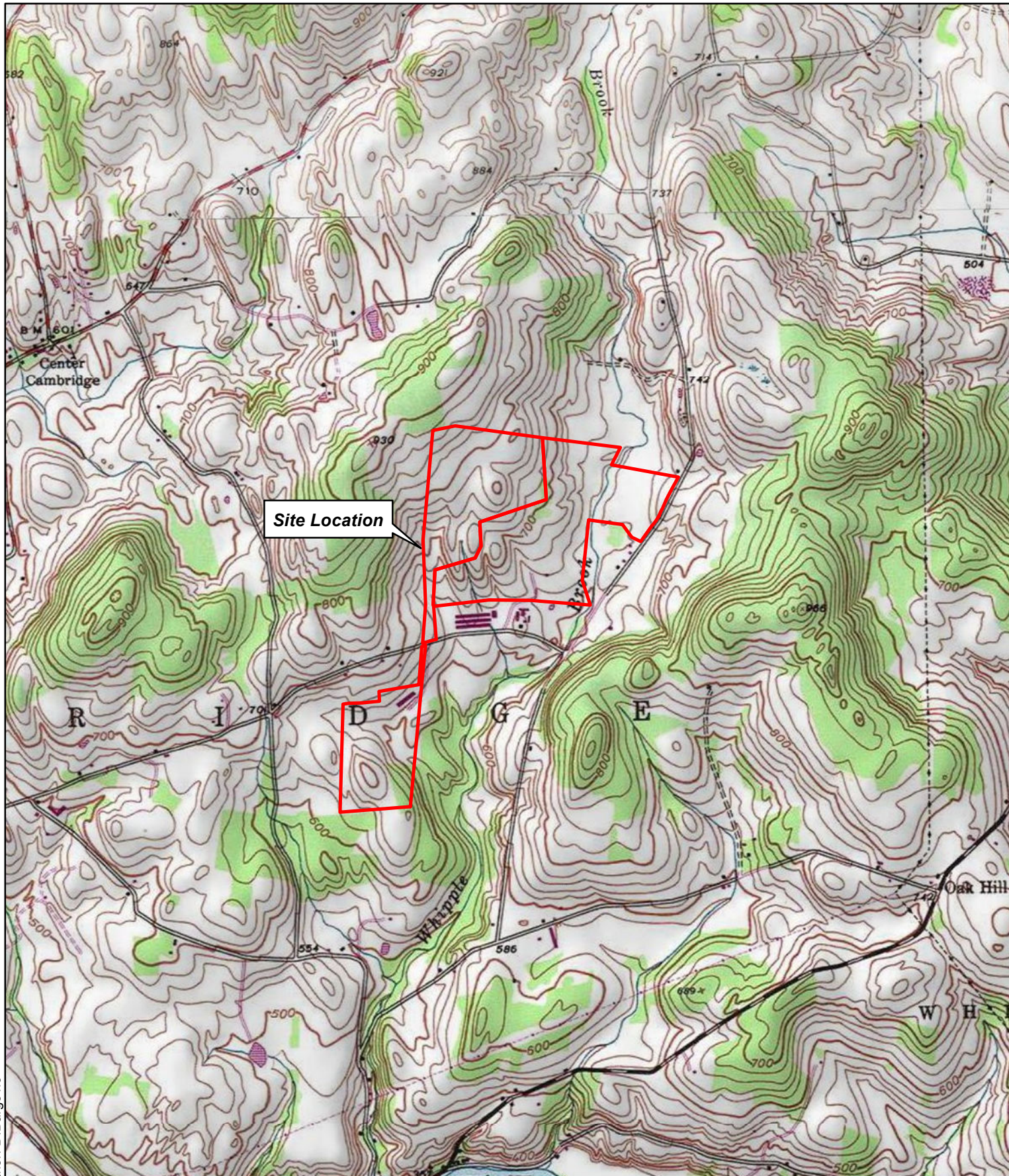
10.0 SCHEDULE

The following table provides an estimated schedule for completion of the CTI Agri-Cycle 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. Note that in particular, the field activities associated with the Remedial Investigation are currently scheduled for winter months, which may result in delays due to inclement weather.

Table 2: Project Schedule

| DESCRIPTION | ESTIMATED START | ESTIMATED FINISH |
|--|--------------------|---------------------|
| Remedial Investigation – Phase 1 | October 2021 | December 2021 |
| Remedial Investigation – Phase 2 | April 2022 | June 2022 |
| Remedial Investigation Report Preparation | June 2022 | July 2022 |
| NYSDEC Review & Approval of Investigation Report | July 2022 | August 2022 |

FIGURES



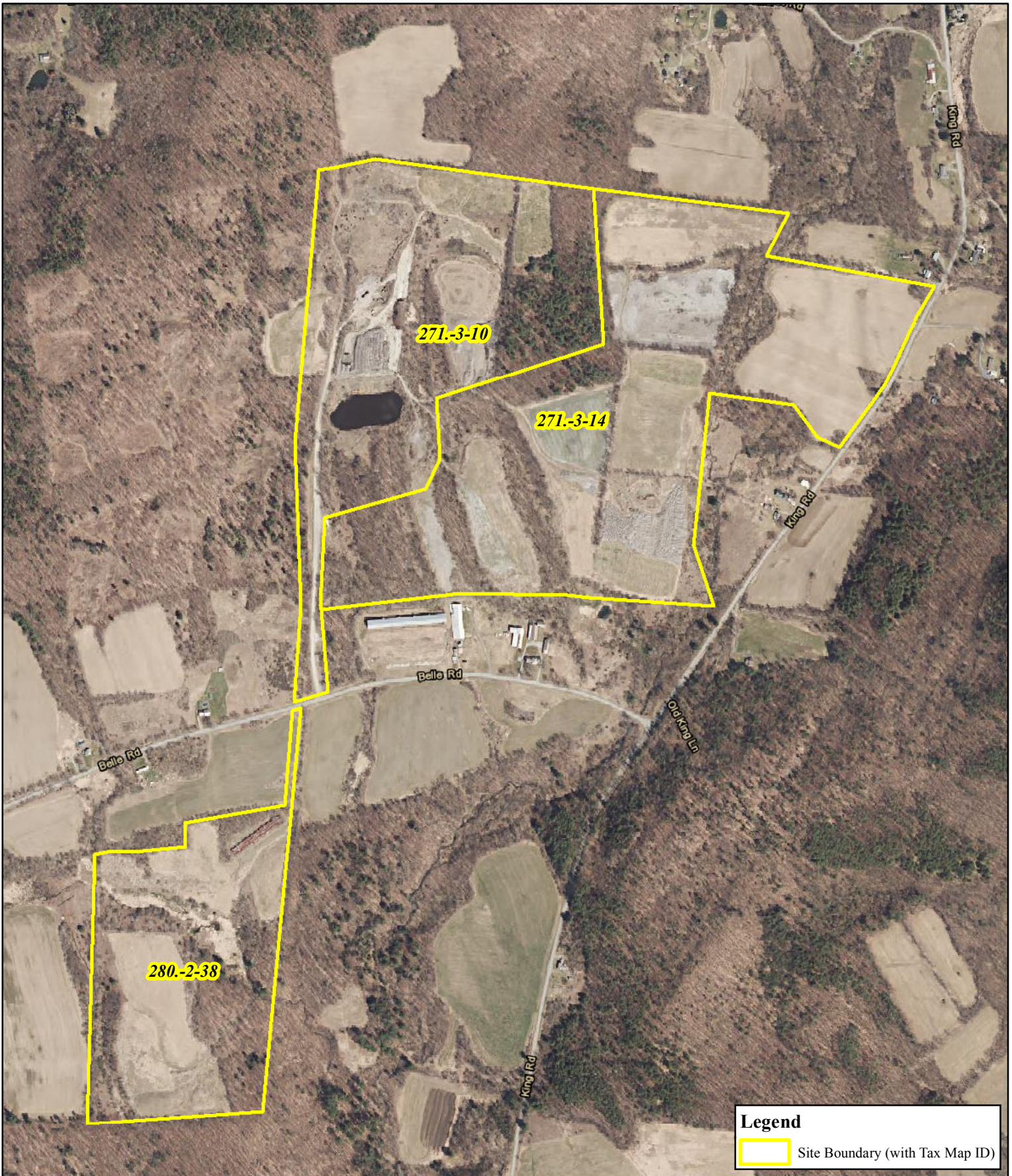
CHA

Scale 1" = 2000'

CHA Project No.
057581

Figure 1
Site Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Service Layer Credits:
Copyright: © 2013 National Geographic Society, I-cubed
Eagle Bridge USGS Quadrangles Date: 1980



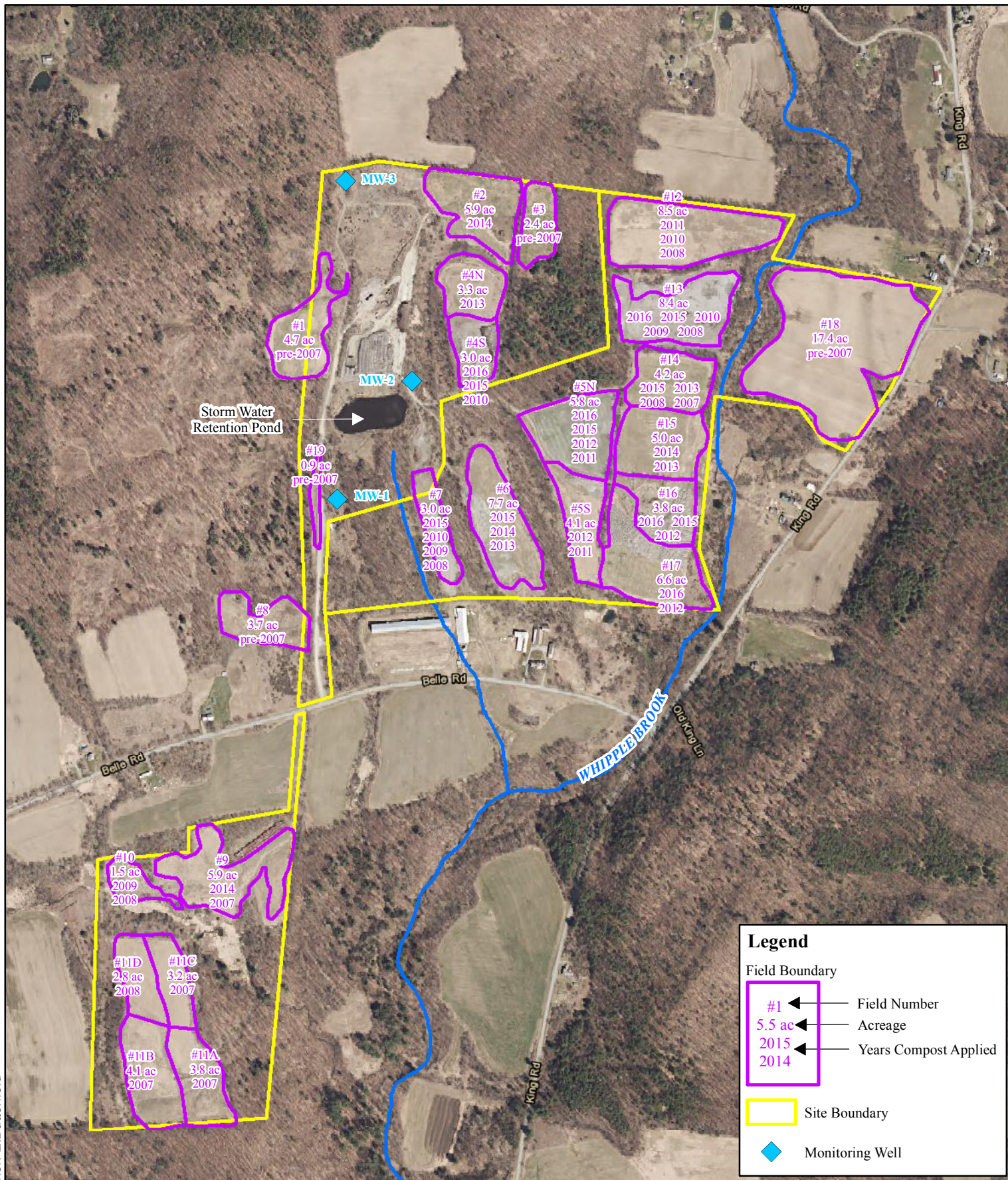
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CHA Project No.
057581

Figure 2
Site Boundary Map
CTI Agri-Cycle Composting Facility

308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Image Courtesy of NYS Office of Information Technology Services,
GIS Program Office • Photo Date: 2017
Site Boundary corresponds to Tax Map Boundaries



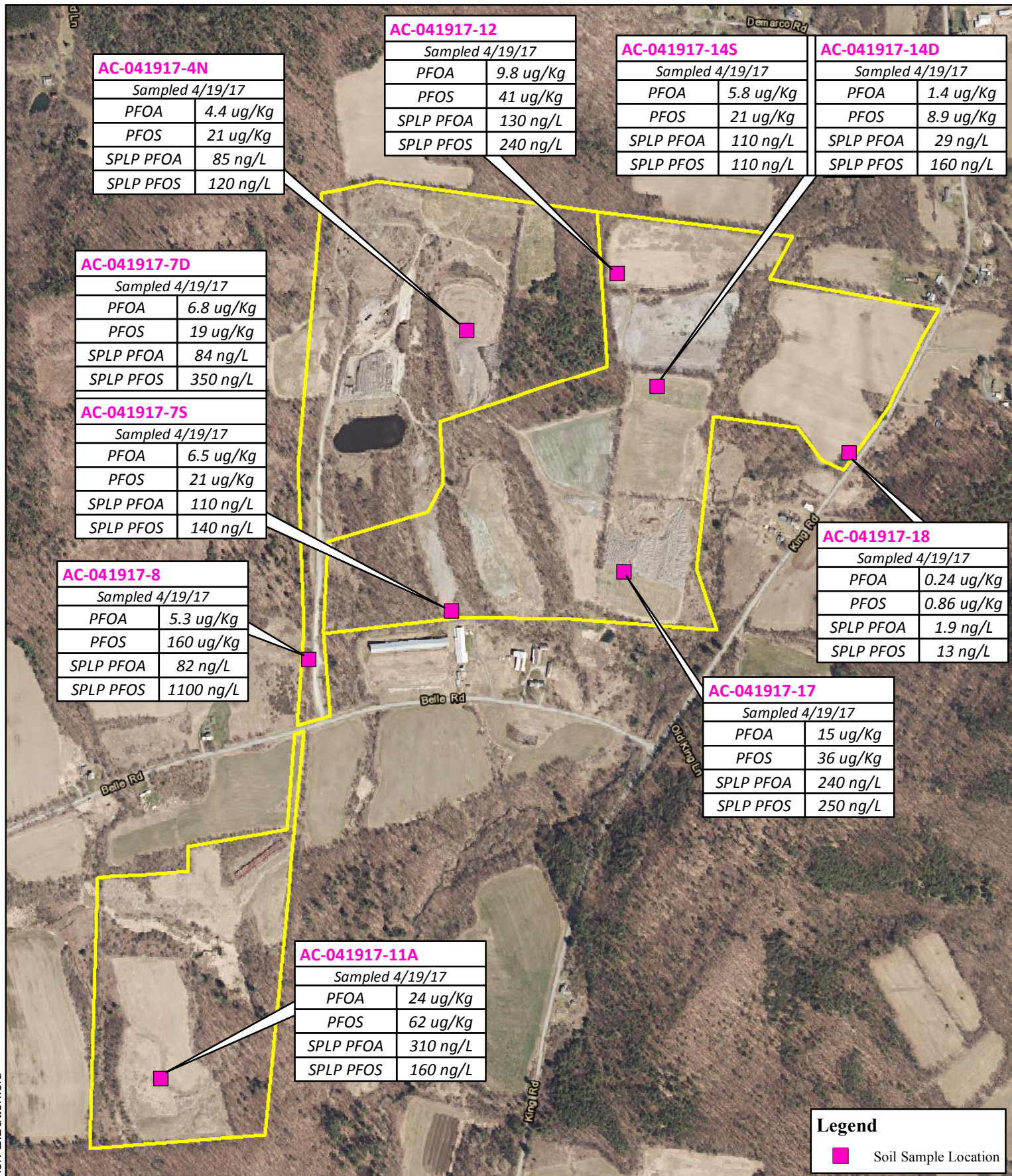
CHA

Scale 1" = 800'

CHA Project No.
057581

Figure 3
Site Layout Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Image Courtesy of NYS Office of Information Technology Services,
GIS Program Office • Photo Date: 2017
Site Boundary corresponds to Tax Map Boundaries



CHA

Scale 1" = 800'

CHA Project No.
057581

Figure 4
Historical Soil Sample Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Image Courtesy of NYS Office of Information Technology Services,
GIS Program Office • Photo Date: 2017

SO / AC-040517-FC

Sampled 1/31/17

PFOA 28 ug/Kg

PFOS 72 ug/Kg

Sampled 4/5/17

PFOA 27 ug/Kg

PFOS 57 ug/Kg

SL

Sampled 1/31/17

PFOA 1.5 ug/L

PFOS 25 ug/L

CO / AC-040517-YW

Sampled 1/31/17

PFOA 0.91 ug/Kg

PFOS 148 ug/Kg

Sampled 4/5/17

PFOA ND

PFOS ND

WR / AC-040517-WR1

Sampled 1/31/17

PFOA 3.4 ug/Kg

PFOS 8.5 ug/Kg

Sampled 4/5/17

PFOA 1.3 ug/Kg

PFOS 5.2 ug/Kg

AC-040517-WR2

Sampled 4/5/17

PFOA 3.5 ug/Kg

PFOS ND

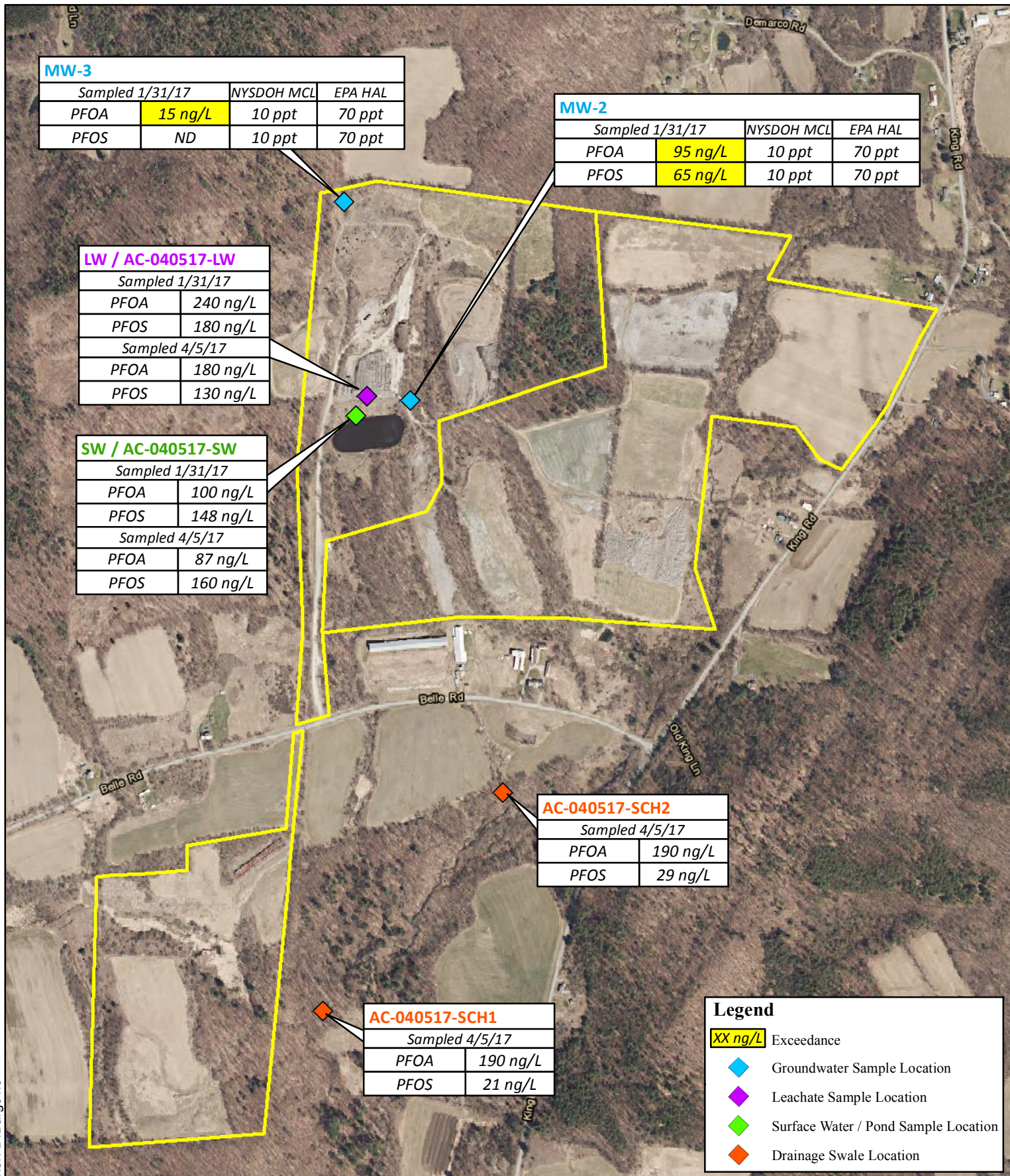
Legend

- Yard Waste Sample Location
- Windrow Sample Location
- Paper Sludge Sample Location
- Finished Compost Sample Location

Figure 5**Historical Solids Sample Location Map**
CTI Agri-Cycle Composting Facility308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 800'

CHA Project No.
057581Image Courtesy of NYS Office of Information Technology Services,
GIS Program Office • Photo Date: 2017

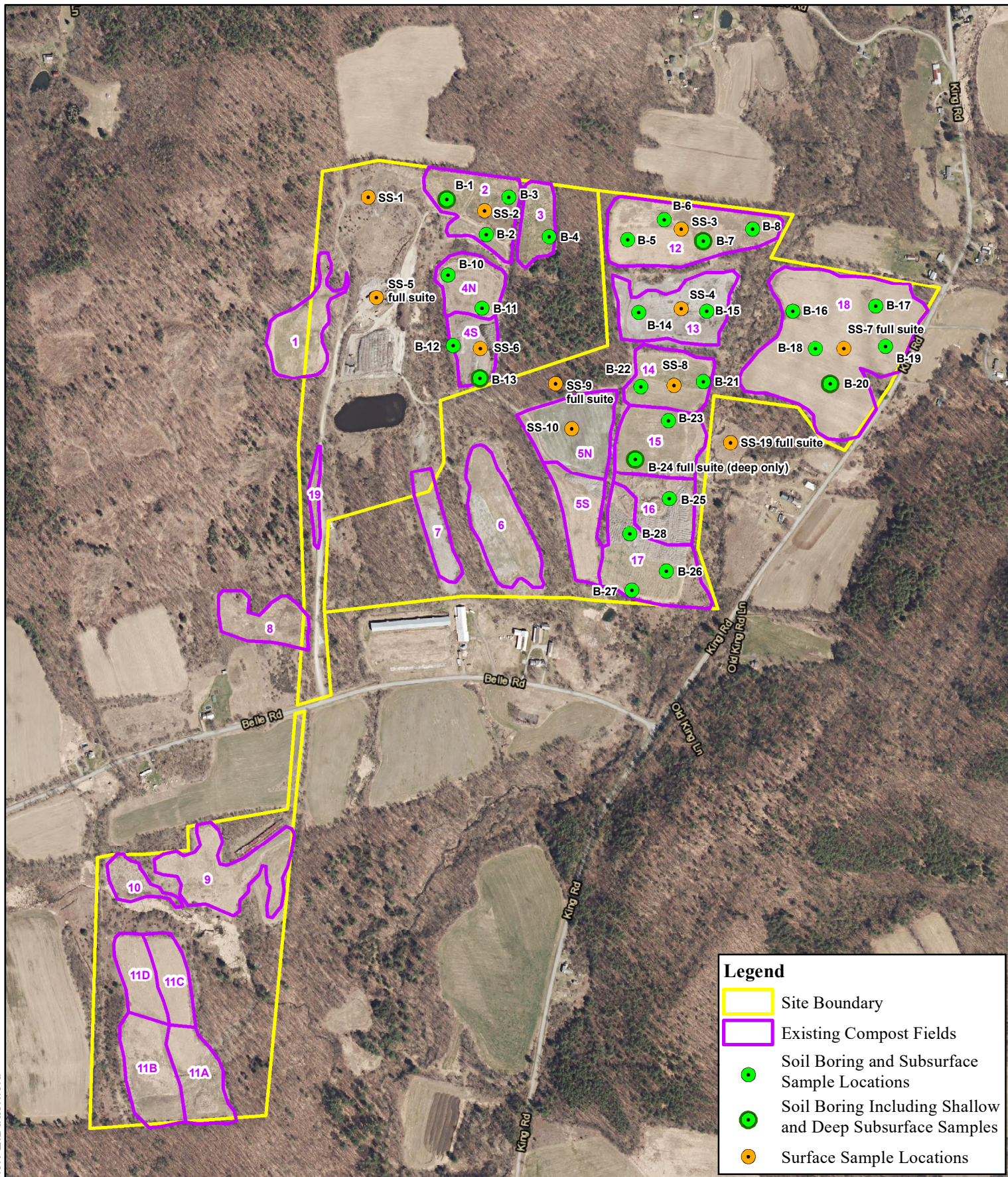


Scale 1" = 800'

CHA Project No.
057581

Figure 6
Historical Water Sample Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Image Courtesy of NYS Office of Information Technology Services,
GIS Program Office • Photo Date: 2017



Legend

- Site Boundary
- Existing Compost Fields
- Soil Boring and Subsurface Sample Locations
- Soil Boring Including Shallow and Deep Subsurface Samples
- Surface Sample Locations

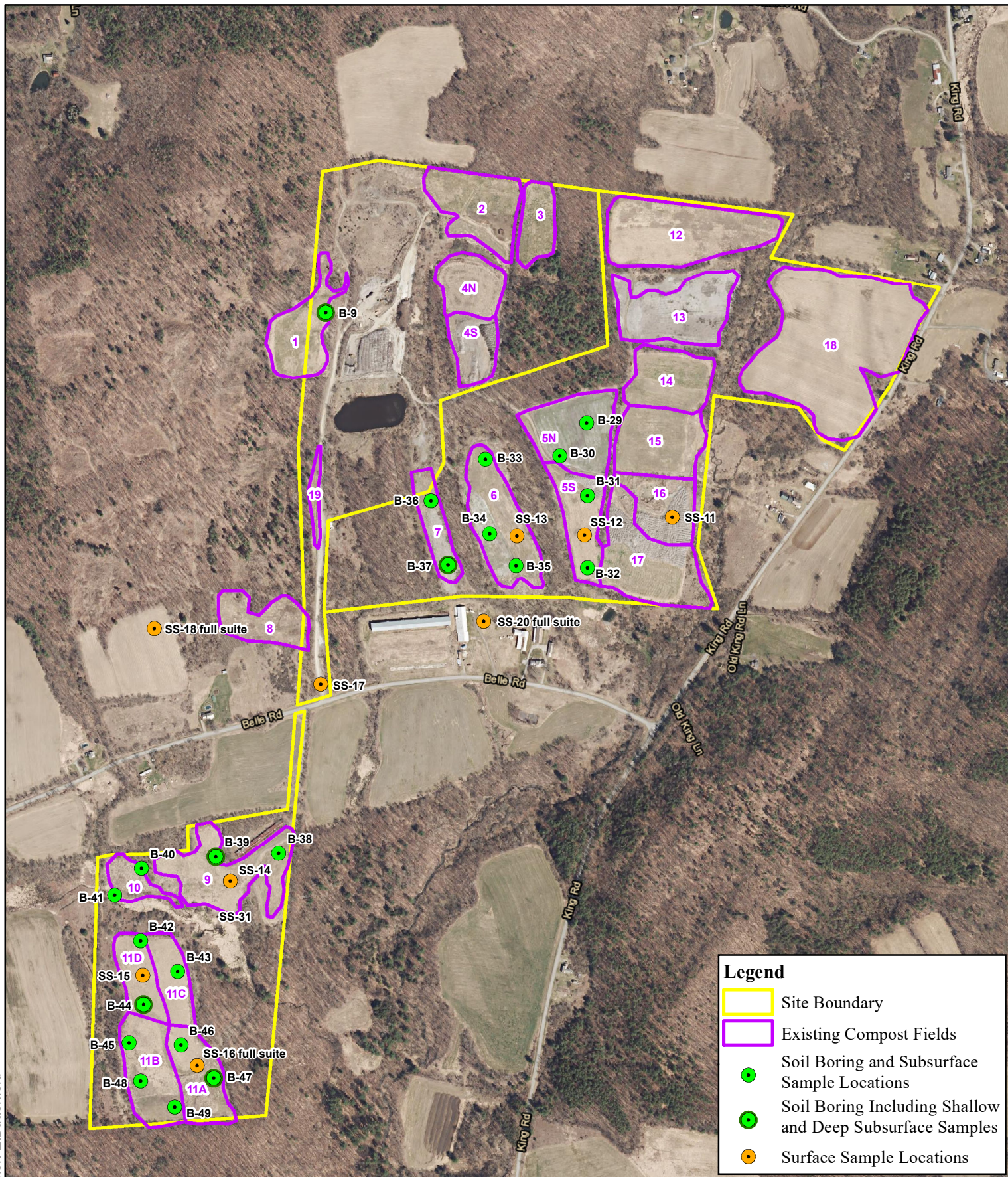


Scale 1" = 800'

CHA Project No.
057581

Figure 7A - Phase 1
Proposed Soil Borings/Sampling Locations Map
CTI Agri-Cycle Composting Facility
 308 & 311 Belle Road, Buskirk
 Town of Cambridge, Washington County, New York

*Image Courtesy of NYS Office of Information Technology Services,
 GIS Program Office • Photo Date: 2017
 Site Boundary corresponds to Tax Map Boundaries*



Legend

- Site Boundary
- Existing Compost Fields
- Soil Boring and Subsurface Sample Locations
- Soil Boring Including Shallow and Deep Subsurface Samples
- Surface Sample Locations

Figure 7B

Proposed Soil Borings/Sampling Locations Map CTI Agri-Cycle Composting Facility

308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

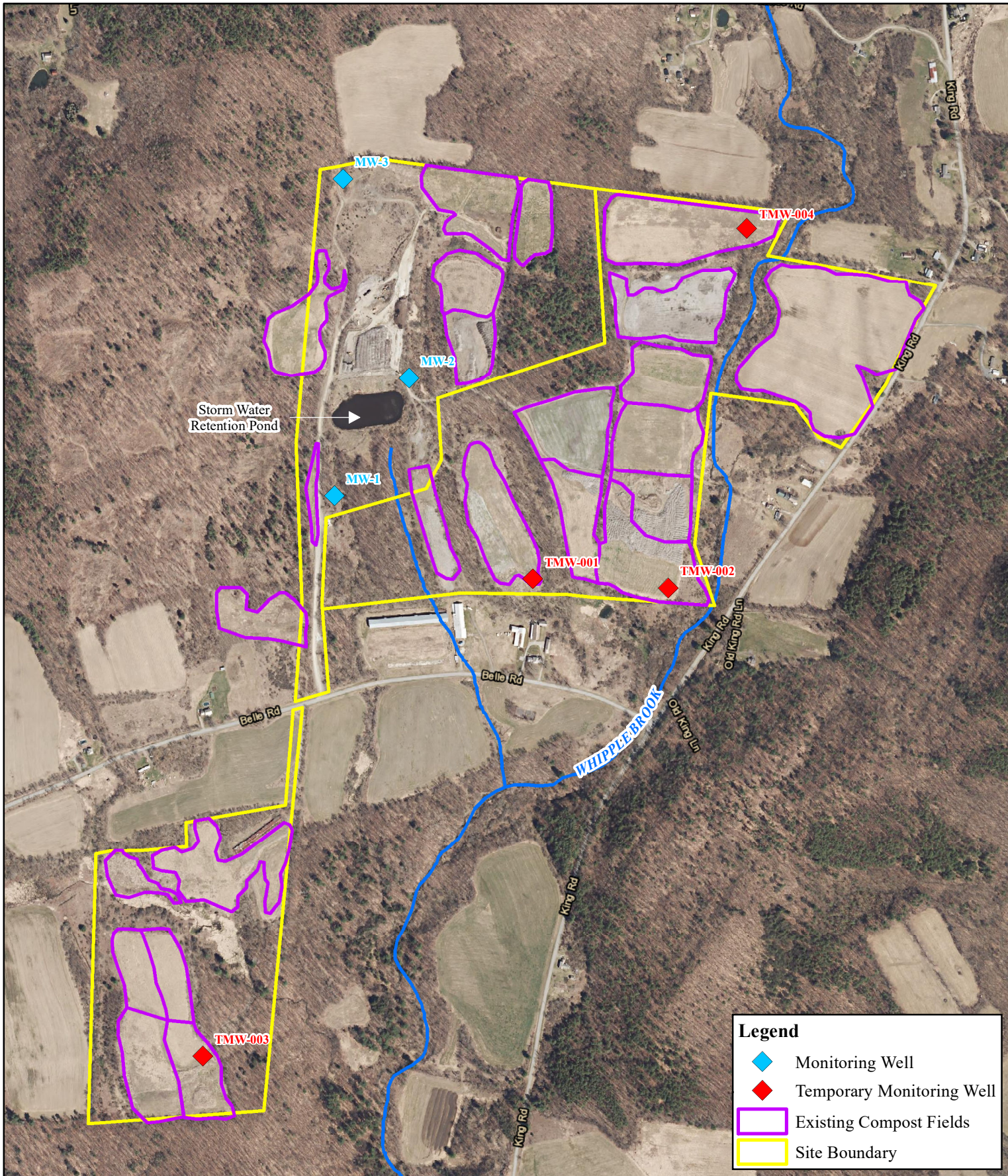
Image Courtesy of NYS Office of Information Technology Services,
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Site Boundary corresponds to Tax Map Boundaries



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Scale 1" = 800'

CHA Project No.
057581



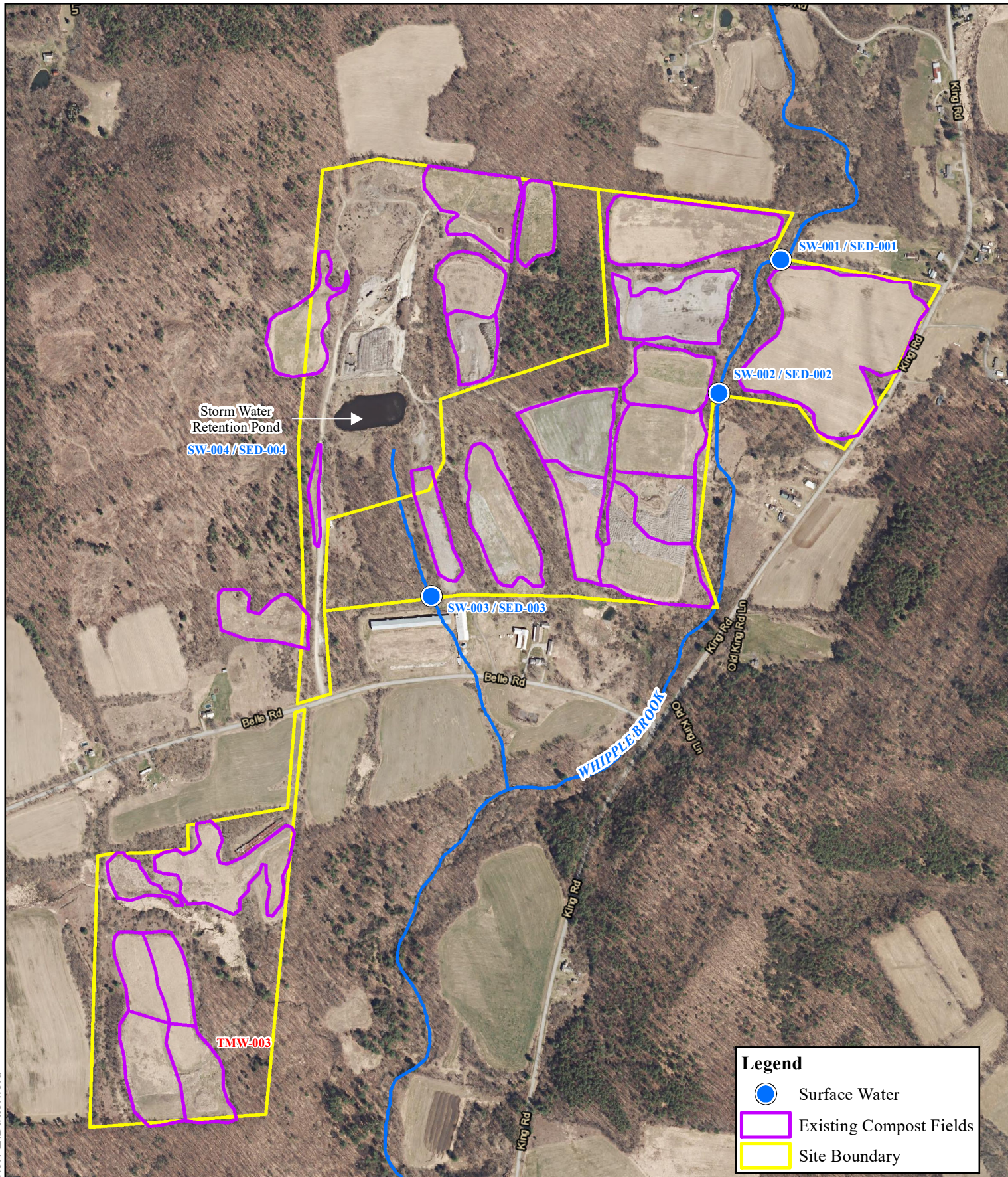
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Scale 1" = 800'

CHA Project No.
057581

Figure 8A - Phase 1
Proposed Water Sampling Locations Map
CTI Agri-Cycle Composting Facility
 308 & 311 Belle Road, Buskirk
 Town of Cambridge, Washington County, New York

Image Courtesy of NYS Office of Information Technology Services,
 GIS Program Office • Photo Date: 2017
 Site Boundary corresponds to Tax Map Boundaries



CHA

Scale 1" = 800'

CHA Project No.
057581

Figure 8B - Phase 2
Proposed Water Sampling Locations Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Image Courtesy of NYS Office of Information Technology Services,
GIS Program Office • Photo Date: 2017
Site Boundary corresponds to Tax Map Boundaries

APPENDIX A

Field Sampling Plan

Field Sampling Plan

**CTI Agri-Cycle
308 and 311 Belle Road
Buskirk, New York**

BCP Site No. C558043

CHA Project Number: 057581

Prepared for:
CTI Agri-Cycle
4 Open Square Way
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Prepared by:



III Winners Circle
Albany, NY 12205
Phone: (518) 453-4500
Fax: (518) 453-1735

July 2020
Revised October 2020

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TABLES

Table 1: Sampling Rationale

APPENDICES

Appendix A: CHA Standard Operating Procedures

LIST OF ACRONYMS & ABBREVIATIONS

| | |
|--------|---|
| BCP | Brownfield Cleanup Program |
| BGS | Below Ground Surface |
| CHA | CHA Consulting, Inc. |
| DO | Dissolved Oxygen |
| ELAP | Environmental Laboratory Accreditation Program |
| FSP | Field Sampling Plan |
| HASP | Health and Safety Plan |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| PCB | Polychlorinated Biphenyls |
| PFAS | Per- and Polyfluoroalkyl Substances |
| PFOA | Perfluorooctanoic Acid |
| PFOS | Perfluorooctanesulfonic Acid |
| PID | Photoionization Detector |
| PPE | Personal Protection Equipment |
| QAPP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance/Quality Control |
| RI | Remedial Investigation |
| RIWP | Remedial Investigation Work Plan |
| SOP | Standard Operating Procedure |
| SVOC | Semi-Volatile Organic Compound |
| TAL | Target Analyte List |
| VOC | Volatile Organic Compound |

1.0 INTRODUCTION

This Field Sampling Plan (FSP) has been prepared for the CTI Agri-Cycle facility (Site), located at 308 and 311 Belle Rad in Buskirk, Washington County, New York, and is to be utilized during the Remedial Investigation (RI) at the Site. The Site is a part of the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP). The Site location and Site Plan are shown on Figures 1 and 2 of the RIWP, respectively.

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

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

- Collection of surface soil samples
- Installation of soil borings;
- Collection of subsurface soil samples;
- Installation of temporary groundwater wells;
- Collection of groundwater samples;
- Collection of surface water samples;
- Waste characterization sampling;
- Equipment cleaning; and
- Waste handling.

2.0 GENERAL SAMPLING PROTOCOLS

The sampling approach and rationale for sample collection is described in the RI Work Plan. 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 RI Work Plan. Sampling activities will be conducted in a manner to protect both workers and the general public in accordance with the Health and Safety Plan (HASP), found in Appendix C of the RI Work Plan.

2.1 SAMPLE DESIGNATION

Subsurface soil samples will be identified in accordance with CHA SOP#103 Sample Naming and Numbering. In summary, each sample will be uniquely defined by including the media type and sequential number. To avoid confusion with samples collected prior to this RI Work Plan, CHA will start at number 001 on all media types (e.g. SOIL-001)

The following abbreviations will be used to identify media types:

Surface Soil.....SS
Subsurface Soil.....SOIL (will use B for Boring)
Groundwater.....GW
Surface Water.....SW
Waste Characterization.....WC

As further described in the QAPP, quality assurance/quality control (QA/QC) samples will also be collected. The following abbreviations will be used to identify these samples in place of the media type:

Trip Blank.....TP
Equipment Rinse (Field Blank).....FB
Duplicate.....DUP
Matrix Spike.....MS
Matrix Spike Duplicate.....MSD

2.2 SAMPLE HANDLING

A new pair of disposable nitrile gloves will be used at each location sampled for chemical analyses. Additional glove changes will be undertaken as conditions warrant. Given the contaminants of concern at the Site, the use of latex gloves is prohibited. Special sample collection and handling requirements are necessary for perfluoroalkyl substances (PFAS) compounds. Samples collected for PFAS analysis will be handled in accordance with CHA SOP#341.

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 QAPP. The sample containers will be placed on ice and/or ice packs in laboratory-supplied rigid coolers after collection and labeling.

For this project CHA staff will hand deliver the sample coolers to the Alpha Analytical Service Center located in Albany, New York, or coordinate with their courier service.

Samples will remain under the control of CHA's field representative until relinquished to the laboratory or commercial courier 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., 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

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

3.0 INVESTIGATION ACTIVITIES

3.1 SURFACE SOIL SAMPLING

A total of 16 surface soil samples will be collected as part of this investigation. Generally, one surface soil sample will be collected from each of the fields, and 2 soil samples will be collected from areas outside of the fields to be used to further delineate the extent of contamination. Fifteen surface soil samples will be collected from the 0 to 2-inch interval for PFOA and PFOS analysis, and one (1) sample will be collected from 0 to 2-inch interval for volatile organic compounds (VOCs,) semi-volatile organic compounds (SVOCs), Pesticides, Herbicides, polychlorinated biphenyls (PCBs) and metals, as further described in the FSP. Proposed surface soil samples are shown on Figure 7.

In addition to the soil samples described above, two duplicate samples and two matrix spike/matrix duplicate (MS/MSD) samples will be collected in accordance with the QAPP.

3.2 SOIL BORING INSTALLATION AND SOIL SAMPLING

As part of the RI, forty-nine (49) borings will be installed using track-mounted Geoprobe® hydraulic-push drilling equipment. Proposed soil boring locations are shown on Figure 7 of the RIWP. The borings have been spaced out to evaluate the compost and provide representative samples from each of the former compost fields. Proposed soil boring locations are shown on Figure 7. The soil borings will be advanced through the composted material (generally assumed to be up to 5 ft bgs) to evaluate the thickness of the compost. Additionally, ten (10) of these soil borings will be advanced to native soil which is estimated at a depth of 10-feet bgs to evaluate the soil beneath the compost.

Soil samples will be collected continuously from grade to final depth using a Macrocore® sampling device. 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 photoionization detector (PID) or equivalent meter will be used to obtain readings along the length of the soil sample. Soil from each boring advanced

within a field will be composited into one sample that will be submitted to laboratory for a select set of parameters as described in Table 1. The process for creating the composite will be as follows:

1. Remove rocks, twigs, leaves and other debris from the sampling device.
2. Place the sample into a stainless-steel bowl and thoroughly mix using a stainless-steel spoon.
3. Scrape the sample from the sides, corners and bottom of bowl, roll to the middle of the bowl and mix.
4. Quarter the sample and move to the four corners of the bowl. Each quarter will be individually mixed and rolled to the center of the bowl and then the entire sample will be mixed again.
5. Place the sample into the appropriate glassware required for each of the remaining parameters as shown in Table 1; PFOA and PFOS, semi-volatile organic compounds (SVOCs), Total polychlorinated biphenyls (PCBs) and target analyte list (TAL) Metals.

Subsurface soil samples analyzed for the presence of volatile organic compounds (VOCs) will be chosen from the soil exhibiting the most elevated PID readings, collected using a Terra Core™ sampler (or equivalent), and will not be composited. The sampling device will be inserted into the undisturbed soil from the Geoprobe® Macrocore tube that exhibits the highest readings on the PID. If no indication of VOCs is evident from the PID, staining or other evidence of contamination, the VOC sample will be randomly selected from one of the borings.

The 5-gram plug of soil will be capped and sent to the laboratory where it will be preserved, extracted, and analyzed. The remaining sample volume will be homogenized to create a composite sample for the other analyses listed in Table 1.

The laboratory will be certified under the NYSDOH Environmental Laboratory Approval Program (ELAP).

Before drilling at each boring location and after drilling at the last location, the drilling 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 and hydrated.

3.3 GROUNDWATER INVESTIGATION

There are currently three existing groundwater monitoring wells located along the western side of the Site. In addition to the permanent wells, three (3) temporary monitoring wells will be installed in presumed down-gradient locations to further evaluate potential impacts to groundwater. Groundwater samples will be collected from each of the permanent and temporary wells for a total of six groundwater samples (Figure 8). Samples will be collected for a select set of parameters, further described in Table 1. Dedicated/disposable tubing will be installed at each well and a low-flow pump will be used to collect the sample.

In addition to these samples, one duplicate, one field blanks, one equipment blank, one trip blanks, and one MS/MSD sample will be collected. Additionally, one waste characterization samples will be collected from the containerized purge water.

All non-disposable equipment will be cleaned in accordance with Section 4.0 to minimize the potential for cross-contamination. Bottle requirements and handling procedures are presented in the QAPP. Sampling protocols are presented in the following sub-sections.

3.3.1 Water Level Measurements

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. 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 comes in contact with well water will be cleaned in accordance with Section 5.0 to minimize the potential for cross-contamination.

3.3.2 Well Sampling

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 PFAS. In summary the following protocol will be adhered to:

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 (DO), 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 (3) 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 low flow methodologies such as a PFAS free bladder pump or equivalent.
6. Water extraction equipment will be cleaned in accordance with the protocols presented in Section 4.0.
7. New polyethylene tubing will be used at each well.
8. Groundwater samples will be analyzed for a select set of parameters as described in Table 1.
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 SURFACE WATER INVESTIGATION

There is currently one stormwater retention pond along the western portion of the Site, Whipple Brook that runs north to south along the eastern portion of the Site, and an unnamed stream that runs through the middle of the Site. One surface water sample will be collected from the stormwater retention pond, one from the down-stream end of the unnamed stream before it exits the Site, and two samples will be collected from Whipple Brook; one prior to entry on the Site and one downstream, prior to leaving the property. Surface water samples will be collected for a select set of parameters, further described in Table 1. Surface water samples will be collected in accordance with CHA SOP#401. In addition to these samples, one duplicate will also be collected.

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.

4.1.1 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 CHA SOP#341 summarized below:

1. Disassemble equipment, as required.
2. Scrub equipment with a plastic brush to remove heavy soiling and rinse thoroughly in tap water.
3. Triple rinse with PFOA-free water.
4. 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.

4.1.2 Large Equipment

The permanent components of the drill rig (body, tracks, etc.) may come into contact with contaminated soils. Detergent other than Alconox should not be used. Scrub equipment with a plastic brush and rinse thoroughly in tap water, then triple-rinse in distilled or deionized water.

5.0 INVESTIGATION DERIVED WASTE

All soil removed from intrusive activities will be containerized in 55-gallon drums, in a predetermined staging area to be characterized and disposed of at a permitted disposal facility. Up to approximately 0.5-cubic yards of soil are anticipated from these activities.

Additionally, all purged water from groundwater sampling and slug testing activities 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. Based upon the estimates provided above, two (2) composite soil samples from the soil drums, and one (1) groundwater samples from the drummed water, will be collected for a select set of parameters, further described in Table 1.

Gloves, personal protection equipment, sampling materials, etc. will be collected daily and disposed of as solid waste. All work will be performed in accordance with CHA SOP#507.

TABLES

Table 1: Sampling Rationale

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|--|-----------------|---|--|---|
| <i>Surface Soil</i> | | | | |
| SS-001 through SS-004, SS-006, SS-008, SS-10 through SS-15 and SS-17 | 0-2-inches bgs | One sample per compost field, one in the center of the Site, and one in the northwest corner. | PFOA, PFOS | To investigate the extent of surface soil contamination across the Site, focusing on compost fields. |
| SS-005, SS-007, SS-009, SS-16, SS-18, SS-19, and SS-20 | 0-2 inches bgs | Middle of the Site. | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To investigate the potential for additional contamination in the surface soils on Site. |
| SS-DUP001 | 0-2-inches bgs | TBD | PFOA, PFOS | Per QAQC procedure, two total blind duplicate samples will be collected with selected soil samples to determine the precision of laboratory analysis. |
| SS-DUP002 | 0-2-inches bgs | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure, one blind duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SS-MS001 | 0-2-inches bgs | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SS-MS002 | 0-2-inches bgs | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure, one matrix spike sample will be collected for every 20 samples determine the precision of laboratory analysis. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|---|---|--|--|--|
| SS-MSD001 | 0-2-inches bgs | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SS-MSD002 | 0-2-inches bgs | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure, one matrix spike duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| <i>Sub-Surface Soil</i> | | | | |
| SOIL-001, SOIL-002, SOIL-003, SOIL-004N/S, SOIL-005N/S, SOIL-006, SOIL-007, SOIL-009, SOIL-010, SOIL-011A/B, SOIL-011C/D, SOIL-012, SOIL-013, SOIL-014, SOIL-015, SOIL-016, SOIL-017, SOIL-018N, SOIL-018S with COM Suffix | 1-5 feet bgs | One composite sample per field corresponding to numbers in the sample ID. Two samples in Field 18. | PFOA, PFOS | To investigate the extent of sub-surface soil contamination throughout the first layer of compost on Site. |
| B-001D, B-007D, B-009D, B-018D, B-020D, B-024D, B-037D, B-039D, B-044D, B-047D With NAT Suffix | Top 2 feet of native soil under compost layer | Varying fields across the Site. | PFOA, PFOS | To investigate and evaluate the extent of sub-surface soil contamination underneath the compost. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|-------------|---|-----------------|--|--|
| B-024D | Top 2 feet of native soil under compost layer | Field 15 | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To investigate and evaluate the potential for additional sub-surface soil contamination underneath the compost. |
| B-029 | 1-5 feet bgs | Field 5N | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To investigate and evaluate the potential for additional soil contamination throughout the first layer of compost. |
| SOIL-DUP001 | 1-5 feet bgs | TBD | PFOA, PFOS | Per QAQC procedure, one blind duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SOIL-DUP002 | Top 2 feet of native soil under compost layer | TBD | PFOA, PFOS | Per QAQC procedure, one blind duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SOIL-MS001 | 1-5 feet bgs | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SOIL-MS002 | Top 2 feet of native soil under compost layer | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| SOIL-MSD001 | 1-5 feet bgs | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|--------------------|---|----------------------------|--|--|
| SOIL-MSD002 | Top 2 feet of native soil under compost layer | TBD | PFOA, PFOS | Per QAQC procedure, one matrix spike duplicate sample will be collected for every 20 samples determine the precision of laboratory analysis. |
| Groundwater | | | | |
| GW-MW-1 – GW-MW-3 | N/A | Permanent Monitoring Wells | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To sample the existing Site monitoring wells for contaminants of concern. |
| TMW-001 – TMW-004 | N/A | Temporary Monitoring Wells | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To sample the Site groundwater for contaminants of concern. |
| GW-DUP001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure one blind duplicate sample will be collected with a selected groundwater sample to determine the precision of laboratory analysis. |
| GW-MS001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure one matrix spike sample will be collected with a selected groundwater sample to determine the precision of laboratory analysis. |
| GW-MSD001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure one matrix spike duplicate duplicate sample will be collected with a selected groundwater sample to determine the precision of laboratory analysis. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|--|-----------------|-------------------|---|--|
| GW-FB001 | N/A | TBD | TCL VOCs | Per QAQC procedure one field blank is required for each day of onsite groundwater sampling. |
| GW-EB001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure, one equipment blank is required for every 20 groundwater samples collected. |
| GW-TB001 | N/A | TBD | VOCs | Per QAQC procedure, one trip blank is required for each cooler containing samples for VOC analysis. VOC samples should be combined into one cooler each day. |
| <i>Surface Water/Sediment</i> | | | | |
| SW-001through SW-004 and Sed-001 through Sed-004 | N/A | Shown on Figure 8 | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | To sample the surface waters associated with the Site. |
| SW-DUP001 | N/A | TBD | 1,4-Dioxane, PFAS, TCL VOCs, TCL SVOCs, TAL Metals, PCBs, Herbicides, Pesticides | Per QAQC procedure one blind duplicate sample will be collected with a selected surface water sample to determine the precision of laboratory analysis. |
| <i>Waste Characterization</i> | | | | |
| WC-001 | N/A | Soil Cuttings | TCLP VOC, TCLP SVOC, TCLP Metals, PCBs, TCLP herbicides, TCLP Pesticides, Reactivity, Corrosivity, Ignitability | Characterization of waste to be disposed of off-Site. |

| Sample ID | Sample Depth(s) | Sample Location | Analytical Parameters | Rationale |
|-----------|-----------------|-----------------|---|---|
| GW-WC-001 | N/A | Purged Water | VOC, SVOC, TAL Metals, PCBs, Herbicides, Pesticides, Reactivity, Corrosivity, Ignitability | Characterization of liquid waste to be disposed of off-Site. |

APPENDIX A

CHA Standard Operating Procedures



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

NYSDEC, Electronic Data Delivery Manual, January 2013,
http://www.dec.ny.gov/docs/remediation_hudson_pdf/eddmanual.pdf

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

G. APPENDICES/FORMS:

Not Applicable

END OF SOP

Final Check by C. Burns 12/2/15



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



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 |
| Bladder Pump | 3 | 3 | 3 | 3 | 3 | 3 |
| DPIS | 3 | 3 | 2 | 2 | 2 | 2 |
| Diffusion Sampler | 2 | 2 | X | 2 | 2 | X |
| 1 - Not recommended, better methods exist 2 - Useful with limitations 3 - Recommended method X - Unacceptable Note: 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



SAMPLING PERFLUOROALKYL SUBSTANCES (PFASs) and PERFLUORINATED COMPOUNDS (PFCS)

A. PURPOSE/SCOPE:

The objective of this SOP is to ensure proper and uncontaminated collection of Perfluoroalkyl Substances (PFASs) and other Perfluorinated Compounds (PFCs). PFASs 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:

Field equipment, field clothing, PPE, sample containers, and any other items used or present on site made of or containing the following materials **ARE NOT PERMITTED:**

- 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.
- Most repellents, sunscreens, moisturizers, cosmetics, or other related products
- Decon 90

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.

SAMPLING PERFLUOROALKYL SUBSTANCES (PFASs) and PERFLUORINATED COMPOUNDS (PFCS)

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. The following materials are **ALWAYS PERMITTED** in sampling equipment:

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

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

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.

Soil Sampling with a Hand Auger (SOP #305)

- A stainless steel hand auger without any coatings must be used when sampling.
- Scoops and spatula used must be stainless steel.

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.
- Other pump types are typically okay, but should still be examined for Teflon or other prohibited materials.



SAMPLING PERFLUOROALKYL SUBSTANCES (PFASs) and PERFLUORINATED COMPOUNDS (PFCS)

Surface Soil Sampling (SOP #405)

- A stainless steel spoon and bowl should be used. Cover the bowl with a stainless steel lid where possible between the addition of each aliquot. Do NOT cover the bowl with aluminum foil.

Small Equipment Decontamination (SOP #501)

- Water used for decontamination on site should be laboratory certified “PFAS-free” water.

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

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

These equipment changes can be applied to other SOPs if PFASs 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 PFOA-free water as the final step. If large quantities of PFOA-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.



SAMPLING PERFLUOROALKYL SUBSTANCES (PFASs) and PERFLUORINATED COMPOUNDS (PFCS)

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 shipping container packed only with ice made from frozen water.
- 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.

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.

D. 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 $4\pm 2^{\circ}$ Celsius.

E. 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.



SAMPLING PERFLUOROALKYL SUBSTANCES (PFASs) and PERFLUORINATED COMPOUNDS (PFCS)

No food or drink is permitted on-site, 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, 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.

If laboratory results are received and the combined concentration PFOA and PFOS was between 50 and 70 parts per trillion (ppt), consider contacting the laboratory to ensure that the analytical results reported are based on the more comprehensive technique from EPA Method 537 for measuring PFOA.

F. REFERENCES:

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

Shoemaker, J. A., Grimmet, P. E., & Boutin, B. K. (2009). Method 537. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) (EPA/600/R-08/092) (USA, EPA, Office of Research and Development). Cincinnati, OH: U.S. Environmental Protection Agency.

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

G. 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

| PROHIBITED | ACCEPTABLE |
|---|--|
| Field Equipment | |
| 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 |
| Field Clothing and PPE | |
| 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>Sunscreens – 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>Insect Repellents – Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect Repellent, Herabl Armor, California Baby Natural Bug Spray, BabyGanics</p> <p>Sunscreen and Insect Repellent – Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion</p> |
| Sample Containers | |
| LDPE or glass containers | HDPE or polypropylene |
| PTFE or Teflon-lines caps | Unlined polypropylene caps |
| Equipment Decontamination | |
| Decon 90 | Alconox and/or Liquinox |
| Water from an on-site well | Laboratory certified “PFAS-free” water |
| Food Considerations | |
| 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 WATER SAMPLING

A. PURPOSE/SCOPE:

The objective of sampling surface water in various streams, lakes, or ponds is to obtain samples that are representative of existing surface water conditions. For samples collected in water bodies adjacent to a contaminated site, the objective may also be to determine the presence and extent of contamination emanating from the site. This SOP includes samples collected from depth, as well as samples collected from the surface.

These are standard operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure or other procedure limitations. In all instances, the ultimate procedures employed should be documented and approved by the project manager.

B. EQUIPMENT/MATERIALS:

Any equipment or sampling techniques used to collect a sample is acceptable as long as it provides a sample which is representative of the water body being sampled and is consistent with the work plan. Sampling situations vary widely, and, therefore, no universal sampling procedure can be recommended. However, sampling of both aqueous and non-aqueous liquids from the above mentioned sources is generally accomplished through the use of one of the following samplers or techniques:

- Dip sampler
- Direct method
- Discrete depth samplers (e.g. Kemmerer or Van Dorn bottles)
- Peristaltic pumps
- Storm water collection devices

The physical location of the investigator when collecting a sample may dictate the equipment to be used. If surface water samples are required, direct dipping of the sample container into the stream is desirable. This is possible, however, only from a small boat, a pier, etc., or by wading in the stream. Wading, however, may cause the re-suspension of bottom deposits and bias the sample. Wading is acceptable if the stream has a noticeable current (is not impounded), and the samples are collected while facing upstream. If the stream is too deep to wade, or if the sample must be collected from more than one water depth, or the sample must be collected from a bridge, etc., supplemental sampling equipment must be used.

Generally, the deciding factors in the selection of a sampling device for sampling liquids in streams, rivers, lakes, ponds, lagoons, and impoundments are:

- Will the sample be collected from shore or from a boat?
- What is the desired depth at which you wish to collect the sample?
- What is the overall depth and flow direction of river or stream?
- What type of sample will be collected (i.e., water or lagoon liquids)?

Appropriate sampling equipment must be selected by the project manager and will typically be addressed in the work plan. The following sub-sections describe the equipment available, their appropriate use, and advantages/disadvantages.

SURFACE WATER SAMPLING

1. Dip Sampler

A dip sampler is useful for situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access is limited. The long handle on such a device allows access from a discrete location. Sampling procedures are as follows:

- Assemble the device in accordance with the manufacturer's instructions.
- Extend the device to the sample location and collect the sample.
- Retrieve the sampler and transfer the sample to the appropriate sample container.

2. Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples from the surface. This method is not to be used for sampling lagoons or other impoundments where contact with contaminants are a concern. Using adequate protective clothing, access the sampling station by appropriate means. For shallow stream stations, the sampler should face upstream and collect the sample without disturbing the sediment. Surface water samples should always be collected prior to a sediment sample at the same location. Submerges the inverted bottle to the desired sample depth and then tilt the opening of the bottle upstream to fill. Samples should be collected approximately six inches below the surface with the sample bottles completely submerged. The collection bottle may be rinsed two times by the sample water. Cap the bottle while below the surface.

When collecting samples using the direct dip method (Section C); for lakes and other impoundments, collect the sample under the water surface avoiding surface debris and the boat wake. When using the direct method, do not use pre-preserved sample bottles as the collection method may dilute the concentration of preservative necessary for proper sample preservation. If the bottles are pre-preserved, then pre-cleaned, unpreserved bottles should be used to collect the sample. The water samples should then be transferred to the appropriate preserved bottles.

3. Discrete Depth Samplers

When discrete samples are desired from a specific depth, and the parameters to be measured do not require a Teflon® coated sampler, a standard Kemmerer or Van Dorn sampler may be used. The Kemmerer sampler is a brass cylinder with rubber stoppers that leave the ends of the sampler open while being lowered in a vertical position, thus allowing free passage of water through the cylinder. The Van Dorn sampler is plastic and is lowered in a horizontal position. In each case, a messenger is sent down a rope when the sampler is at the designated depth, to cause the stoppers to close the cylinder, which is then raised. Water is removed through a valve to fill respective sample containers. With a rubber tube attached to the valve, dissolved oxygen sample bottles can be properly filled by allowing an overflow of the water being collected. With multiple depth samples, care should be taken not to stir up the bottom sediment and thus bias the sample.

- a. Using a properly decontaminated Kemmerer or Van Dorn bottle, set the sampling device so that the sampling end pieces are pulled away from the sampling tube, allowing the water to be sampled to pass through this tube.
- b. Lower the pre-set sampling device to the predetermined depth. Avoid bottom disturbance.
- c. When the discrete sampler bottle is at the required depth, send down the messenger, closing the sampling device.

SURFACE WATER SAMPLING

- d. Retrieve the sampler and discharge the first 10 to 20 mL to clear any potential contamination on the valve. Transfer the sample to the appropriate sample container.
- e. Be sure to use special attachments available on some discrete samplers to distribute small volumes at low flow rates; e.g., VOCs at 100 to 200 mL/ min.

4. Peristaltic Pump Samplers

Another device that can be effectively used to sample a water column is the peristaltic pump/vacuum jug system. The use of a metal conduit to which the tubing is attached, allows for the collection of a vertical sample (down to about a 25 foot depth) which is representative of the water column. Commercially available pumps vary in size and capability, with some being designed specifically for the simultaneous collection of multiple water samples. The battery-powered “ISCO” sampler is one such peristaltic pump. It is designed to collect discrete samples into 24 polyethylene or glass bottles at preset intervals. Some ISCO models can be configured to collect samples into a single container. To operate the compositor:

- a. Place collection jars in appropriate positions in compositor. Add ice.
- b. Connect sample hose and strainer and position in waste stream.
- c. Adjust bottle position to '1'.
- d. Adjust head, tube lengths and width to appropriate settings.
- e. Set sample volume; e.g., approx. 300 mL.
- f. Set time interval to 60 minutes.
- g. Check that pump is functioning in 'forward' position.
- h. Turn switch to auto.
- i. After first sample is collected, check to see that an adequate volume was collected.
- j. Place lid on ISCO and place custody seals over the closures so that no tampering occurs.
- k. If the sampler is not in a secure area, secure the sampler with lock and chain.

5. Stormwater Samplers

A stormwater sampler is designed to collect a “first flush” sample in one bottle and a “time weighted” composite sample in the second bottle. Typically the composite sampler is set (by the user) to take a 200 mL sample every 10 minutes until the composite sample bottle is full. Thus it is actually two separate samplers in one; designed to meet the regulatory guidelines. It can be triggered (by sensor) to begin collecting samples by either rainfall or water level increase.

- a. Set the sampler in an upright position.
- b. Be sure the water sensor is plugged into the jack on the lower right side of the control panel.
- c. Check to be sure the two float switches in the bottle cap are properly connected.
- d. Plug the lead from the bottle cap into the socket on the bottom of the controller housing.
- e. Remove the battery charger from the sampler enclosure.
- f. Turn on the sampler with the toggle switch on the right side of the controller enclosure.
- g. Press the right side sampler button to activate the right side sample pump.
- h. Press the left side sampler button to activate the left side sample pump.
- i. Check to be sure the sample pumps are fully charged.
- j. Verify the sample size to be collected once the storm sampler has been set dependent upon the vertical distance between the water and the sampler.



SURFACE WATER SAMPLING

The appropriate sampling device must be of a proper composition. Selection of samplers constructed of glass, stainless steel, PVC or PFTE (Teflon) should be based upon the analyses to be performed. When sampling for organic compounds, select equipment with fluorocarbon polymer, glass, or metal components if components will directly contact samples to be analyzed for organic compounds. Do not use plastics other than fluorocarbon polymers. When sampling for inorganic constituents, select equipment with components made of fluorocarbon polymer or other relatively inert and uncolored plastics or glass if components will directly contact samples to be analyzed for inorganic constituents. Do not use metal or rubber components for trace element sampling. If a reusable container is used for sampling, the container should be decontaminated between sampling locations in accordance with SOP#501.

C. PROCEDURE:

After the planning and preparation activities are completing, the surface water sampling event can proceed. The typical procedure is detailed in the following steps.

1. Sample Site Selection and Inspection

Samples must be collected in a manner to minimize entrained/suspended sediments. Surface water samples are to be collected commencing with the most downstream sample to avoid sediment interference with other downstream samples.

A life vest and safety line will be worn in all cases where footing is unstable or where water is fast moving or over three feet in depth.

After the sampling location has been established, describe the surface water sampling location by describing the stream bed and the stream water. Describe the amount of organic material seen in the stream, from topped trees and branches to fine particles on the bed. Estimate the texture of the stream sediment (% rocks, gravel, sand, silt/clay) and note the presence of odors, if any. Describe the stream at the sampling location in terms of the percentage of pool (deep, calm, pooled areas), % riffle (shallow, swift-flowing, with the surface broken e.g., tumbling over rocks), and % run (smoothly flowing). Describe the adjacent banks and surrounding areas in terms of amount and type of vegetation, steepness of the banks, rocky versus muddy banks, outcrops, sunny versus shady, etc. Record this information on the Surface Water Sampling Field Log.

2. Flow Rate Measurements (*if required*)

Measure or estimate (if the stream is too large to measure) the average stream width and depth. Measure flow velocity three times by measuring off a 10-foot stretch and timing how long is required for a floating object to traverse the 10-foot length. Average the three measurements of stream velocity and use the average velocity to calculate the average flow volume (Section G).

3. Water Quality Parameter Monitoring

Using the collection vessel, transfer the necessary amount of surface water from the water body to a container for field measurements of Eh, pH, specific conductance, turbidity, dissolved oxygen, and temperature. Alternatively, some instruments are equipped with specially designed cups to hold the



SURFACE WATER SAMPLING

water or may have submersible probes that are placed into the actual water body itself, etc. Record the field parameter measurements on the [Surface Water Sampling Field Log](#).

4. Sample Collection

When collecting both water and sediment at the same location, the surface water sample will be collected first, followed by the collection of the sediment sample. Refer to SOP #403 for more details regarding sediment sampling.

Point sampling will be used when a water sample needs to be collected from a specific depth in the water column. The sample may be composited with other point samples or placed directly into the sample containers pre-rinsed with water from the same point in the water column. A point sample may also be collected in shallow waters by holding a sample container with the top still on below the surface at the desired depth. Remove the top and allow the container to fill to the required volume and then replace the top and remove the container from the liquid.

Use the collection vessel to fill all designated sample bottles. It is imperative that all sampling equipment be clean and kept clean during all phases of purging and sample collection. The sample team should be divided into "clean hands" and "dirty hands" tasks. Only personnel with "clean hands" must touch equipment that will come into contact with the sample.

Care must be taken to avoid handling the interior of the bottle or bottle cap. A new pair of disposable gloves must be worn for each surface water sample location. The bottle cap must not be placed on the ground or in a pocket to avoid contamination.

D. QA/QC REQUIREMENTS:

All data must be documented on field data sheets or within site logbooks. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.

When possible, field quality control 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.

E. SPECIAL CONDITIONS:

1. Flowing Water Sites

Surface water samples should usually be collected in areas of the surface water body that are representative of the surface water body conditions. Representative samples can usually be collected in portions of the surface water body that have a uniform cross section and flow rate. Since mixing is influenced by turbulence and water velocity, the selection of a site immediately downstream of a riffle area (e.g. fast flow zone) will ensure good vertical mixing. These locations are also likely areas for deposition of sediment since the greatest deposition occurs where stream velocity slows. These areas should be characterized by a steady, but non-turbulent, flow of water.



SURFACE WATER SAMPLING

A site that is clear of immediate point sources (e.g. tributaries and industrial/municipal effluents) is preferred for the collection of surface water samples from flowing water sites unless the sampling is being performed to assess these sources.

Tributaries should be sampled as near the mouth as is feasible. However, it is important to select the sample location taking into consideration the impact that the downstream receiving water body has on the tributary flow.

One team member will perform the actual sample collection, carefully adopting an optimal sampling position. Once in that position, the sampler will not move their feet until sampling at that locality is concluded in order to minimize agitation of the sediment and water.

Stream sediments are to remain undisturbed by the water collection vessel. Should contact with the bottom and re-suspension of sediment occur, the sampling team is to halt sampling until the water has cleared. If the water does not clear within a few minutes, the team is to proceed slightly upstream (about 1 meter or just above the disturbed area) and resume the sampling effort. Take care not to collect any floating solids or materials disturbed from the bottom of the water body.

2. Still Water Sites

Lakes, ponds, and impoundments have a greater tendency to stratify than rivers and streams. The lack of mixing may require more samples to be obtained and each layer of the stratified water column may need to be considered. In larger water bodies, several subsamples may be composited to form a single sample. These vertical and/or horizontal sampling locations are often taken along a grid. Consult the work plan or project manager to identify the appropriate sample location.

When choosing a sampling location, avoid areas near structures such as harbors, boat ramps, piers, fuel docks, and moored boats (to avoid point sources of contamination), unless these structures are part of the study.

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/>.

U.S. Geological Survey, 2006, Collection of water samples (ver. 2.0): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A4, September, retrieved January 5, 2009 from <http://pubs.water.usgs.gov/twri9A4/>.

G. APPENDICES/FORMS:

Surface Water Sampling Field Log

END OF SOP

Final Check by C. Burns 10/23/15



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



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



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**

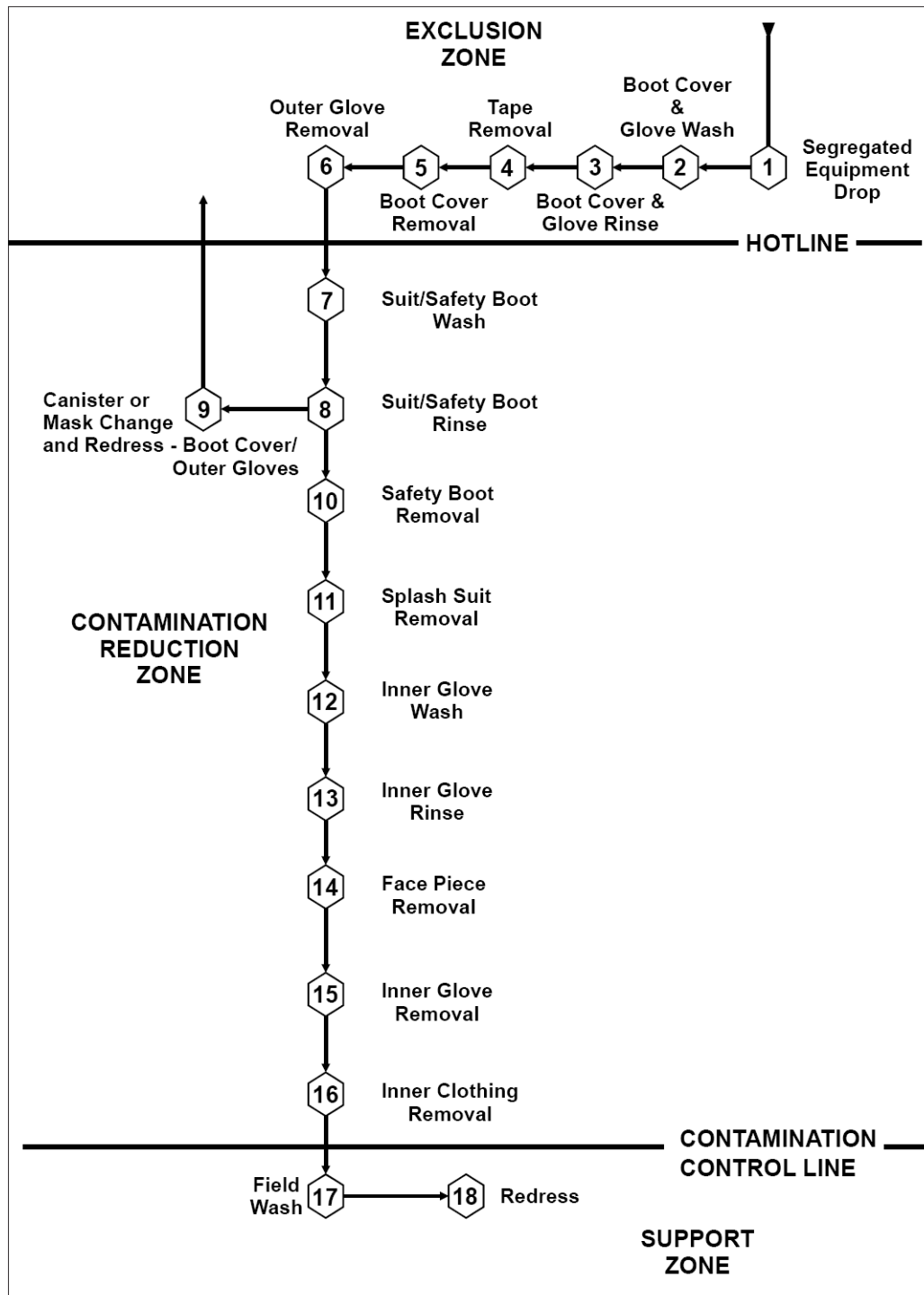
| | | | | |
|---------|-----|--------------------------------|-----|---|
| Station | 1: | Segregated Equipment Drop | 1. | Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic 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. |

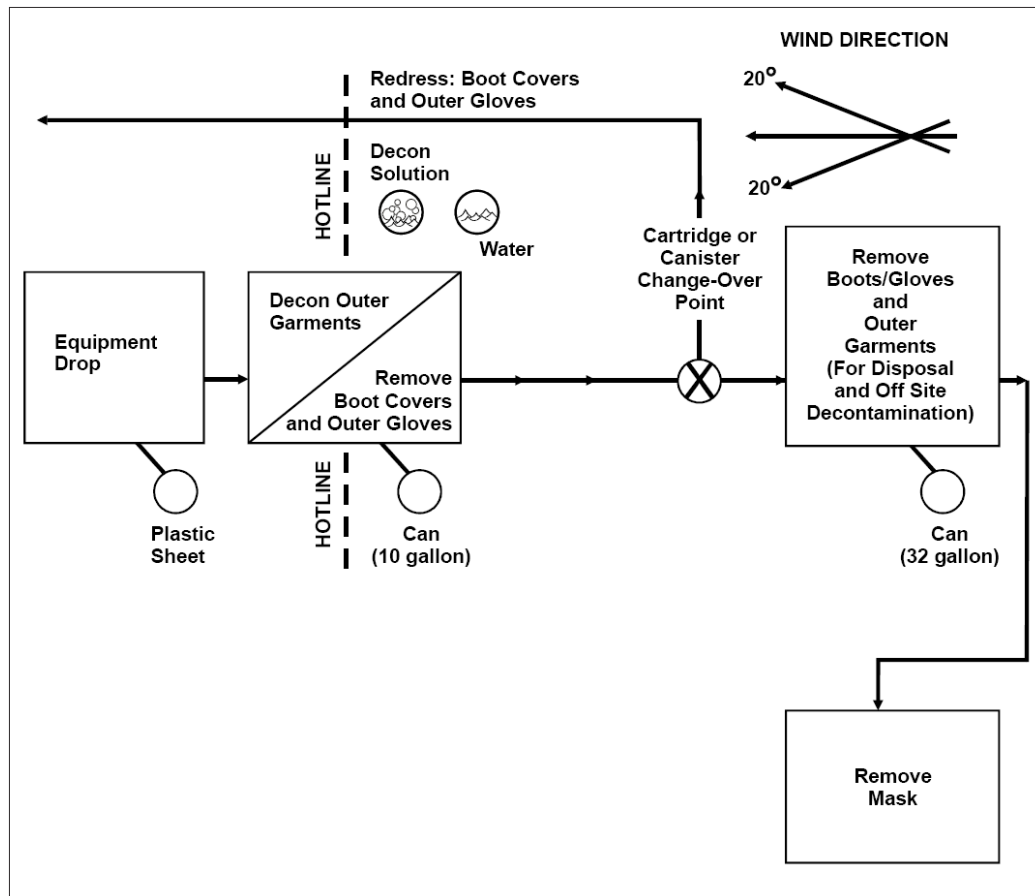
**DECONTAMINATION OF PERSONNEL****Maximum Measures for Level C Decontamination**

**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 (HNO₃) Acid Reagent A.S.C. 71%
- Sodium Hydroxide (NaOH) 97%
- 10 mL glass pipettes
- Narrow range (0-3 and 12-14) pH paper
- Nitrile gloves

C. PROCEDURE:

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



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

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|----------------------------------|------------|-------------------------------------|---|---|--|----------------|
| WATER | | | | | | |
| Acid Soluble & Insoluble Sulfide | ----- | 9030B | Cool to 4 deg C No Headspace | P or G | 7 Days | 8 oz. |
| Acidity as CaCO ₃ | 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 ₃ | 310.1 | 2320B | Cool to 4 deg C | P or G | 14 Days | 100 mL |
| Ammonia | 350.2/3 | 4500-NH ₃ B,E | Cool to 4 deg C, H ₂ SO ₄ 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 ₂ S ₂ O ₃ 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 ₃ to pH<2 | P or G | 6 Months | 100 mL |
| Calcium- Hardness | 200.7 | 3111B | HNO ₃ to pH<2 | P or G | 6 Months | 100 mL |
| Carbamates | 531.1 | ----- | Cool to 4 deg C, 0.08% Na ₂ S ₂ O ₃ 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 ₂ SO ₄ 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 ₂ S ₂ O ₃ 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 ₂ S ₂ O ₃ 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 ₂ S ₂ O ₃ 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 |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|----------------------------|-------------------------|-------------------------------------|---|---|--|----------------|
| Fecal Coliform | ----- | 9222B or D | 0.008% 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 |
| Fecal Streptococci | ----- | 9230C | 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 |
| 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% Na2S2O3 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% 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 |
| Hardness | ----- | ----- | HNO3 to pH<2 | P | 6 months | 1000 mL |
| Heterotrophic Plate Count | ----- | 9215B | 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 |
| Hexavalent Chromium | 7196A | 3500Cr-D | Cool to 4 deg C | P | 24 hours | 500 mL |
| HPLC (Explosive) | ----- | 8330 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000mL |
| HPLC (Explosive) | ----- | 8310 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | | 1000mL |
| Mercury | ----- | 7470A | Cool to 4 deg C | P or G | 28 Days | 8 oz. |
| Metals | 200.7 | ----- | HNO3 to pH<2 | P | 6 Months | 100 mL |
| Nitrate | 300 | ----- | Cool to 4 deg C | P or G | 48 Hrs. | 100 mL |
| Nitrate (Chlorinated) | 353.2 | 4500-NO3 F | Cool to 4 deg C | P or G | 48 Hrs | 250 mL |
| Nitrate (Non- chlorinated) | 353.2 | 4500-NO3 F | H2SO4 to pH<2, Cool to 4 deg C | P or G | 14 Days | 250 mL |
| Nitrite | 300, 353.2, 354.1 | 4500-NO3 D | Cool to 4 deg C | P or G | 48 Hrs | 100 mL |
| Odor | ----- | 2150B | Cool to 4 deg C | G only | 24 Hrs | 200 mL |
| Oil and Grease | ----- | 1664 | HCl to pH<2, Cool to 4 deg C | G, Amber Teflon-lined screw cap | 28 days | 1000 mL |
| Organic Nitrogen | 351.1 | ----- | Cool to 4 deg C, H2SO4 to pH<2 | G | 28 Days | 500 mL |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|--|------------|-------------------------------------|---|--|--|----------------|
| Organochlorine Pesticides/PCB | 608 | 8081A, 8082 | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present if aldrin is to be determined bind to pH 5-9. | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000 mL |
| Ortho Phosphate | 300 | 4500 P-E | Cool to 4 deg C | P or G | 48 Hrs | 50 mL |
| Orthophosphate | 365.2 | ----- | Filter immediately, Cool to 4 deg C | P or G | 48 Hrs. | 50 mL |
| pH, Hydrogen ion | ----- | 4500-H-B | Cool to 4 deg C | P or G | Analyze Immediately | 25 mL |
| Phenols | 420.1 | 9065, 510ABC | Cool to 4 deg C, H2SO4 to pH<2 | G | 28 Days | 500 mL |
| 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 |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|----------------------------------|------------------|-------------------------------------|---|--|--|----------------|
| TDS | | | Cool to 4 deg C | P | 7 days | 500 mL |
| Temperature | ----- | 2550B | None | P or G | Analyze Immediately | 1000 mL |
| Temperature | 170.1 | ----- | None Required | G, Bottle and Top | Analyze immediately | 1000 mL |
| Total Kjeldahl Nitrogen | 353.3/1 | 4500Norg-C | 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. |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|------------------------------------|------------|-------------------------------------|---|---------------------------------|--|----------------|
| Corrosivity Toward Steel | ----- | 1110 | Cool to 4 deg C | P | 14 Days | 4 oz. |
| Cyanide | ----- | 9010B, 4500CN | Cool to 4 deg C | G, Amber | 14 Days | 4 oz |
| Dioxin | ----- | 8280A | Cool to 4 deg C | G | 14 Days | 8 oz. |
| DRO | ----- | 8015B | Cool to 4 deg C | G, Amber | 14 Days | 4 oz. |
| Extractable Organic Compounds | ----- | | Cool to 4 deg C, Store in dark | G | 14 days | 8 oz |
| Extractable Sulfide | ----- | 9031 | Cool to 4 deg C, fill top of sample with 2N Zinc Acetate until moistened | P or G | 7 Days | 8 oz. |
| Fluoride | ----- | 9214 | None | P | 28 Days | 8 oz. |
| Gases | ----- | 3810 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| Grain Size | ----- | | N/A | G | N/A | 8 oz |
| GRO | ----- | 8015B | Cool to 4 deg C, check state regulations for proper preservative. NJ (methanol), PA (encore samplers) NY (cool to 4 deg C). | G, Amber VOA vial | 14 Days | 15 Grams |
| HPLC (PAH) | ----- | 8310 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 14 days until extraction 40 days after extraction | 4 oz. |
| Ignitability | ----- | 1010 | None | P or G | None | 8 oz. |
| Ignitability of Solids | ----- | 1030 | None | P or G | None | 8 oz. |
| Mercury | 245.1 | 7471A | Cool to 4 deg C | G, Amber | 28 Days | 4 oz. |
| Metals | ----- | 6010B, 6020, 7000A | Cool to 4 deg C | G, Amber | 6 Months | 8 oz. |
| Moisture Content | ----- | | Store in airtight jar 3-30 deg C | G | N/A | 8 oz |
| Nitrate | ----- | 9210 | Cool to 4 deg C | P or G | 48 Hrs | 8 oz. |
| Oil & Grease (Sludge, Sludge- Hem) | ----- | 9071B | Cool to 4 deg C | G | 28 Days | 8 oz. |
| Organochlorine | ----- | 8081A | Cool to 4 deg C | P or G | 14 Days | 8 oz. |
| Paint Filter Liquids Test | ----- | 9095A | Cool to 4 deg C | P or G | ----- | 8 oz. |
| PCBs | ----- | 8082 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 14 Days | 4 oz. |
| pH | ----- | 9045C | Cool to 4 deg C | G, Amber | Analyze Immediately | 4 oz. |
| pH, Soil and Waste | ----- | 9045A | Cool to 4 deg C | G | Analyze Immediately | 8 oz. |
| Phenol | ----- | 9065, 9066, 9067 | Cool to 4 deg C | G, Amber | 28 Days | 4 oz. |
| Radiological | ----- | ----- | Cool to 4 deg C | G | 6 Months | 8 oz. |
| Reactivity Cyanide | ----- | SW-846 7.3.3.2 | Cool to 4 deg C | P | 14 Days | 8 oz. |
| Reactivity Sulfide | ----- | SW-846 7.3.4.2 | Cool to 4 deg C | P | 14 Days | 8 oz. |
| Semivolatle Organics | ----- | 8270C | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|--|------------|-------------------------------------|---|--------------------------------|--|----------------|
| Sulfate | ----- | 9035, 9036, 9038 | Cool to 4 deg C | P or G | 28 Days | 8 oz. |
| Sulfides | ----- | 9215 | Cool to 4 deg C | P or G | 7 Days | 8 oz. |
| TCLP Metals | ----- | 1311, 6010B, 6020, 7000A, 7470A | Cool to 4 deg C | G, Amber | 180 Days (Hg 28 days) | 8 oz |
| TCLP Herbicides | ----- | 1311 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| TCLP Pesticides | ----- | 1311 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| TCLP Semivolatile Organics | ----- | 1311, 8270C, 8081A, 8151A | Cool to 4 deg C | G, Amber Teflon Lined | 14 Days | 8 oz. |
| TCLP Volatile Organics | ----- | 1311, 8260B | Cool to 4 deg C | G, Amber VOA Vial Teflon Lined | 14 Days | 8 oz. |
| Temperature | ----- | 2550 | ----- | P | Analyze Immediately | 4 oz. |
| TOC | ----- | Lloyd Kahn Method | Cool to 4 deg C | G, Amber | 14 days | 4 oz. |
| Total Coliform | ----- | 9131 | Cool to 4 deg C | Sterile, P or G | 6 Hrs | 4 oz. |
| Total Coliform | ----- | 9132 | Cool to 4 deg C | Sterile, P or G | 6 Hrs | 4 oz. |
| Total Cyanide | ----- | 9013 | Cool to 4 deg C | P or G | 14 Days | 8 oz. |
| Volatile Organic Compounds | ----- | 8260B | Cool to 4 deg C Check individual state regulations for proper preservative. NJ (methanol), PA (encore samplers), NY (cool to 4 deg C) | G, wide mouth, teflon liner | 14 Days | 4 oz. |
| Volatile Organic Compounds | ----- | 8021 | | G, wide mouth, teflon liner | 14 Days | 4 oz. |
| GLP 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 |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---------------------|------------|-------------------------------------|--------------|-----------|--------------|----------------|
|---------------------|------------|-------------------------------------|--------------|-----------|--------------|----------------|

Notes:

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

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

G. APPENDICES/FORMS:

Not Applicable

END OF SOP

Final Check by C. Burns 10/27/15

APPENDIX B

Quality Assurance Quality Control Plan

Quality Assurance Project Plan

**CTI Agri-Cycle
308 and 311 Belle Road
Buskirk, New York**

BCP Site No. C558043

CHA Project Number: 057581

*Prepared for:
CTI Agri-Cycle
4 Open Square Way
Holyoke, Massachusetts 01040*

Prepared by:



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July 2020

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LIST OF ACRONYMS & ABBREVIATIONS

| | |
|--------|---|
| AMSL | Above Mean Sea Level |
| ASP | Analytical Services Protocol |
| CHA | CHA Consulting, Inc. |
| COC | Chain of Custody |
| DER | Division of Environmental Remediation |
| ELAP | Environmental Laboratory Approval Program |
| ESA | Environmental Site Assessment |
| FSP | Field Sampling Plan |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| 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 |
| PE | Professional Engineer |
| PFAS | Per- and Polyfluoroalkyl Substances |
| PFOA | Perfluorooctanoic acid |
| PFOS | Perfluorooctanesulfonic acid |
| PG | Professional Geologist |
| 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 | Semivolatile Organic Compound |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| TCLP | Toxicity Characteristic Leaching Procedure |
| USEPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compound |

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 at the CTI Agri-Cycle Brownfield Cleanup Program (BCP) Site in Buskirk, Town of Cambridge, New York. 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 during the investigation. This QAPP has been prepared in accordance with the New York State Department of Environmental Conservation's (NYSDEC) Department of Remediation (DER-10) Technical Guidance for Site Investigation and Remediation. Field activities will be performed in accordance with CHA Consulting, Inc. (CHA) standard operating procedures (SOPs), included in Appendix A of the FSP.

1.1 SITE DESCRIPTION

The CTI Agri-Cycle Site (Site) is located in a rural area with an address of 308 and 311 Belle Road, Buskirk, Washington County, New York, just east of the intersection of King Road and Belle Road, surrounded by a mixture of agricultural land and wooded areas. The Site consists of three adjacent parcels (Tax Map Nos. 280-2-38, 271-3-10 and 271-3-14). Two parcels are located north of Belle Road and west of King Road (northern parcels). The third is located south of King Road and west of Belle Road (southern parcel).

The southern parcel consists of fields and wooded areas, with a barn structure and a stockpile area containing paper sludge on the eastern edge of the parcel. A dirt road provides access to the fields from Belle Road. The northern parcels consist of fields with wooded areas interspersed. Stockpile areas containing paper sludge and yard waste and a stormwater retention pond are also located on the northern parcel. One small farm building is located on the northern edge of the northern parcel. Whipple Brook, a NYSDEC Class C stream, passes through a section of the northern parcel and runs adjacent to the remainder of the Site as it travels north to south across the area.

The Site is currently used for agricultural purposes as well as for receiving and processing yard waste and paper sludge. These activities consist of receiving raw materials from outside sources and initially processing them in stockpile areas. When ready, these materials are spread on fields in “lifts” to further process the material. Vegetation is allowed to grow on the surface and in some cases, livestock is grazed on the fields. The finished product is compost for export offsite and on-site soil amendment. For on-site purposes, the compost is made on the CTI Agri-Cycle LLC property and then transferred for use on property owned by CTI Demonstration Farms, Inc.

The Site has been historically used for agricultural purposes. Aerial photos dating back to the 1950s show cultivated fields and woodland on the project area. Starting from at least 1994, the Site was used to receive residential yard waste and paper sludge from a number of nearby paper mills. These materials were used to create compost material which was then exported offsite to various end users. The processing area and stormwater retention pond were constructed at the Site prior to 1994.

In 2017 the NYSDEC investigated potential contamination in source materials and identified perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) contamination in both raw paper sludge and composted material spread on Site fields. PFOA/PFOS contamination was also discovered in Site surface water and groundwater as well as on properties located offsite to the South. During the 2017 investigation it was noted that offsite distribution of compost material was prohibited by the DEC.

Based on the investigations conducted to date, the primary contaminants of concern for the Site are PFOA and PFOS. These contaminants were found in soils located across the Site and were primarily in areas used for the storage and processing of paper sludge material as it was being used in the production of compost. Concentrations of PFOA and PFOS were found in the raw paper sludge, piled mixtures of paper sludge and yard waste, and in the material spread on fields for the aging process. Total PFOA/PFOS concentrations ranged from 1.1 ppb to 165.3 ppb.

Total PFOA/PFOS concentrations in Site groundwater were detected at a maximum concentration of 266 ppt. The NYSDEC has set a maximum contaminant level (MCL) for PFOA/PFOS in drinking water of 10 ppt, and the EPA has established a health advisory level of 70 ppt for either PFOS or PFOA or both combined. Therefore, the Site contains contaminated groundwater in excess of the drinking water standard and the health advisory level.

Surface water samples were collected from the on-site storm water pond and were found to contain PFOA and PFOS at a total concentration of 240 ppt.

A complete description of the current information regarding nature and extent of contamination and previous environmental investigations is provided in the RIWP.

1.2 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 this RI Work Plan include the following:

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

In general, the RI program will include the following activities:

- Installation of soil borings;
- Collection of subsurface soil samples;
- Collection of groundwater samples;
- Collection of surface water samples;
- Waste characterization sampling;
- Equipment cleaning; 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 CTI Agri-Cycle under the supervision of the CTI Agri-Cycle Project Manager, who is the prime 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

NYSDEC Project Manager

- Approve the Remedial Investigation Work Plan (RIWP) and all appendices, including this QAPP, and any modifications to the project

CTI Agri-Cycle

Eugene Bernat - Project Manager

- Responsible for the overall program management of the CTI Agri-Cycle Remedial Investigation.

CHA

Keith Cowan – 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.

Dr. Christopher Burns, PG - 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.

John Favreau - 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

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

Project Manager, Analytical Contractor

- Ensure resources of laboratory are available on an as-required basis;
- Coordinate laboratory analyses;

- Supervise laboratory's in-house 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 |
|---|---|---|
| NYSDEC Project Manager | | Will represent the NYSDEC in its review and oversight function, in its financial sponsorship, and as arbiter on technical matters |
| Eugene Bernat CTI Agri-Cycle Owner | 4 Open Square Way Holyoke, MA 01040 | Mr. Bernat will represent CTI Agri-Cycle in the review and oversight of the project, participate in citizen participation activities, and serve as the point of contact for CTI Agri-Cycle. |
| Keith Cowan CHA Project Manager | III Winners Circle Albany, NY 12205 (518) 453-4500 kcowan@chacompanies.com | Mr. Cowan will oversee the project, provide quality control on documents and determinations and mentor the daily task manager. |
| Dr. Christopher Burns, P.G. CHA CHA Quality Assurance/ Quality Control Officer | 9020 Stony Point Parkway Suite 160 Richmond, VA 23235-4700 (804) 897-0954 ext. 248 cburns@chacompanies.com | Dr. Burns will act as CHA's QA/QC Officer, which will include providing an internal audit of field sampling procedures, a review of laboratory activities and QA/QC, assistance in the preparation and review of final reports. |
| Keith Cowan CHA Technical Manager/ Project Coordinator | III Winners Circle Albany, NY 12205 (518) 453-8795 kcowan@chacompanies.com | Mr. Cowan 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 report, and provide technical representation for field activities. |
| John Favreau CHA Field Leader & Health and Safety Officer | III Winners Circle Albany, NY 12205 (518) 453-8795 jfavreau@chacompanies.com | Mr. Favreau will supervise field investigation activities and will also serve as database manager. Mr. Favreau will serve as the Health and Safety point of contact for CHA staff. |

| Name | Address | Responsibilities |
|--|---|---|
| Melissa Deyo Alpha Analytical, Inc. Laboratory Project Manager | 8 Walkup Drive Westborough, MA 01581 (508) 898-9220 | Ms. Deyo will act as CHA's point of contact with the contracted laboratory. |

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample preparation and handling, sample COC, laboratory analyses, and reporting, in order to provide accurate data. Specific procedures to be followed for sampling, sample custody and document control, calibration, laboratory analyses and data reduction, validation, assessment and reporting are presented in Sections 4.0 through 8.0 of this QAPP and CHA SOP#603.

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.

Soil, groundwater and surface water samples will be analyzed primarily for Per- and Polyfluoroalkyl Substances (PFAS); specifically, PFOA and PFOS. A limited number of samples will also be analyzed for the following:

- Target compound list (TCL) volatile organic compounds (VOCs);
- TCL semi-volatile organic compounds (TCL SVOCs);
- Target Analyte List (TAL) metals;
- Polychlorinated biphenyls (PCBs);
- TCL Pesticides;
- 1,4-Dioxane; and
- Per- and Polyfluoroalkyl 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 VOC determinations only) will be shipped by the laboratory to the Site and back to the laboratory without opening in the field. The trip blank will provide a measure of potential cross-contamination of samples resulting from shipment, handling and/or ambient conditions at the Site.

4.1 ACCURACY, PRECISION AND SENSITIVITY OF 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(s) precision (relative percent difference of duplicate analysis) will be determined from the duplicate analyses of MS samples. A minimum of one sample will be spiked and analyzed in duplicate. Additional details are provided in CHA SOP#605. Analysis will compare with the criteria presented in the appropriate methods identified in Section 4.0.

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

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

4.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

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

The sampling program has been designed to provide data representative of Site conditions. During development of these networks, consideration was given to location of historical 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;
- 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 subsurface soil, groundwater and surface water samples. 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 Field Sampling Plan (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 (Sample Type) | Analysis | Parameter/Fraction | Number of Primary Samples | Number of Duplicates/ MS/MSD | Number of Trip Blanks | Number of Field Blanks | Number of Equipment Blanks | Minimum Sample Volume/ Container | Sample Preservation | Technical Holding Time |
|---------------------------------|--------------------------------|---------------------------|--|---|--------------------------------------|-----------------------------------|---|---|--------------------------------|---------------------------------------|
| Soil | EPA Method 537 (Mod.) | PFOA, PFOS | 44 | 3/3/3 | 0 | 0 | 0 | 8 oz plastic wide | Cool to 4 °C | 14 days |
| | EPA Method 8260C | TCL VOCs | 3 | 1/1/1 | 0 | 0 | 0 | 5 grams/40mL VOA | Cool to 4 °C | 14 days |
| | EPA Method 8270D | TCL SVOCs | 3 | 1/1/1 | 0 | 0 | 0 | 4 oz glass wide | Cool to 4°C | 14 days |

| Matrix (Sample Type) | Analysis | Parameter/Fraction | Number of Primary Samples | Number of Duplicates/ MS/MSD | Number of Trip Blanks | Number of Field Blanks | Number of Equipment Blanks | Minimum Sample Volume/ Container | Sample Preservation | Technical Holding Time |
|-------------------------|--------------------------------|------------------------------------|---------------------------------|------------------------------------|--------------------------|---------------------------|----------------------------------|---|------------------------|---|
| Soil | EPA 6010C, 7471B | TAL Metals | 3 | 1/1/1 | 0 | 0 | 0 | 8 oz glass wide | Cool to 4°C | 180 days (28 days for mercury) |
| | EPA Method 8082A | PCBs | 3 | 1/1/1 | 0 | 0 | 0 | 4 oz glass wide | Cool to 4°C | 14 days |
| | EPA Method 8081A | TCL Pesticides | 3 | 1/1/1 | 0 | 0 | 0 | 4 oz. glass wide | Cool to 4°C | 14 days |
| | EPA Method 537 (Mod.) | PFAS (full list) (21 compounds) | 3 | 1/1/1 | 0 | 0 | 0 | 8 oz plastic wide | Cool to 4°C | 14 days |

| Matrix (Sample Type) | Analysis | Parameter/Fraction | Number of Primary Samples | Number of Duplicates/ MS/MSD | Number of Trip Blanks | Number of Field Blanks | Number of Equipment Blanks | Minimum Sample Volume/ Container | Sample Preservation | Technical Holding Time |
|--|----------------------------------|--------------------|---------------------------------|------------------------------------|--------------------------|---------------------------|----------------------------------|---|------------------------|------------------------------|
| Soil | EPA Method 8270D SIM ID | 1,4-Dioxane | 3 | 1/1/1 | 0 | 0 | 0 | 4 oz glass wide | Cool to 4°C | 14 days |
| Groundwater and Surface Water | EPA Method 537 (Mod.) | PFOA, PFOS | 8 | 1/1/1 | 0 | 0 | 1 | 8 oz plastic wide | Cool to 4 °C | 14 days |

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

6.1 CHAIN-OF-CUSTODY

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 ($\pm 2^{\circ}\text{C}$) 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 Logbook.

The Contract Laboratory will be responsible for maintaining analytical logbooks 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 logbooks;
- 3) Field data records;
- 4) Sample identification documents;
- 5) Chain-of-Custody records;
- 6) Report notes, calculations, etc.;
- 7) References, literature;
- 8) Miscellaneous - photos, maps, drawings, etc.; and
- 9) Copies of all final reports pertaining to the project.

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

7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 INSTRUMENT CALIBRATION AND TUNING

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

7.2 FIELD INSTRUMENT CALIBRATION

Calibration of the field instruments will be completed prior to each day's use in accordance with the manufacturer's instructions. 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 on the log provided in Appendix A.

8.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

8.1 GENERAL

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

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

8.2 FIELD DATA

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

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

- Sample identification;
- Source;
- Date and time of sampling;
- Sampling equipment;
- Person(s) collecting the sample; and
- Results of field monitoring and/or observations.

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

- The use of approved sampling and sample handling procedures;

- Proper packing/shipping procedures were used; and
- Proper COC was maintained.

8.3 LABORATORY REPORTING

Reporting and deliverables for soil, groundwater and surface water 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 added into the existing database maintained by CHA staff. From there the data can be processed and compared to existing standards using the existing software. An electronic copy of the analytical data in Category B format and in EQUIS format will be provided to NYSDEC.

8.5 DATA VALIDATION

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

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.

9.2 LABORATORY QUALITY CONTROL

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

9.2.1 Blank Samples

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

9.2.2 Matrix Spike/Matrix Spike Duplicates

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

9.2.3 Surrogate Analyses

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples, by the laboratory, to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and

environmental sample analyzed by GC or GC/MS, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will be compared with the control limits set by procedures specified in the method (or from laboratory specific control limits) for analytes falling within the quantification limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit; assessment of analytical quality in these cases will be based on the quality control embodied in the check and MS/MSD samples.

10.0 PROCEDURES USED TO ASSESS PERFORMANCE

10.1 PRECISION

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

$$\text{Precision} = \frac{[D_2 - D_1]}{(D_1 + D_2)/2} \times 100$$

D_1 = matrix spike recovery

D_2 = matrix spike duplicate spike recovery

Acceptance criteria for duplicate soil samples will be $\leq 30\%$ RPD. Acceptance criteria for duplicate water samples will be $\leq 20\%$ 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:

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

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

10.4 OUTLIERS

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

11.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

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

At a minimum, these reports will include:

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

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

APPENDIX A
Field Calibration Log

PID Calibration Log

| Meter Make and Model: | | | Serial Number: | | | |
|---|------------|---------------------------|----------------------------|-----------|-----------|-----------|
| Name of Person Performing Calibration: | | | CHA Project Number: | | | |
| Test Type (Bump/full cal.) | Gas Tested | Calibration Parameters | Results | Pass/Fail | Date/Time | Signature |
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APPENDIX C

Health and Safety Plan

Health and Safety Plan

**CTI Agri-Cycle
308 and 311 Belle Road
Buskirk, New York**

Site No. C558043

CHA Project Number: 057581

*Prepared for:
CTI Agri-Cycle
4 Open Square Way
Holyoke, Massachusetts 01040*

Prepared by:



*III Winners Circle
Albany, NY 12205
Phone: (518) 453-4500
Fax: (518) 453-1735*

*July 2020
Revised October 2020
Revised November 2020*

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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 on the Remedial Investigation activities, located at 308 & 311 Belle Road, the Town of Buskirk, Washington County, New York (see Figure 1). This project's various assignments require CHA employees to perform tasks where personal safety could be compromised due to chemical, physical, and/or biological hazards. While conducting field work, CHA employees may be exposed to chemical, physical, and/or biological hazards including but not limited to: Chemical exposure due to the presence of subsurface contamination in areas of proposed soil boring/sampling and groundwater sampling.

- Slip/Trips/Falls
- Heat Stress
- Excessive noise for certain operations
- Heavy equipment operation
- Environmental and Biological hazards (e.g. insects, plants, UV 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 previous investigations conducted by others. 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 ensuring 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. 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. These activities and any non-intrusive activities conducted in an Exclusion Zone require training per 29 CFR 1910.120 on a NYSDEC Brownfield hazardous waste site.

2.0 KEY PERSONNEL

2.1 OFF-SITE PERSONNEL

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:

Ronald Rogers, SMS, CSM
(518) 453-3917 (Office)
(518) 810-8926 (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.

Contact:

Keith Cowan
(518) 453-2899 (Office)
(518) 466-8157 (Cell)

2.2 ON-SITE PERSONNEL

Title: Site Safety Officer

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.

Contact:

John Favreau
(518) 453-8795 (Office)
(518) 858-7068 (Cell)

Title: Field Team Leader

Description: 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:

John Favreau

(518) 453-8795 (Office)

(518) 858-7068 (Cell)

Title: Work Party

Description: Performs field operations

Contact:

Caroline Hurlburt

(518) 453-2869 (Office)

(203) 823-1800 (Cell)

2.3 ON-SITE OPTIONAL 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.

Contact:

Ronald Rogers

(518) 471-3920 (Office)

(518) 810-8926 (Cell)

Title: Scientific Advisor

Description: Guides the Project Team Leader in scientific matters.

Contact:

Christopher Burns, Ph.D., PG
(804) 412-8841

2.4 AS-NEEDED PERSONNEL

Title: Fire Department

Description: Responds to fires and performs rescues

Contact:

911

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

Eugene Bernat of CTI Agri-Cycle

Contact:

228 Mendon Street
Upton, MA, 01568
(413)552-3688

3.0 SITE ENTRY

3.1 OBJECTIVES

The objectives of the site entry are to:

1. Collect soil, groundwater and surface water samples according to the remedial investigation work plan (RIWP)
2. Document contractor activities
3. Screen soils (visual, olfactory and photoionic) for level of contamination in accordance with the NYSDEC 6NYCRR Part 360 Soil Cleanup Guidance Objectives.

Intrusive site activities are expected to include the following:

1. Oversight of soil borings
2. Sampling of soil, groundwater and surface water for laboratory analysis
3. Oversight of proper spoil disposal (i.e. drill cuttings and purged groundwater)

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 daily jobsite briefing form is included in Appendix A.

3.3 SAFETY TRAINING

The SSO will confirm that every person assigned to a task has had adequate training for that task and that the training is up-to-date by checking with the CHA Safety Coordinator and online database. CHA staff working on this project shall have a minimum of

- 40-Hour Initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with 29 CFR 1910.120
- Current 8-hour HAZWOPER Refresher Training
- Field equipment safety training where applicable

All training will have been conducted and certified in accordance with 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 the Site that every CHA employee 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 this type of work if deemed necessary by the PM. The use of respirators is not anticipated at the Site; however, should air monitoring during the work indicate the need for respiratory protection, subsequent work will be performed only by personnel who have had a respirator fit test and have been medically cleared by the occupational health physician to wear a respirator.

3.5 SITE MAPPING

Site mapping has been included in the Figures section of the HASP. Figure 1 illustrates the location of the subject Site. Figure 2 illustrates the Site boundaries. Figure 3 illustrates the route to the nearest hospital from the subject Site.

4.0 SITE CHARACTERIZATION

4.1 SITE DESCRIPTION & HISTORY

The CTI Agri-Cycle Site (Site) is located in a rural area with an address of 308 and 311 Belle Road, Buskirk, Washington County, New York, just east of the intersection of King Road and Belle Road, surrounded by a mixture of agricultural land and wooded areas. The Site consists of three adjacent parcels (Tax Map Nos. 280-2-38, 271-3-10 and 271-3-14). Two parcels are located north of Belle Road and west of King Road (northern parcels). The third is located south of King Road and west of Belle Road (southern parcel).

The southern parcel consists of fields and wooded areas, with a barn structure and a stockpile area containing paper sludge on the eastern edge of the parcel. A dirt road provides access to the fields from Belle Road. The northern parcels consist of fields with wooded areas interspersed. Stockpile areas containing paper sludge and yard waste and a stormwater retention pond are also located on the northern parcel. One small farm building is located on the northern edge of the northern parcel. Whipple Brook, a NYSDEC Class C stream, passes through a section of the northern parcel and runs adjacent to the remainder of the Site as it travels north to south across the area.

The Site is currently used for agricultural purposes as well as for receiving and processing yard waste and paper sludge. These activities consist of receiving raw materials from outside sources and initially processing them in stockpile areas. When ready, these materials are spread on fields in “lifts” to further process the material. Vegetation is allowed to grow on the surface and in some cases, livestock is grazed on the fields. The finished product is compost for export offsite and on-site soil amendment. For on-site purposes, the compost is made on the CTI Agri-Cycle LLC property and then transferred for use on property owned by CTI Demonstration Farms, Inc.

The Site has been historically used for agricultural purposes. Aerial photos dating back to the 1950s show cultivated fields and woodland on the project area. Starting from at least 1994, the Site was used to receive residential yard waste and paper sludge from a number of nearby paper mills. These materials were used to create compost material which was then exported offsite to various end users. The processing area and stormwater retention pond were constructed at the Site prior to 1994.

In 2017 the NYSDEC investigated potential contamination in source materials and identified perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) contamination in both raw paper sludge and composted material spread on Site fields. PFOA/PFOS contamination was also

discovered in Site surface water and groundwater as well as on properties located offsite to the South. During the 2017 investigation it was noted that offsite distribution of compost material was prohibited by the DEC.

Based on the investigations conducted to date, the primary contaminants of concern for the Site are PFOA and PFOS. These contaminants were found in soils located across the Site and were primarily in areas used for the storage and processing of paper sludge material as it was being used in the production of compost. Concentrations of PFOA and PFOS were found in the raw paper sludge, piled mixtures of paper sludge and yard waste, and in the material spread on fields for the aging process. Total PFOA/PFOS concentrations ranged from 1.1 ppb to 165.3 ppb.

Total PFOA/PFOS concentrations in Site groundwater were detected at a maximum concentration of 266 ppt. The NYSDEC has set a maximum contaminant level (MCL) for PFOA/PFOS in drinking water of 10 ppt, and the EPA has established a health advisory level of 70 ppt for either PFOS or PFOA or both combined. Therefore, the Site contains contaminated groundwater in excess of the drinking water standard and the health advisory level.

Surface water samples were collected from the on-site storm water pond and were found to contain PFOA and PFOS at a total concentration of 240 ppt.

Alterations of this HASP and its PPE requirements may occur if Site investigations indicate the presence of contaminants other than those identified during previous investigations higher levels of contamination than the previous investigations noted.

4.2 NEIGHBORING PROPERTIES

The Site is bordered by the following:

North: Agricultural and wooded land

East: King Road (northern parcels), agricultural/wooded land (southern parcel)

South: Belle Road & agricultural/wooded land (northern parcels), wooded land (southern parcel)

West: Agricultural and wooded land

4.3 SITE TOPOGRAPHY

The Site is located in a hilly area with elevations on the Site parcels ranging from approximately 600 to 860 feet above mean sea level. Overall, the northern parcels collectively slope toward the east and

southeast, and general drainage is to Whipple Brook, which runs along the eastern side of the property, and ultimately the Hoosick River. The southern parcel features varying topography.

4.4 METEOROLOGIC DATA

The time of year that work is expected to be conducted at the Site is during the summer. The weather and temperature for that time of year are expected to vary, but warm temperatures are typical, and the potential exists for extreme heat. 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 Team Leader may notify the PM and stop work for the day. Information on heat stress is included in Appendix A.

5.0 HAZARD EVALUATION

Hazards are generally divided into three (3) categories: exposure to chemicals and hazardous materials; safety/physical hazards; and biological hazards. Chemical hazards are further segregated by their routes of exposure that may cause adverse health effects. Safety/physical hazards include those such as electrical shock, slips/trips/falls and confined spaces. Biological hazards typically include plants, animals, and insects.

5.1 CHEMICAL HAZARDS

Based on previous soil, groundwater and surface water sampling, the primary chemical hazards associated with the Site are PFOA and PFOS, belonging to a class of “emerging contaminants”. The primary concern with these compounds is ingestion.

5.2 DISPERSION PATHWAYS

The potential exposure mechanisms that can transport particulates containing PFOA/PFOS and expose workers to these contaminants include:

- 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. Visible dust can be controlled by utilizing dust suppression techniques discussed in this HASP. The primary effect of visible dust is irritation of the eyes, nose, and throat. While it is not anticipated, visible emissions should be monitored and the following corrective actions can be implemented if irritation or concern of dust arises.

- Minimizing the amount of exposed ground surface/covering exposed surfaces
- Lightly wetting surfaces
- Reducing vehicle speeds

5.3 PHYSICAL HAZARDS

Physical hazards including the following may be encountered on the Site:

- Slips/Trips/Falls
- UV rays
- Lifting (generators, drums, equipment)
- Moving parts or equipment (including heavy construction equipment)
- Heat Stress
- Loud noise from drilling equipment

5.4 BIOLOGICAL HAZARDS

Biological hazards such as the following may be encountered on site:

- Ticks, mosquitoes, stinging insects, arachnids, chiggers
- Rodents, snakes, Hantavirus
- Physically damaging plants, poisonous plants

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 | Installation of soil borings | <ul style="list-style-type: none"> • Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents. • Inhalation of dusts, and other airborne particulates during site activities. | <ul style="list-style-type: none"> • 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. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|--|---|--|---|
| | | <ul style="list-style-type: none"> Exposure to loud noise | <ul style="list-style-type: none"> Avoid walking through puddles, and contacting other potential sources of contaminants. Keep airborne dust levels to a minimum by wetting down surfaces. |
| All personnel in Exclusion Zone and Contamination Reduction Zone | Collection of soil, groundwater and surface water samples | <ul style="list-style-type: none"> Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents. Inhalation of volatile organic vapors, dusts, and other airborne particulates during site activities. | <ul style="list-style-type: none"> 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. Avoid walking through puddles, and contacting other potential sources of contaminants. Keep airborne dust levels to a minimum by wetting down surfaces. |
| All personnel | All field activities | Slips, trips & falls | <ul style="list-style-type: none"> Wear appropriate work boots. Avoid slippery surfaces. Remind field personnel to exercise good housekeeping practices Be observant of activities around. |
| All personnel | All field activities | Physical injuries, such as abrasions or cuts | <ul style="list-style-type: none"> Use safe work practices Don proper PPE Have a first aid kit readily available at site |
| All personnel | Heavy lifting | Back injuries from lifting | <ul style="list-style-type: none"> Practice safe lifting techniques. Always use a minimum of 2 people for heavy lifts Lift with legs |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|--------------------|----------------------|---|--|
| All personnel | Heat stress | Exposure to high temperatures associated with working outdoors in excessive heat conditions | <ul style="list-style-type: none"> • Wear cool, light clothing • Hydrate regularly • Take frequent breaks in cool areas |
| All personnel | All field activities | Fire (general) | <ul style="list-style-type: none"> • Identify location of fire extinguisher(s) – contractor sourced • Keep ignition sources away from flammable materials and atmospheres. |
| All personnel | All field activities | Noise Exposure | <ul style="list-style-type: none"> • Wear hearing protection if you must shout to hear someone who is standing one foot or less away. |
| All personnel | All field activities | Contact with heavy equipment and traffic | <ul style="list-style-type: none"> • Do not stand unnecessarily close to the Geoprobe® when it is operating • Do not stand in lanes of traffic. Use cones or barricades to delineate work areas when work within access roads is required. • Wear a hard hat and high visibility clothing • Make eye contact with the operator/drivers |
| All personnel | All field activities | Security | <ul style="list-style-type: none"> • Stay alert to all on-site activities • Report suspicious activities to PM and/or CTI Agri-Cycle |
| All personnel | All field activities | Ticks | <ul style="list-style-type: none"> • Avoid unnecessary entry into tall grass and brushy areas. • Wear insect repellents containing DEET or Permethrin. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|--------------------|----------------------|--|---|
| | | | <ul style="list-style-type: none"> • Wear light colored clothing to easily identify ticks. • Inspect yourself throughout the day and following completion of field activities. • Tuck pants into socks or boots, wear long sleeves and minimize skin exposure. |
| All personnel | All field activities | Stinging insects (bees, hornets, wasps and yellow jackets) | <ul style="list-style-type: none"> • Do not agitate nests unless absolutely necessary. • Be aware of holes in the ground within the work area. • Avoid wearing bright or patterned clothing. • Avoid wearing/using scented items (e.g., perfume, cologne, soaps). • Inspect food and drinks prior to consumption. • Use insecticide when necessary. |
| All personnel | All field activities | Hantavirus | <ul style="list-style-type: none"> • Avoid dermal contact with rodent droppings. • Avoid inhalation of dust that is contaminated with rodent droppings. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|--------------------|----------------------|---|--|
| All personnel | All field activities | Mosquitos/West Nile Virus | <ul style="list-style-type: none"> • Eliminate mosquito breeding areas (standing water) at the work site. • Apply insect repellent containing DEET to exposed, unbroken skin per the manufacturer's instructions. • Wear light colored clothing (pants, long sleeved shirts and socks). |
| All personnel | All field activities | Snakes | <ul style="list-style-type: none"> • Avoid actions which increase the risk of encountering a snake (e.g., overturning logs, rocks, etc.). |
| All personnel | All field activities | Rodents | <ul style="list-style-type: none"> • Avoid contact with rodents and burrowing animals. |
| All personnel | All field activities | Arachnids | <ul style="list-style-type: none"> • Avoid actions which increase the risk of encountering arachnids (e.g., overturning logs, placing hands in dark places). |
| All personnel | All field activities | Physically Damaging Plants (e.g., briars, thistles) | <ul style="list-style-type: none"> • Remove plants prior to implementing the work activity. • Use briar resistant pants or chaps if working in dense thorny vegetation. |

| | | | |
|---------------|----------------------|------------------|---|
| All personnel | All field activities | Poisonous Plants | <ul style="list-style-type: none"> • Avoid contact with the plant. • Cover arms and hands when working in the vicinity of the plants. • Frequently wash potentially exposed skin. • Treat every surface that may have come in contact with the plant as contaminated. |
| All personnel | All field activities | UV Exposure | <ul style="list-style-type: none"> • Cover skin and limit time in sun to extent practical. • Apply sunscreen. |

5.6 COVID-19 PRECAUTIONS

Due to the current global pandemic and concerns related to the coronavirus COVID-19, and the Executive Orders (EO) issued by Governor Andrew Cuomo for the state of New York, the following precautions will be used in the project.

It is assumed CHA representatives will not be in direct contact with infected patients, members of the general public, with those testing positive for the virus, or with those known to have previously been infected. This Site-Specific HASP supplement does not provide guidance or recommendations for working in areas with known infected individuals testing positive for or are being treated for COVID-19.

CHA representatives will implement and follow the below guidance at a minimum while providing services associated with this contract from commencement to completion, and in conjunction with current CHA Health and Safety Guidelines:

- Maintain Social Distancing at a minimum of six (6) feet whenever practical while within the field office location, the contractors field location, all areas within the hospital intended for access by CHA, and within designated construction areas
- To the extent possible, meetings will be scheduled to allow for remote access to reduce the potential for contact
 - CHA representatives will not attend face-to-face meetings in which Social Distancing policies cannot be maintained or in locations which have not been approved by the CHA Health and Safety Officer (ie. A conference room in the wing of the facility treating patients)
- CHA representatives will don the appropriate PPE gear such as, protective latex gloves and medical / dust masks as recommended by the CDC, while working within

construction areas including, but not limited to, inspections, investigations, approvals, and punch-list.

- Masks and gloves are to be replaced at regular intervals as recommended by the CDC, and disposed of appropriately
- CHA representatives will adhere to hand washing and hand sanitizing practices consistent with updated CHA Health and Safety Guidance, and the CDC guidance – links attached within the listed below references.

Additionally, All CHA Employees will adhere to the following protocols:

- 1.) All field staff will have the CHA essential employee letter with them at all times in the field and will also have the applicable client letter stating they are essential employees if provided by the client.
- 2.) We will make all attempts to have 1 person per car for field work, all attempts possible to make this happen.
- 3.) Employee's will practice Social Distancing where it can be safely performed.
- 4.) No handshaking is permitted

References: OSHA 3990-03 2020 "Guidance on Preparing Workplaces for COVID-19;" NYS Executive Orders (EO) No.202 through No. 202.13¹; Center for Disease Control and Prevention (CDC) Guidance Documents on COVID-19 <https://www.cdc.gov/>; CHA Intranet COVID-19 Information Portal <https://intranet.cha-llp.com/cms/news/>.

6.0 AIR MONITORING AND ACTION LEVELS

6.1 AIR MONITORING

The following environmental monitoring instruments shall be used on the Site at the specified intervals. Monitoring instruments will be calibrated prior to each full day of equipment usage or more frequently in accordance with manufacturer's recommendations. Calibrations will be performed and specified as noted in the QAPP, included in Appendix B of the RIWP.

- Photoionization Detector

¹ NYS Executive Orders issued by Gov. Andrew Cuomo have extended from 202 through 202.13 as of 4/4/2020. EO No. 202 Declaring a Disaster Emergency in State of New York was issued on 1/30/2020.

The photoionization detector (PID) shall be used to detect volatile organic vapors in the ambient air and will be calibrated and set up prior to the start of each day's activities.

| Contaminant/Method | Frequency | Action Level | SSO Action |
|--------------------|-----------------|--------------|--|
| Organic Vapors | At least hourly | 50 ppm | Stop work and notify PM of elevated organic vapors |

Note that the air monitoring referenced within this HASP is intended to establish action levels for worker safety. Air monitoring and corresponding action levels in accordance with the NYS Generic Community Air Monitoring Plan (CAMP), which provide a measure of protection for the downwind surrounding community, are provided in Appendix D of the RI Work Plan.

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 soil sampling and screening activities will occur.

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.

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: Will include all areas outside the EZ and CRZ.

Hazards within the support zone include slips/trips/falls and other physical hazards associated with undeveloped fields and wooded areas.

7.1 COMMUNICATION

Communication shall be accomplished by person to person verbal correspondence and through the use of cellular telephones. Communication procedures will be reviewed at the Safety Meeting before entering the work zone.

8.0 HAZARD COMMUNICATION

In compliance with 29 CFR 1910.1200, any hazardous materials brought onto the 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 the Site, reviewing them for hazards that working personnel may be exposed to, and evaluating their use on the 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 Site, the party responsible for bringing the material onto the 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. 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 and B PPE will not be used and Level C PPE is not expected to be needed. If site conditions change and contamination is present at levels above the action levels, 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"> • No drums present • No free product visible • 2-Minute Breathing Zone PID Readings < 5 ppm with the 10.6 eV bulb • No strong odors present | D | <ul style="list-style-type: none"> • Long pants (no shorts) • Shirts with sleeves • Hard hat • Safety glasses • Reflective vests or yellow safety shirt • Work boots with safety toe • Hearing protection (if required) • Gloves (as appropriate) |
| Site Observation or Screening/Sampling Activities within the Exclusion Zone <ul style="list-style-type: none"> • No drums present • No free product visible • 2-Minute Breathing Zone PID Readings >5 ppm with the 10.6 eV bulb • Strong, pungent odors noted | C | <ul style="list-style-type: none"> • Same as D, plus • Full-faced air purifying respirator (APR) with organic/acid vapor cartridges • Protective coveralls (e.g. Tyvek) • Protective outer boot covers • Outer gloves with disposable nitrile or latex inner gloves Inner polyethylene boot covers with outer latex boot covers • Both inner and outer gloves must be chemically resistant • Flame retardant coveralls under protective coveralls whenever drums or drum carcasses are encountered. |

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. The following equipment is needed for decontamination:

- Alconox
- Water
- Impermeable Containers

The following list summarizes typical decontamination steps for personnel exiting the Exclusion Zone. Additional steps may be warranted based upon specific site conditions.

Level D

- Remove any protective equipment.
- Discard disposable garments.
- Wash/rinse boots.
- Containerize wash and decontamination water for disposal, as necessary.

Level C

- Wash/rinse outer suit and boots.
- Wash/rinse outer gloves.
- Remove outer boots.
- Remove outer gloves.
- Deposit disposables in container for proper disposal.
- Remove suit.
- Remove respirator.
- Remove inner gloves.
- Containerize wash and decontamination water for disposal, as necessary.

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. Disposable items will be disposed of in dry, impermeable containers.

Equipment and vehicles used by the Contractor in the Exclusion zone to handle contaminated materials will undergo decontamination procedures in the Contamination Reduction Zone prior to leaving the Site. The SSO will document 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 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 polyethylene sheeting or aluminum foil in order to avoid contacting a contaminated surface prior to use. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned. During periods of transportation and non-use, all decontaminated sampling equipment will be wrapped in aluminum foil.

Large Equipment:

CHA personnel are not responsible for the decontamination of large equipment. Information for large equipment decontamination is provided by the site contractor. Decontamination of heavy construction equipment will be performed by the contractor under the contractor's HASP.

12.0 EMERGENCY PROCEDURES

911 service is available and confirmed at this location; always call 911 immediately as the first option for emergency medical assistance. Only if 911 is unavailable or has a long lead time should someone be driven to the nearest medical facility.

On-site emergencies can range in intensity from minor to serious conditions. Various procedures for responding to site emergencies are listed in this section. The designated SSO is responsible for contacting the CHA Project Manager who will notify the CTI Agri-Cycle Representative and local emergency services as appropriate in emergency situations (however, others must assume responsibility if the situation warrants). An injured person shall be accompanied by another worker at all times.

Should an on-site emergency occur at the project site (related to the project or otherwise) the following procedures shall be followed:

- Call 911 for emergency support.
- If the emergency occurs and is project specific, notify your assigned Health and Safety Coordinator 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.
- All persons shall exit areas in groups and attempt to stay together during evacuation procedures.
- While evacuating, notice any conditions which should be reported to emergency personnel. Be alert for the location of smoke, fire and/or vapors. Report any of these conditions to emergency personnel.
- Be aware of emergency response vehicles and avoid interference with these.

Remain calm, keep voices low and wait for instructions from the Incident Commander. Do not leave the scene prior to notifying your assigned Project Manager and Site Field Team Leader. An incident report form is included in Appendix C.

13.0 EMERGENCY MEDICAL CARE

911 service is available and confirmed at this location; always call 911 immediately as the first option for emergency medical assistance. Only if 911 is unavailable or has a long lead time should someone be driven to the nearest medical facility.

Nearest hospital: Southwestern Vermont Medical Center

Address: 100 Hospital Drive
Bennington, Vermont 05201

Emergency Room Telephone Number: (802) 442-6361

Directions to the hospital from the Site, along with a map showing the route, are included with the Figures, attached.

13.1 EMERGENCY NOTIFICATION NUMBERS

Fire Dept.: 911

Police Dept.: 911

Department of Emergency Services: 911

Poison Control: (800) 222-1222

CHA Contact: Keith Cowan, (518) 446-8157

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 CPR, if necessary.

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 should 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.

14.0 CERTIFICATION

All site personnel covered by this HASP have read the HASP and are familiar with its contents and provisions.

Name

Title

Date

| | | |
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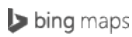
15.0 STANDARD OPERATING PROCEDURES

OSHA Quick Cards and applicable standard operating procedures are available in Appendix B.

16.0 JOB HAZARD ANALYSIS

| | | | |
|---|------------------------------|---|---------------------------|
| | Airport Safety | | Hand Power Tools |
| | Asbestos Abatement | ✓ | Heat Stress |
| | ATV- 4 Wheeler | ✓ | Heavy Equipment |
| | Bridge Inspection | | Pressurized Containers |
| | Cold Stress/Winter Weather | | Rail Safety |
| | Confined Space | ✓ | Slips, Trips, Falls |
| | Dogs | ✓ | Working In/Around Traffic |
| ✓ | Environmental Sampling | | Working Over Water |
| ✓ | Excavation | | Working with Ladders |
| | Exposure to Electrical Lines | | |

FIGURES



A 311 Belle Rd, Buskirk, NY 12028

B Southwestern Vermont Medical Center, 100 Hospital Dr, Bennington, VT 05201

37 min , 19.9 miles

Light traffic


Via NY-67, VT-67A

· Local roads

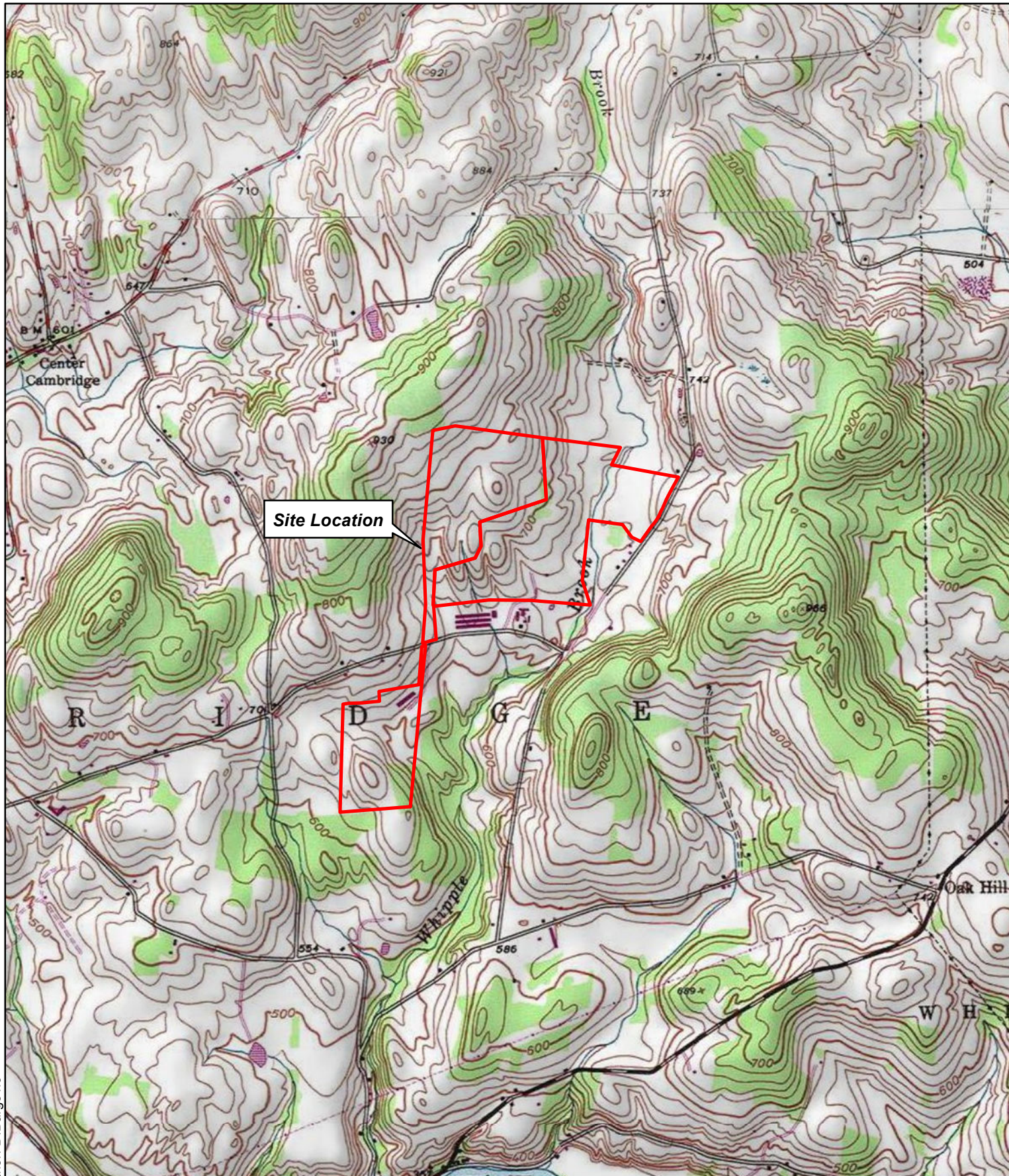
Type your route notes here

A 311 Belle Rd, Buskirk, NY 12028

| | | |
|----|---|--------|
| ↑ | 1. Head east on Belle Rd toward King Rd | 0.2 mi |
| ↗ | 2. Turn right onto King Rd | 0.9 mi |
| ↘ | 3. Turn right to stay on King Rd | 1.0 mi |
| ↙ | 4. Turn left onto County Route 59 / County Hwy-59 | 0.2 mi |
| ↘ | 5. Turn right to stay on Buskirk West Hoosick Rd / County Hwy-59 | 0.4 mi |
| ↙ | 6. Turn left onto NY-67 / State Route 67 | 3.1 mi |
| ↗ | 7. Turn right onto NY-22 / NY-67 / State Route 22 | 2.5 mi |
| ↑ | 8. Keep straight onto NY-67 / State Route 67 | 4.1 mi |
| 🛣️ | 9. Road name changes to VT-67 / VT Route 67 W • <i>Entering Vermont</i> | 2.0 mi |
| ↗ | 10. Turn right onto VT-67A / Main St | 3.5 mi |
| 🔄 | 11. At roundabout, take 2nd exit | 0.5 mi |
| ↗ | 12. Bear right onto Benmont Ave | 1.0 mi |
| ↑ | 13. Keep straight onto Dewey St | 0.5 mi |
| ↗ | 14. Turn right onto Hospital Dr | 0.1 mi |

| | | |
|---|--------------------------------------|--------|
|  | 15. Turn right | 256 ft |
| | Arrive | |
| 16. | The last intersection is Hospital Dr | |

B Southwestern Vermont Medical Center

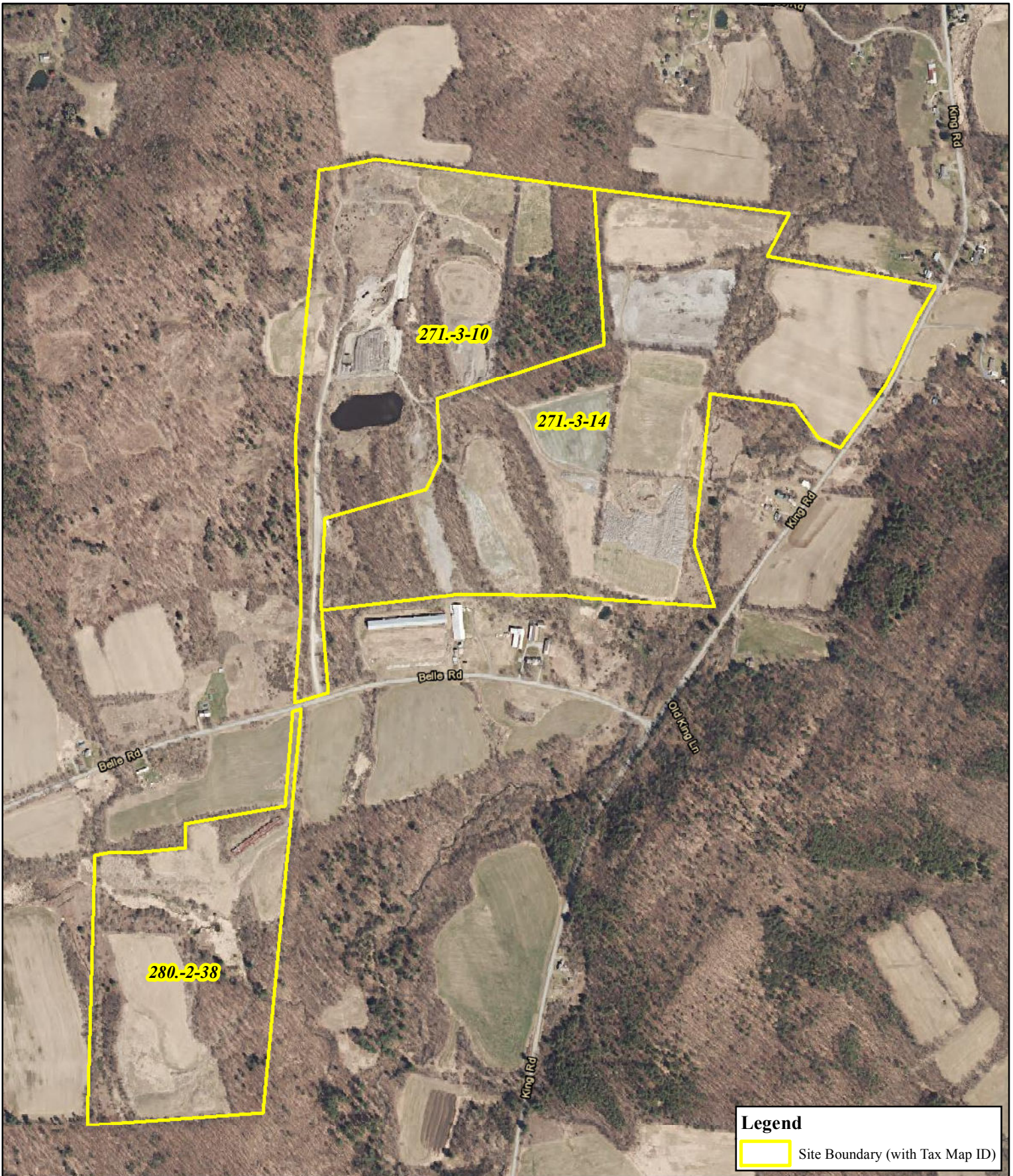



Scale 1" = 2000'

CHA Project No.
057581

Figure 1
Site Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Service Layer Credits:
Copyright: © 2013 National Geographic Society, I-cubed
Eagle Bridge USGS Quadrangles Date: 1980



Legend
 Site Boundary (with Tax Map ID)



CHA

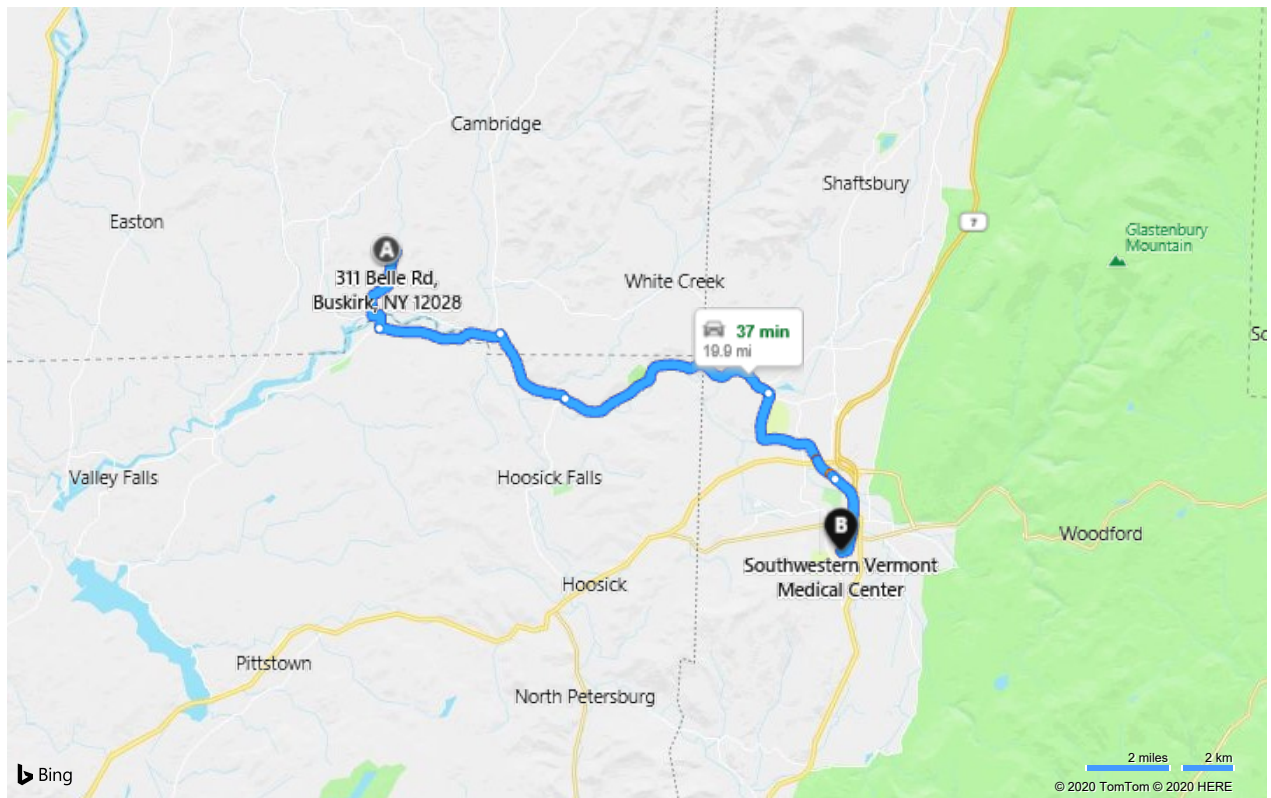
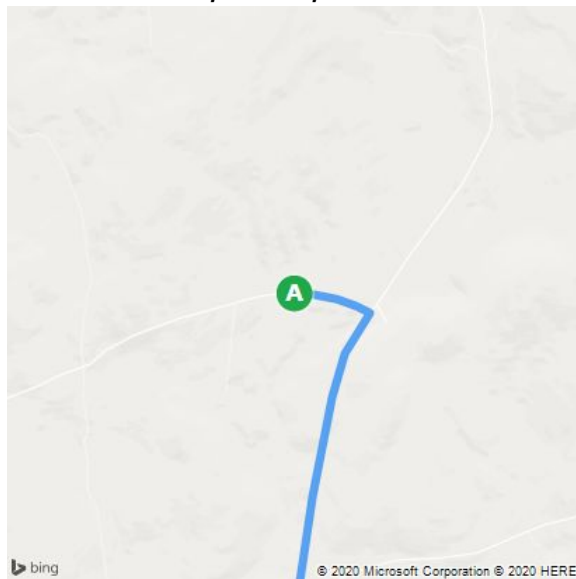
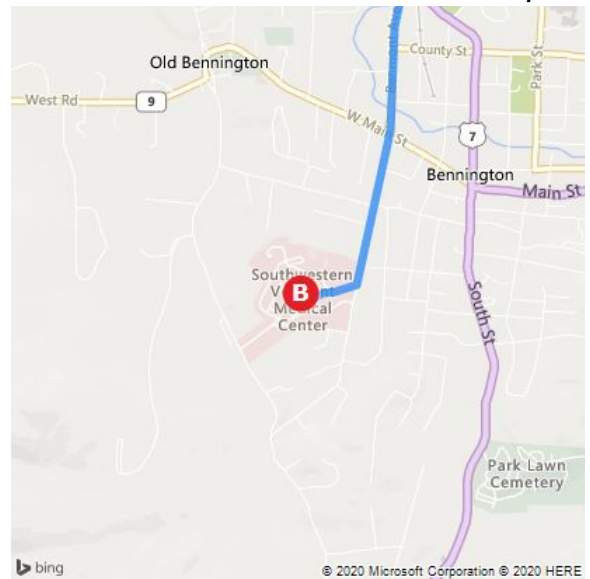
Scale 1" = 800'

CHA Project No.
057581

Figure 2
Site Boundary Map
CTI Agri-Cycle Composting Facility

308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Image Courtesy of NYS Office of Information Technology Services,
GIS Program Office • Photo Date: 2017
Site Boundary corresponds to Tax Map Boundaries

**A 311 Belle Rd, Buskirk, NY 12028****B Southwestern Vermont Medical Center, 1...**

These directions are subject to the Microsoft® Service Agreement and are for informational purposes only. No guarantee is made regarding their completeness or accuracy. Construction projects, traffic, or other events may cause actual conditions to differ from these results. Map and traffic data © 2020 TomTom.

APPENDIX A

Daily Jobsite Safety Brief Form



DAILY JOBSITE SAFETY BRIEF

PROJECT INFORMATION

| | | | |
|-------------------------|------------------------|--|----------------------------|
| Project Name: | | CHA Project No. | |
| Project Start Date: | Completion Date: | Weather: | |
| Project Location: | | Project Task: | |
| | | <i>Complete a Site Health & Safety Plan per Task</i> | |
| Description of Work: | | | |
| <i>Be Specific:</i> | | | |
| Key Personnel: | | | |
| Responsibilities: | <i>Project Manager</i> | <i>Field Team Leader</i> | <i>Site Safety Officer</i> |
| 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

JHA Quick Cards

Job Hazard Analysis

| Task | Hazard Type and Description | Hazard Control |
|-----------------------------|---|--|
| | | |
| 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 |

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| | “wind throws” where strong winds can blow down trees | during high wind occurrences that exhibit previous wind damage |
| Working at high altitudes | Altitude sickness | Recognize signs of acute mountain sickness including headaches, light-headedness, inability to catch one’s breath, nausea, and vomiting. Practice prevention by acclimating slowly to high elevations and staying hydrated. If the following symptoms progress, immediately descend to lower elevations and seek medical attention: difficulty breathing, chest pain, confusion, decreased consciousness, and loss of balance |
| Electrical storms | Being struck by lightning | While working outside, watch the sky for thunderstorms and seek shelter before the weather deteriorates. Stop working in streams and lakes. Someone at the job site must be able to begin revival techniques (i.e. CPR) if someone is struck by lightning. Do not use telephones. If caught in electrical storms, seek shelter inside a vehicle or building. When in a building, keep away from doors, windows, plugged in appliances, and metal. When in a vehicle, avoid contact with metal objects inside. If outside with no shelter, obey the following procedures: do not congregate, do not use metal objects, avoid standing near isolated trees, seek lower elevations such as valleys or canyons, and avoid being on peaks as well as trees. If you feel your hairs standing on end and your skin tingling, this is a sign that lightening might be about to strike so crouch immediately (feet together, hands on knees). |
| Being outdoors in cold weather for extended periods of time | Hypothermia | Recognize the signs including shivering, numbness, drowsiness, muscle weakness, dizziness, |

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| | Frostbite | <p>nausea, unconsciousness, low/weak pulse, and large pupils. Exercise practice prevention such as staying dry, wearing the appropriate clothing (layers), listen to the weather forecast to plan accordingly, stay hydrated, cover head with warm clothing, and stay active. Be aware of the role that wind-chill can play in hypothermia; under certain conditions, hypothermia can occur without any rain or being wet.</p> <p>Dress for the weather- layers are best, and mittens are better than gloves (keeps your warm fingers together while warming each other). Wear two pairs of socks with the inner layer made of synthetic fiber, such as polypropylene, to wick water away from the skin and the outer layer made of wool for increased insulation. Shoes should be waterproof. Keep your head, face, nose, and ears covered at all times. Clothes should fit loosely to avoid a decrease in blood flow to the arms and legs. Always travel with a friend in case help is needed. Be especially wary of wet and windy conditions; the "feels like" temperature (wind chill) is actually much lower than the stated air temperature. The very old, those who are not in good physical condition, and people with diabetes and anyone with vessel disease should take extra precautions.</p> |
| Working in areas with limited access to clean drinking water | Giardia | Treat, filter, or boil drinking water. Do not drink untreated water from streams, lakes or springs. |
| Working outdoors | Rattlesnakes | Be alert and do not put your feet or |

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| | | <p>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.</p> |
| | Bears | <p>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</p> |
| | Mountain Lions | <p>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> |

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| | <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 Tecnu or similar product with cold water to remove oils</p> |
| Encountering irrigation | Unfriendly encounters with | Do not wear uniforms and carry a |

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| pipes, marijuana plantation, or grow operations | criminal elements | radio backpack that is not visible. Do not confront strangers and act like a tourist if you must speak. Work in pairs or groups. If working in areas likely to contain operations, check in with park staff when leaving vehicle and returning to vehicle. Watch for black piping or other signs. If you find a definite grow operation, leave immediately, note the location, and report it to the authorities |
|---|-------------------|--|

Protecting Workers from Heat Stress

Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions your employer should take any time temperatures are high and the job involves physical work.

Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Low liquid intake
- Heavy physical labor
- Waterproof clothing
- No recent exposure to hot workplaces

Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

To Prevent Heat Illness, Your Employer Should

- Establish a complete heat illness prevention program.
- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.



U.S. Department of Labor



www.osha.gov (800) 321-OSHA (6742)

For more information:

Occupational
Safety and Health
Administration

- Modify work schedules and arrange frequent rest periods with water breaks in shaded or air-conditioned areas.
- Gradually increase workloads and allow more frequent breaks for workers new to the heat or those that have been away from work to adapt to working in the heat (acclimatization).
- Routinely check workers who are at risk of heat stress due to protective clothing and high temperature.
- Consider protective clothing that provides cooling.



How You Can Protect Yourself and Others

- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty. Drink water every 15 minutes.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.



What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.

If you have any questions or concerns, call OSHA at 1-800-321-OSHA (6742).



U.S. Department of Labor

For more information:



**Occupational
Safety and Health
Administration**
www.osha.gov (800) 321-OSHA (6742)

CHA Consulting, Inc.

Job Hazard Analysis

Slips/Trips/Falls

Common hazards

- Slippery surfaces (e.g., wet, oily or greasy)
- Seasonal trip hazards (snow and ice)
- Spills of wet or dry substances
- Changes in walkway levels and slopes
- Unsecured mats
- Poor lighting
- Debris and items stored in walkways
- Trailing cables in pedestrian walkways
- Smoke, steam or dust obscuring view
- Unsuitable footwear

Controlling hazards

When establishing safe work practices, consider:

- Characteristics of physical work area
- Weather conditions (snow, ice, rain)
- Tasks performed
- Workers' work practices
- Equipment

Hazard Control/Engineering Controls

- Type of flooring
- Slope of surface (ramps, handrails)
- Surface free of obstructions/holes
- Drainage
- Lighting levels, non-glare, contrast
- Equipment to be used/not carrying too much at once
- Signage
- Sufficient space
- Minimizing environmental influences, e.g., blocking wind to prevent wet surfaces icing at entrances

Hazard Control/Administrative Controls

- Training workers/awareness
- Safe practices such as a procedure for cleaning spills or requirement for two workers to transport a large equipment that one worker cannot see around or can't handle
- Reporting hazards
- Prompt maintenance
- Job design (identifying tasks requiring excessive pushing/pulling, line-of-sight obstruction)
- Equipment readily available
- Addressing poor work practices
- Inspections
- Review slips, trips and same-level fall hazards

Hazard Control/Housekeeping

- Clean spills
- Remove debris, snow and ice
- Keep equipment clean
- Keep wires, etc. controlled, taped, etc.

Hazard Control/Personal Protective Equipment

- Appropriate footwear for task, which may include appropriate heels, soles and anti-slip boots

APPENDIX C

Incident Reporting Forms



Incident Report

Please note: This form must be completed within (24) hours of an employee's injury or illness during the workday. This form can be completed by the employee or supervisor (or a witness if his/her supervisor is unavailable).

| Employee Information | | | | |
|---|---------------------------------|--|---|------------------------|
| Employee's Name | Title | Group | Supervisor | |
| | | | | |
| Incident Details | | | | |
| Date of Incident | Time of Incident | Location of Incident <i>(provide address, if available)</i> | | |
| | | | | |
| List the Nature of the Employee's Injury & Body Parts Affected (Indicate whether a similar work-related injury has occurred in the past): | | | | |
| | | | | |
| Explain What the Employee Was Doing When the Incident Occurred: | | | | |
| | | | | |
| Describe How the Incident Occurred: | | | | |
| | | | | |
| List any Applicable Objects That Were Directly Involved in the Injury <i>(i.e. motor vehicle, etc):</i> | | | | |
| | | | | |
| Did the Employee Stop Work Due to the Injury? | | | If Yes, Has the Employee Returned to Work? | |
| | | | | |
| Medical Treatment <i>(if known)</i> | | | | |
| Did the Employee Seek Medical Treatment? | Date of First Medical Treatment | Location of Treatment <i>(provide address, if available)</i> | Type of Facility <i>(i.e. emergency room, hospital, urgent care, doctor's office)</i> | What Type of Treatment |
| | | | | |
| Acknowledgment | | | | |
| Employee Signature: | | | Date: | |
| | | | | |
| Supervisor (or Witness) Name (Printed): | | Supervisor (or Witness) Signature: | | |
| | | | | |

RETURN COMPLETED FORM TO MEGAN ROBERTSON IN HUMAN RESOURCES

PHONE NUMBER - (518) 453-8750

FAX NUMBER – (518) 453-2889

E-MAIL ADDRESS – MROBERTSON@CHACOMPANIES.COM

cc: Health & Safety
M. Platt

CHA (Your Location) Office

- What to do for Accidents, Incidents, Safety Hazards & Near Misses

1) If any injury occurs, no matter how minor:

- a. Get it treated immediately as required. Notify supervisor.
- b. Contact Megan Robertson as soon as possible. Contact Margaret Rudzinski if Megan cannot be reached.
- c. Complete a CHA incident report form and return to Megan Robertson within 24 hours. (V:\Public\ANY\Health_&_Safety\Incident Reporting)

‘Contact’ means phone until you talk to the person directly. Voicemails and emails do not count.

(Employees should not provide their personal medical insurance information to the medical facility for work-related incidents. Please contact HR for further direction on how your work-related medical claim will be paid.)

2) For any accident, incident, safety hazard or near miss (no injury occurs)

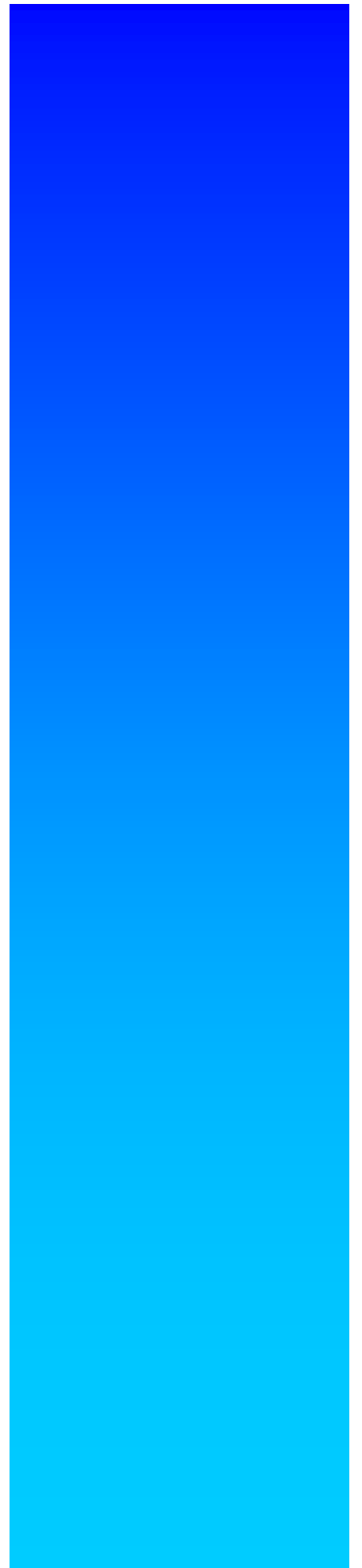
- a. Use your ‘Stop Work’ Authority as required. EVERYONE has the authority to stop work if they see a significant safety issue.
- b. For all – Report to your supervisor within 24 hours.

‘Report’ means phone, leave voicemail or email as appropriate.

| | | |
|---|--|---|
| Megan Robertson (Director of HR Operations) | 1-518-453-8750 – Office phone 1-518-453-2889 – Fax mrobertson@chacompanies.com | For all Project accidents and incident and/or potential workmen’s compensation claims |
| Margaret Rudzinski (Sr. VP, Corporate Environmental Health & Safety) | 1-518-453-2830 – Office phone 1-518-469-9259 – Cell phone mrudzinski@chacompanies.com | Report all safety hazards/issues to Margaret Rudzinski |

Recommendations for additional contacts:

- Office Leader
- Safety Coordinator



APPENDIX D

Community Air Monitoring Plan

Community Air Monitoring Plan (CAMP)

Remedial Investigation

CTI Agri-Cycle

BCP Site #C558043

The following Community Air Monitoring Plan (CAMP) will be implemented for the Remedial Investigation activities to be performed at the CTI Agri-Cycle (Site) Brownfield Cleanup Program (BCP) Site #C558043. Air monitoring will be conducted during all ground-intrusive activities during the remedial investigation 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 hand-held field instruments and perimeter air monitoring stations, for VOCs and particulate levels at the perimeter of the work area.

Continuous monitoring will be performed during ground intrusive activities. Daily summary tables will be provided to the NYSDEC and NYSDOH on a weekly basis. The NYSDEC and NYSDOH will be notified within one business day of any CAMP exceedances and corrective actions taken. Notification of exceedances will be provided to NYSDEC and NYSDOH independently of the weekly reports.

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 Remediation Investigation Work Plan (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.

Fugitive Dust Monitoring and Control

Particulate monitoring will be employed during all ground intrusive activities completed as par tof the RI work. Particulate concentrations will be monitored continuously at the upwind and downwind perimeters 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 a visual beacon to indicate exceedance of the action level. Staff in the field will also be able to receive real-time notifications via SMS text message and/or email of any exceedances. In addition, fugitive dust migration will be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) greater than background (upwind perimeter) for th e15-minute period, or if airborne dust

is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \mu\text{g}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \mu\text{g}/\text{m}^3$, work must be stopped, and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \mu\text{g}/\text{m}^3$, of the upwind level and in preventing visible dust migration.
3. All readings will be recorded and available for State (NYSDEC and NYSDOH) personnel to review.

Organic Vapor Monitoring and Control

Based on the nature of the Site contaminants, it is not anticipated that organic vapors may be emitted during RI activities. However, organic vapors will be monitored continuously via a photoionization detector (PID) at the downwind perimeter of the immediate work area (i.e., the exclusion zone). Upwind concentrations will be measured via a handheld PID at the start of each workday and periodically thereafter to establish background conditions, particularly if there is a change in wind direction.

The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate.

- 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) over a 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- 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 are less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but is no case less than 20 feet, is below 5 ppm over background for a 15-minute average.
- If the organic vapor level in the downwind work area perimeter exceeds the upwind perimeter concentration by more than 25 ppm, the following actions will be taken:
 1. All work will be halted.
 2. Air monitoring will be conducted at 15 minute intervals at a 20-foot offset from the exclusion zone. If two successive readings below 5 ppm are

measured by the field instrument and documented, the work may resume following the previously described monitoring plan.

All fifteen minute readings will be recorded and will be available onsite for Agency (i.e., New York State Department of Environmental Conservation and New York State Department of Health) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.