November 20, 2020

Caroline Jalanti, Environmental Engineer
New York State Department of Environmental Conservation
Division of Environmental Remediation – Bureau A
625 Broadway, 12th Floor
Albany, NY 12233-7015

RE: CTI Agri-Cycle (Site No. C558043) Remedial Investigation Work Plan
NYSDEC Site No. C558043
CHA Project No.: 23278

Dear Ms. Jalanti,

On behalf of CTI Agri-Cycle LLC, please find an enclosed copy of the Second Revised Remedial Investigation Work Plan for Site C55804. This document has been revised to address the comments provided in the New York State Department of Environmental Conservation's (NYSDEC's) comment letter dated November 13, 2020. The NYSDEC comments and CHA responses are summarized below.

Comment 1: CHA may include historic environmental data collected under other Department regulated programs in the final report for Site Characterization purposes. Please keep in mind that data collected outside of the Brownfield Cleanup Program has the possibility of not being deemed acceptable for final remediation planning and evaluation.

Response 1: *This comment is acknowledged.*

Comment 2: Please make this work plan inclusive of any potential "second round/phase II" sampling events that may occur as a follow up to the initial investigation work. Doing so will help to avoid any future work plan submissions and approval processes.

Response 2: *Section 5.9 of the Remedial Investigation Work Plan has been added to include this information.*

Comment 3: Please include language directly in the work plan listing daily reports as a deliverable during any investigation or field work.

Response 3: *A sentence has been added to beginning of Section 5.8 which states that daily field reports will be prepared to summarize any investigation or field work conducted as described in detail in the FSP.*

Comment 4: Appendix C, Section 6 - Air Monitoring; additional text is needed to discuss that the NYS Generic Community Air Monitoring Plan (CAMP) will be implemented during all ground-intrusive activities during the remedial investigation. Text must clarify that the intent of the CAMP is to provide a measure of protection for the downwind surrounding community (off-site receptors including residences and businesses) and not to establish action levels for workers conducting remedial work activities.

Response 4: *The purpose of Section 6 within the Health and Safety Plan is to establish action levels for workers conducting remedial work activities, not the surrounding community. Text has been added to this section which references the CAMP in Appendix D, which discusses the NYS Generic CAMP and downwind community.*

Comment 5: Appendix D, CAMP – Particulate monitoring must be conducted, in conjunction with organic vapor monitoring. Baseline readings of both parameters (particulates and organic vapors) must be measured prior to the commencement of field work, to establish background levels.

Response 5: *The CAMP has been updated to include continuous particulate monitoring in conjunction with organic vapor monitoring. Continuous particulate monitoring will be conducted upwind and downwind (one station for each) of the active work zone.*

Comment 6: Appendix D, CAMP – Please provide more detail on the periodic monitoring plan described in the CAMP. It is not clear how a 15-minute average used for implementing corrective actions will be determined based on the information provided. Please note, continuous datalogging is the preferred method for air monitoring programs.

Response 6: *This section has been revised to include continuous real-time monitoring with one upwind station (particulate monitoring) and one downwind station (particulate and VOC monitoring). A handheld PID will be used to establish a baseline VOC concentration upwind at the start of each day, after lunch breaks, and when there is a change in the wind direction resulting in movement of the station.*

Comment 7: Appendix D, CAMP – Daily summary tables must be provided to the Department and NYSDOH on a weekly basis at a minimum and the Department and NYSDOH must be notified within 24 hours, or one business day, of any CAMP exceedances and corrective actions taken during active field work. In addition, notification of exceedances must be provided to the Department and NYSDOH independently of the daily reports.

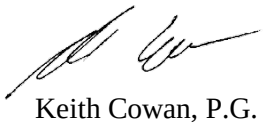
Response 7: *The CAMP has been updated to include the requirement of weekly reports summarizing daily activities. Additionally, any exceedances of 15-minute averages will be reported to NYSDEC and NYSDOH within 24 hours, or one business day.*

Comment 8: Health and Safety Plan – Please provide a Hospital Map with the final work plan.

Response 8: *The hospital map has been included as Figure 3 of the HASP.*

If you have any questions, please do not hesitate to contact me at (518) 453-2899.

Sincerely,



Keith Cowan, P.G.
Vice President

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CHA

Remedial Investigation Work Plan

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

BCP Site No. C558043

CHA Project Number: 057581.000

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

Prepared by:

III Winners Circle
Albany, New York 12205
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July 2020
Revised October 2020
Revised November 2020

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CERTIFICATION

I, Scott M. Smith, 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)

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

Signature of Certifying Engineer

November 20, 2020
Date of Certification

083885
NYS Professional Engineer Registration Number

CHA Consulting, Inc.
Company

Associate Vice President
Title

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LIST OF ACRONYMS & ABBREVIATIONS

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 ahs 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 (µg/kg) in sample AC-041917-8 collected on the western side of the Site to 1.1 µg/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 µg/kg), piled mixtures of paper sludge and yard waste (3.5 µg/kg and 6.5 µg/kg), and in the material spread on fields for the aging process (84 µg/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.

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 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.

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 Figure 7. 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 (Figure 8). 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 Figure 8.

Table 1: Sampling Rationale

Sample ID	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
Surface Soil				
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
Subsurface Soil				
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
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 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
Surface Water/Sediment				
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.
Waste Characterization				
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 Work Plan	June 2020	July 2020
Comment Period & Review of Work Plan	July 2020	August 2020
Resubmittal of Work Plan	September 2020	October 2020
Remedial Investigation – Groundwater and Surface Water Only	November 2020	November 2020
Remedial Investigation – Soil Investigation	December 2020	December 2020
Remedial Investigation Report Preparation	January 2021	February 2021
NYSDEC Review & Approval of Investigation Report	February 2021	March 2021

FIGURES

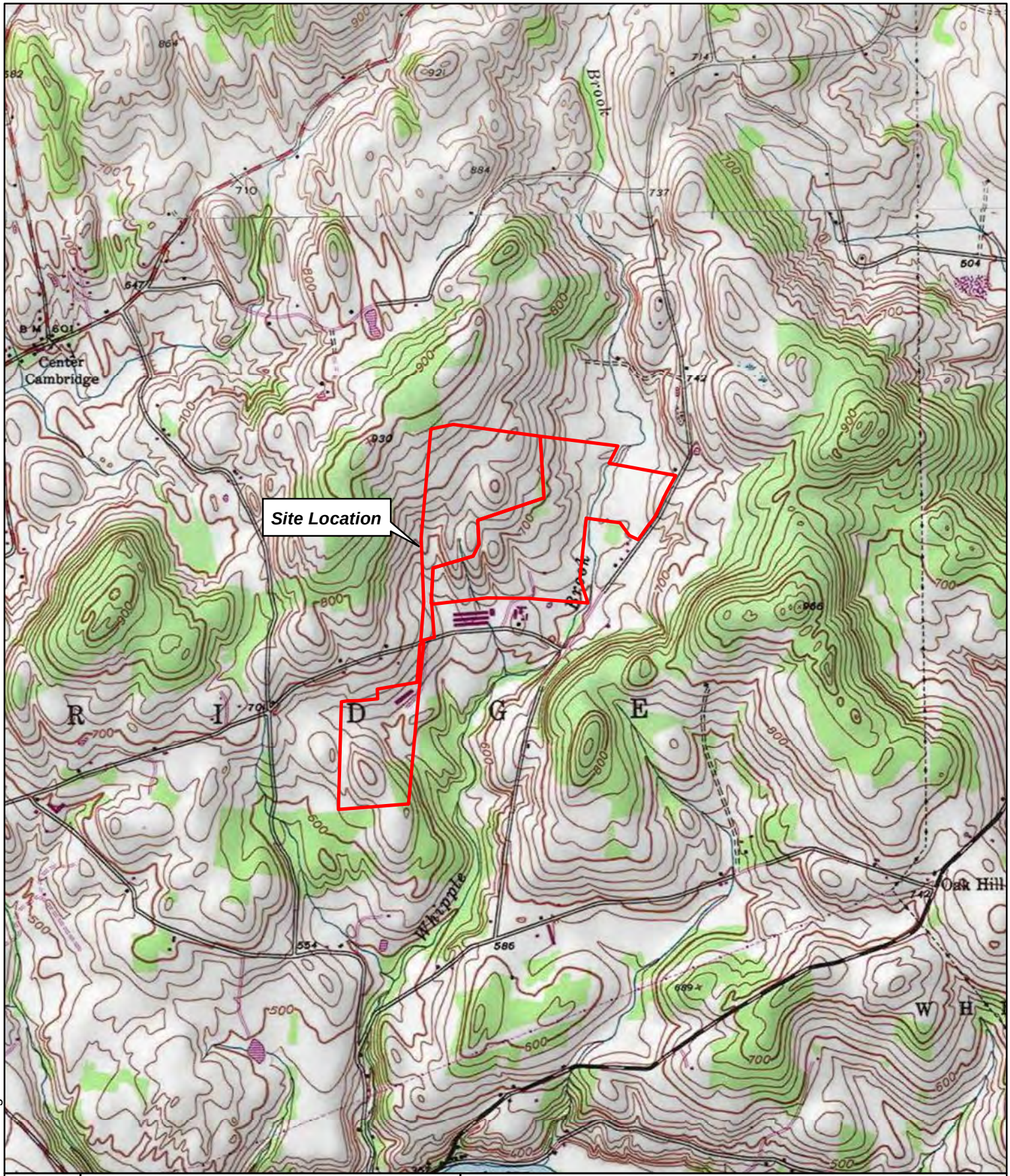

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Figure 1
Site Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 2000'

CHA Project No. 057581

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

Date Saved: 7/21/2020 • Author: D.Bargovic

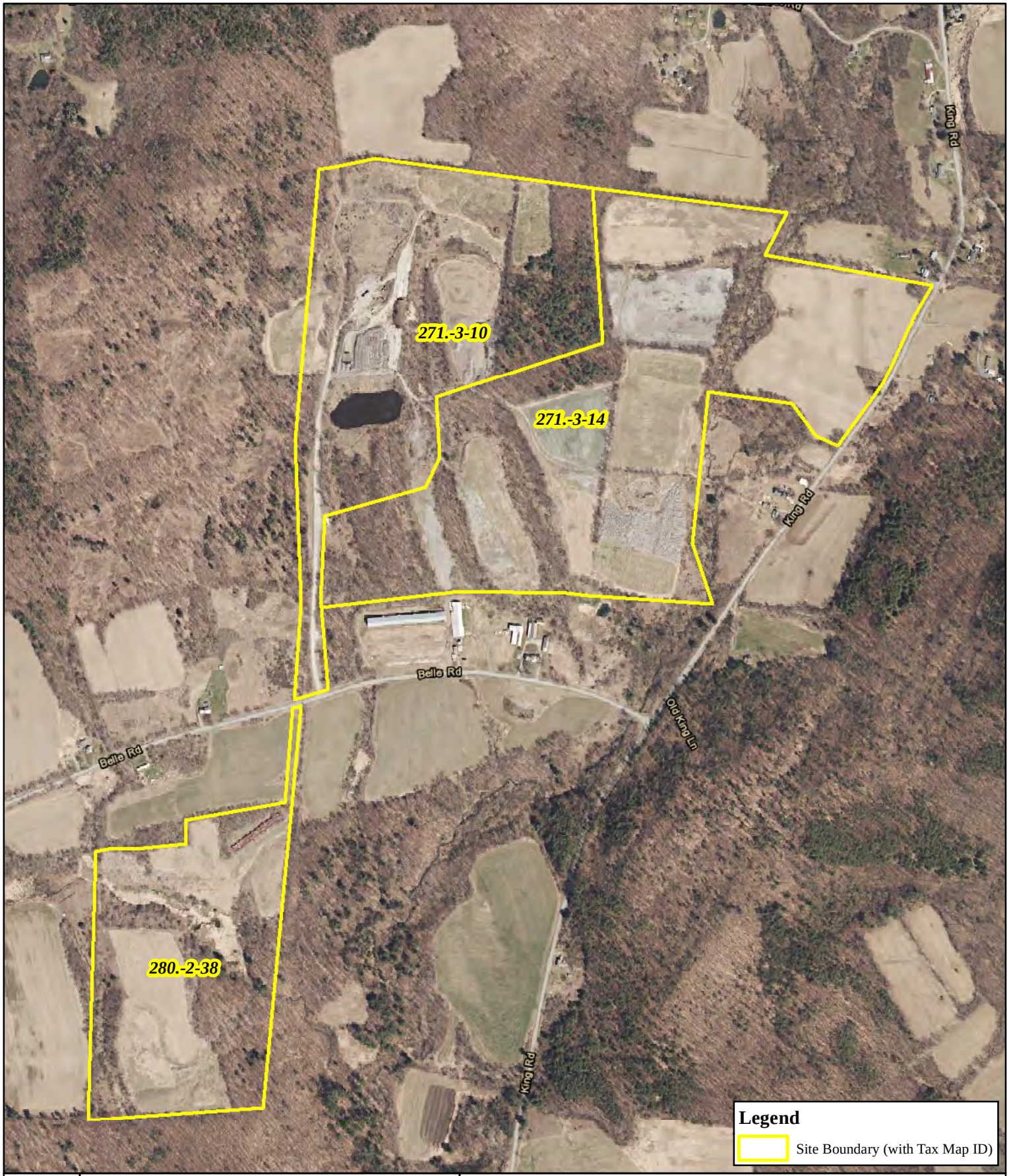

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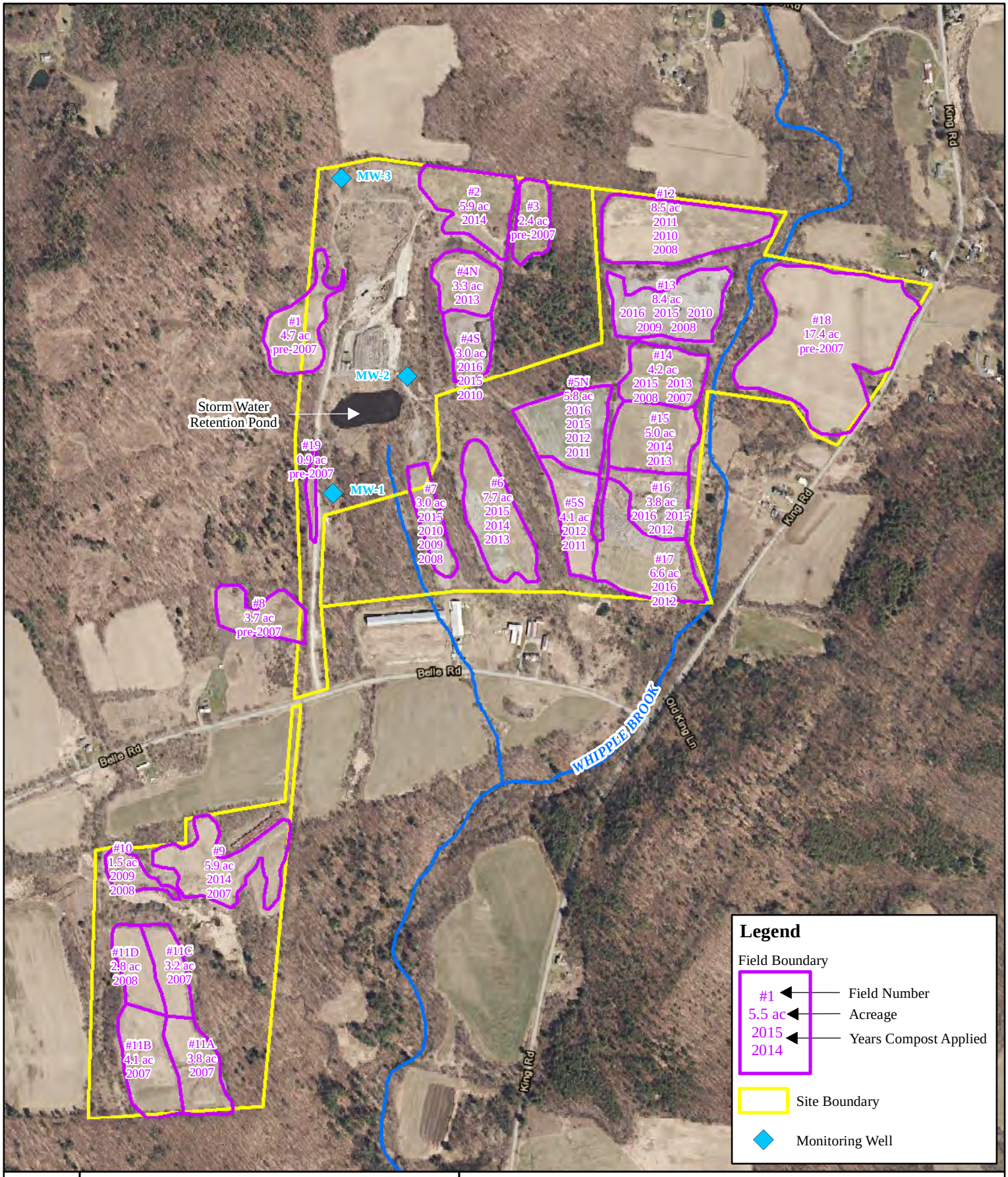
Figure 2
Site Boundary Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 800'

CHA Project No. 057581

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

Date Saved: 7/21/2020 • Author: E.Butterfield



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Date Saved: 7/21/2020 • Author: E.Butterfield

Figure 3
Site Layout Map
CTI Agri-Cycle Composting Facility

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

Scale 1" = 800'

CHA Project No. 057581

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

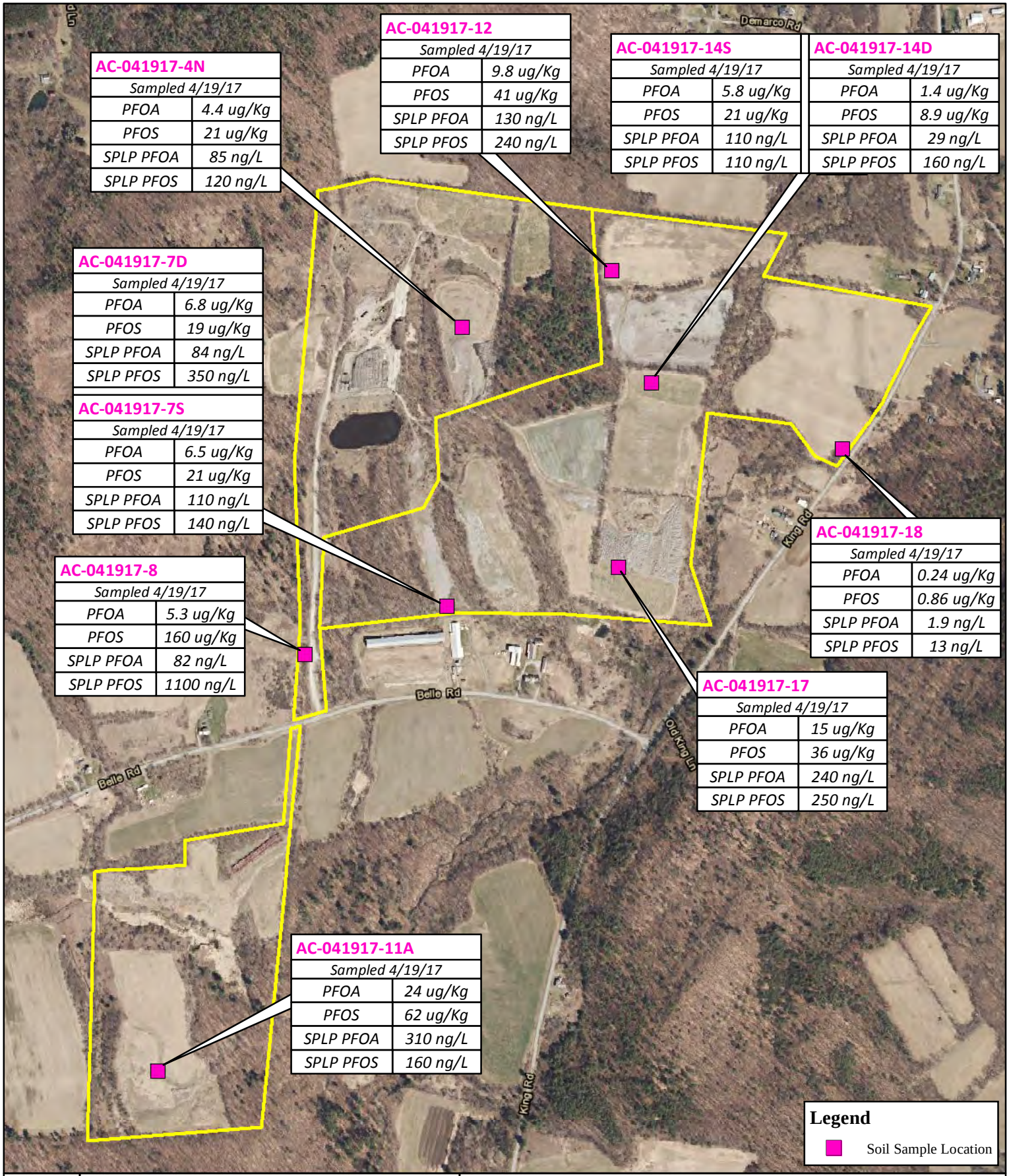

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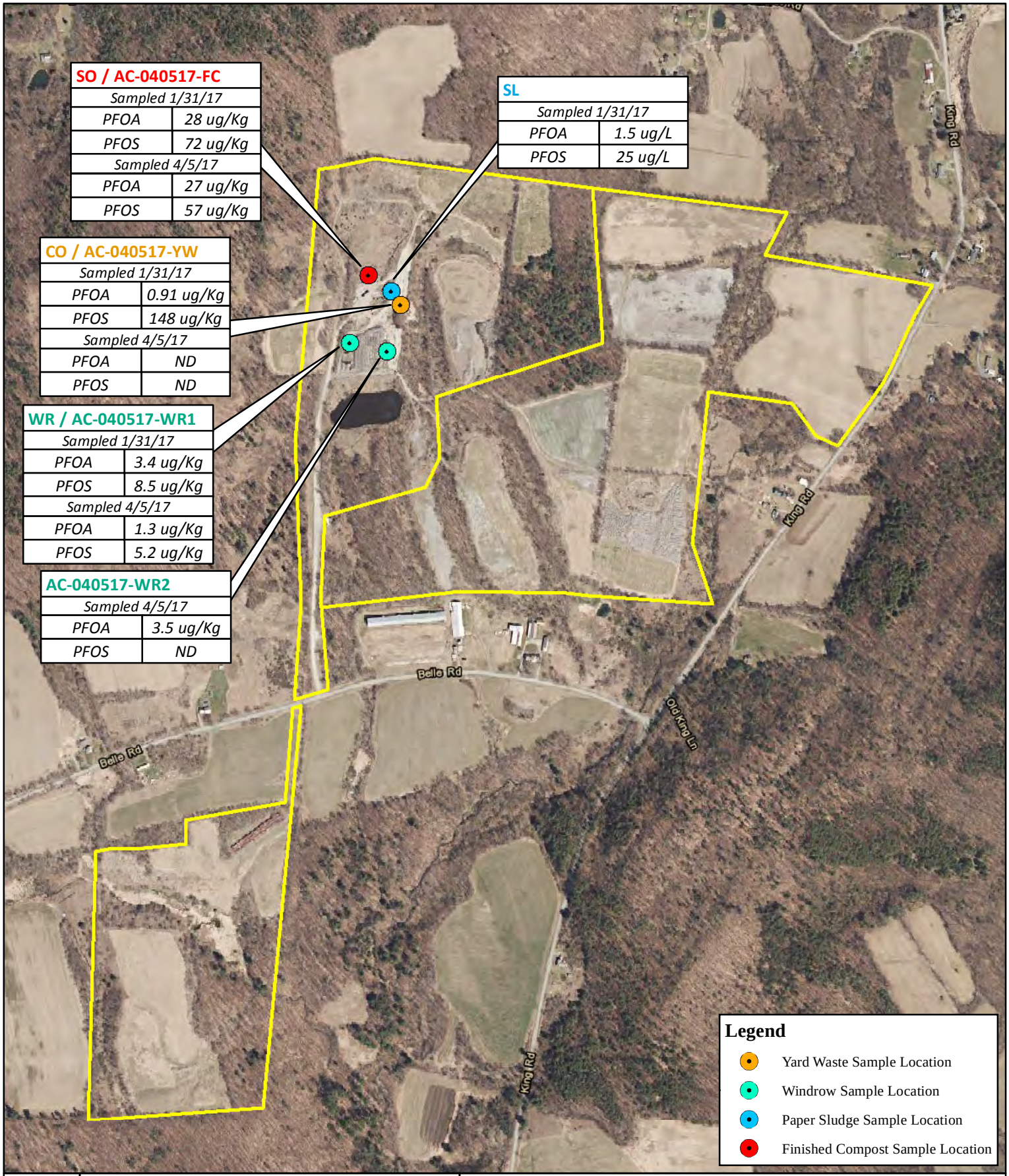
Figure 4
Historical Soil Sample Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 800'

CHA Project No. 057581

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

Date Saved: 7/22/2020 • Author: E.Butterfield



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Date Saved: 7/22/2020 • Author: E.Butterfield

Figure 5
Historical Solids Sample Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 800'

CHA Project No. 057581

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

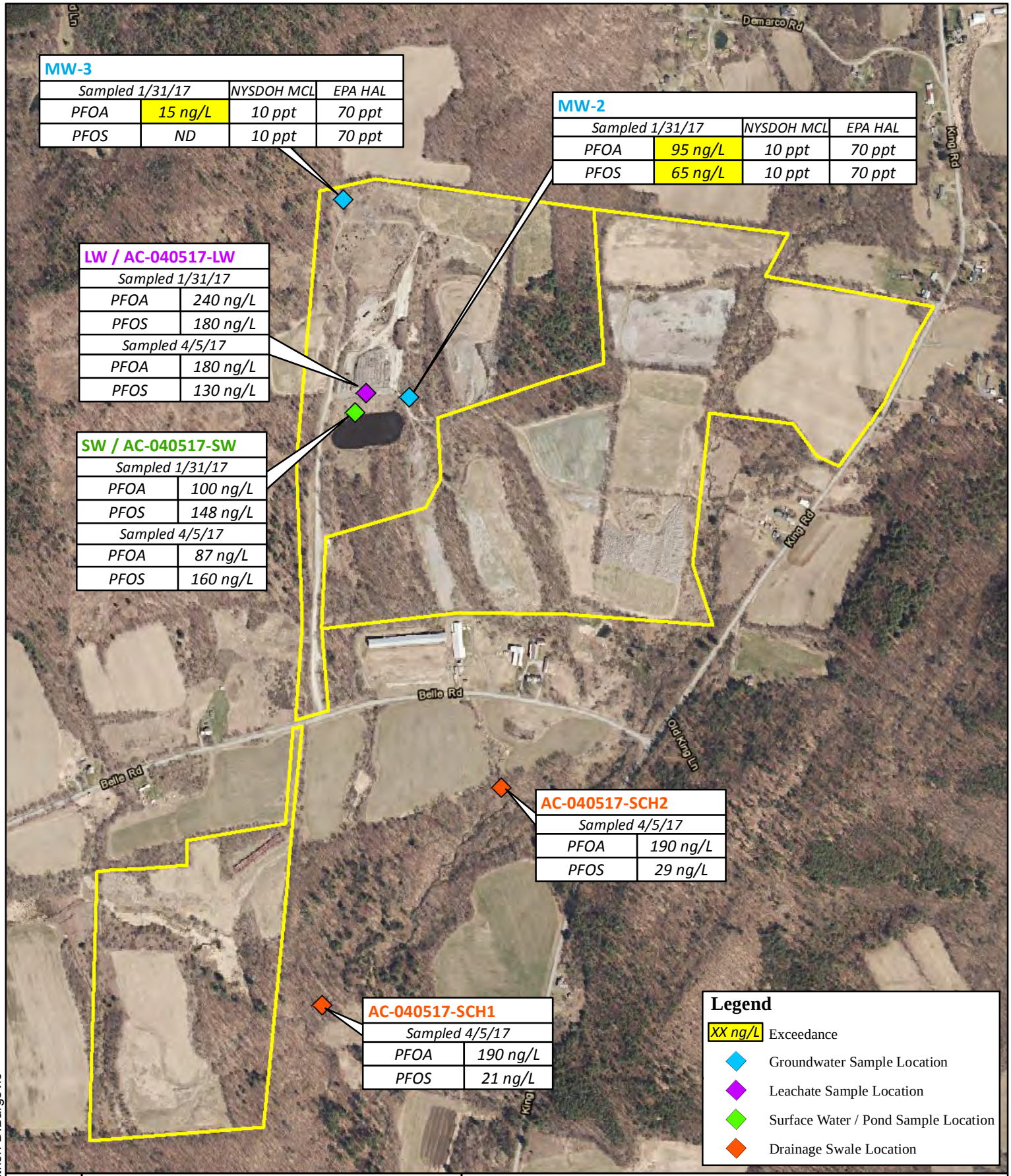

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Figure 6
Historical Water Sample Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 800'

CHA Project No. 057581

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

Date Saved: 7/22/2020 • Author: D.Bargovic

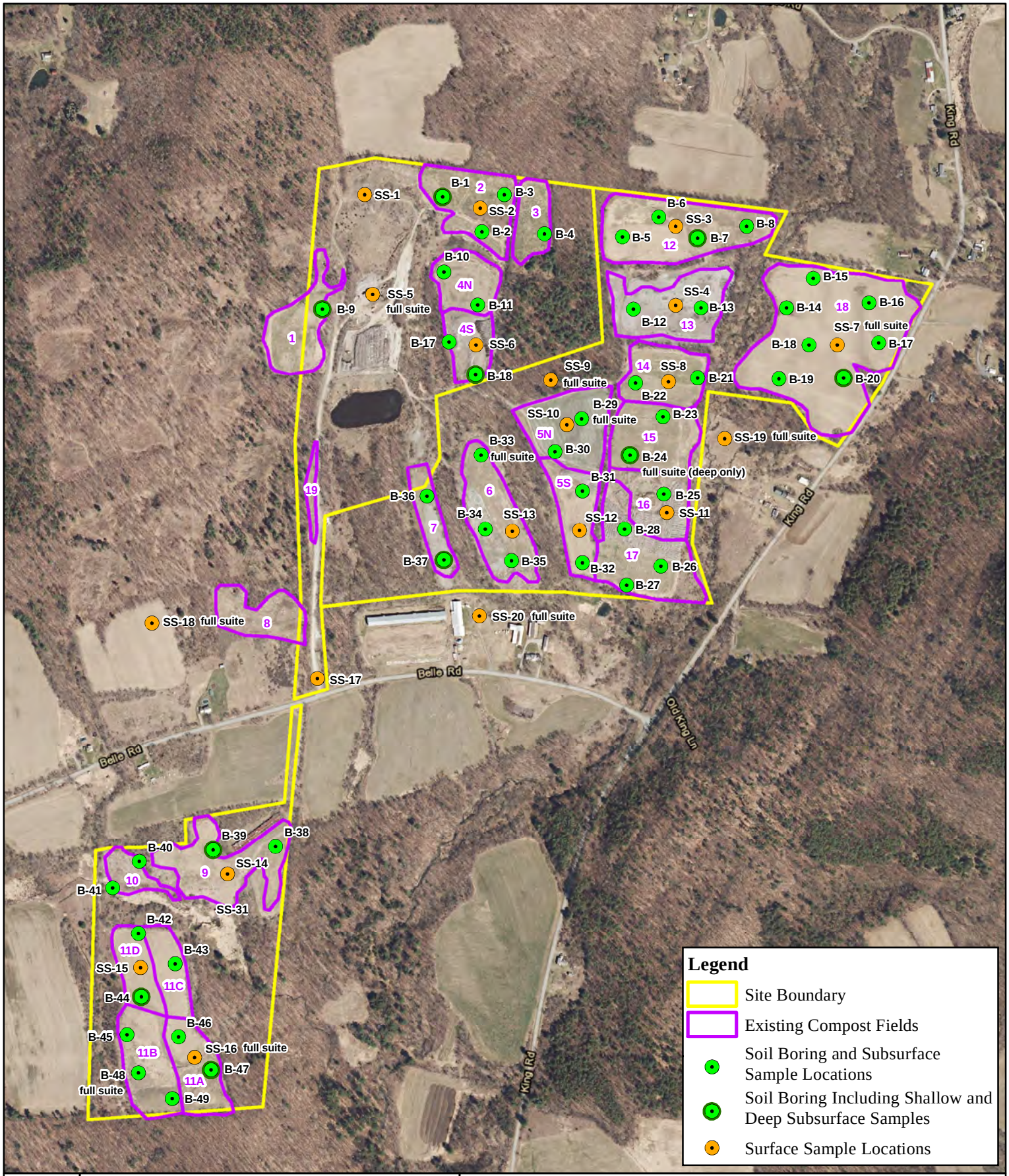

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Figure 7
Proposed Soil Borings/Sampling Locations Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 800'

CHA Project No. 057581

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

Date Saved: 10/1/2020 • Author: E.Butterfield

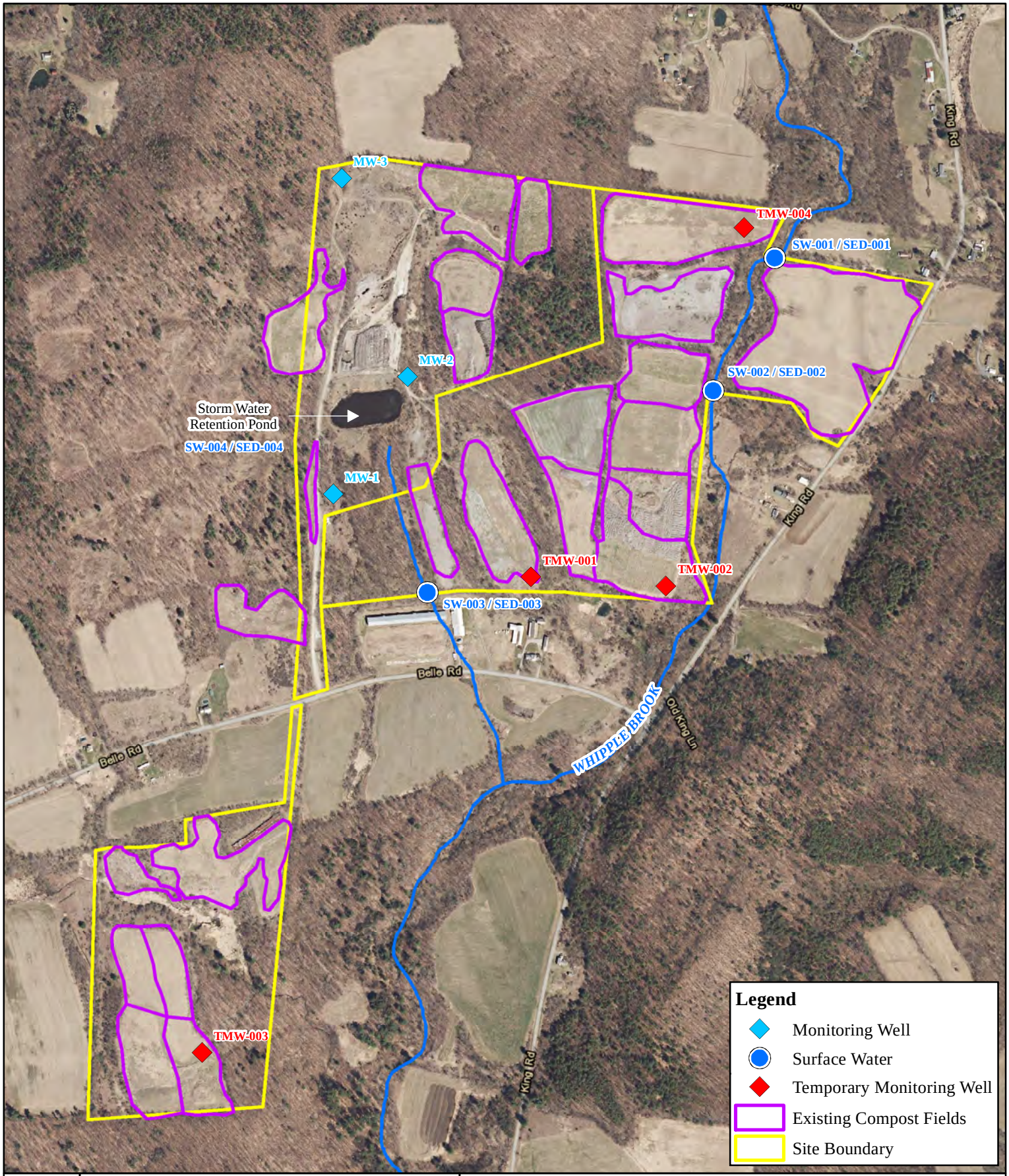

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Figure 8
Proposed Water Sampling Locations Map
CTI Agri-Cycle Composting Facility

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

Scale 1" = 800'

CHA Project No. 057581

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

Date Saved: 10/1/2020 • Author: E.Butterfield

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
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Holyoke, Massachusetts 01040

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

APPENDICES

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
Surface Soil				
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.
Sub-Surface Soil				
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.
Surface Water/Sediment				
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.
Waste Characterization				
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

END OF SOP
Final Check by C. Burns 10/2/15

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

SAMPLE NAMING AND NUMBERING

A. PURPOSE/SCOPE:

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

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

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

b. To enhance clarity in cases of potential ambiguity

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

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

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

B. EQUIPMENT/MATERIALS:

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

C. PROCEDURE:

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

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

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

Authors: Sarah Newell and Mark Corey
Reviewer: Keith Cowan

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

Author: Sarah Johnston
Reviewer: Keith Cowan

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 competed 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 nephalometer 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 Samp*ling 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±2º 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	**Sunscreens** – Alba Organics Natural Sunscree, Yes to Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my Face, Baby sunscreens that are “free” or “natural” **Insect Repellents** – Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect Repellant, Herabl Armor, California Baby Natural Bug Spray, BabyGanics **Sunscreen and Insect Repellant** – Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion
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	Bottled water and hydration fluids to be brought and consumed only in the staging areas. Eating should take place away from the sampling location, wash hands well after handling, wear powderless nitrile gloves

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. Submerses 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 discreet 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 braches 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 4ºC 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.

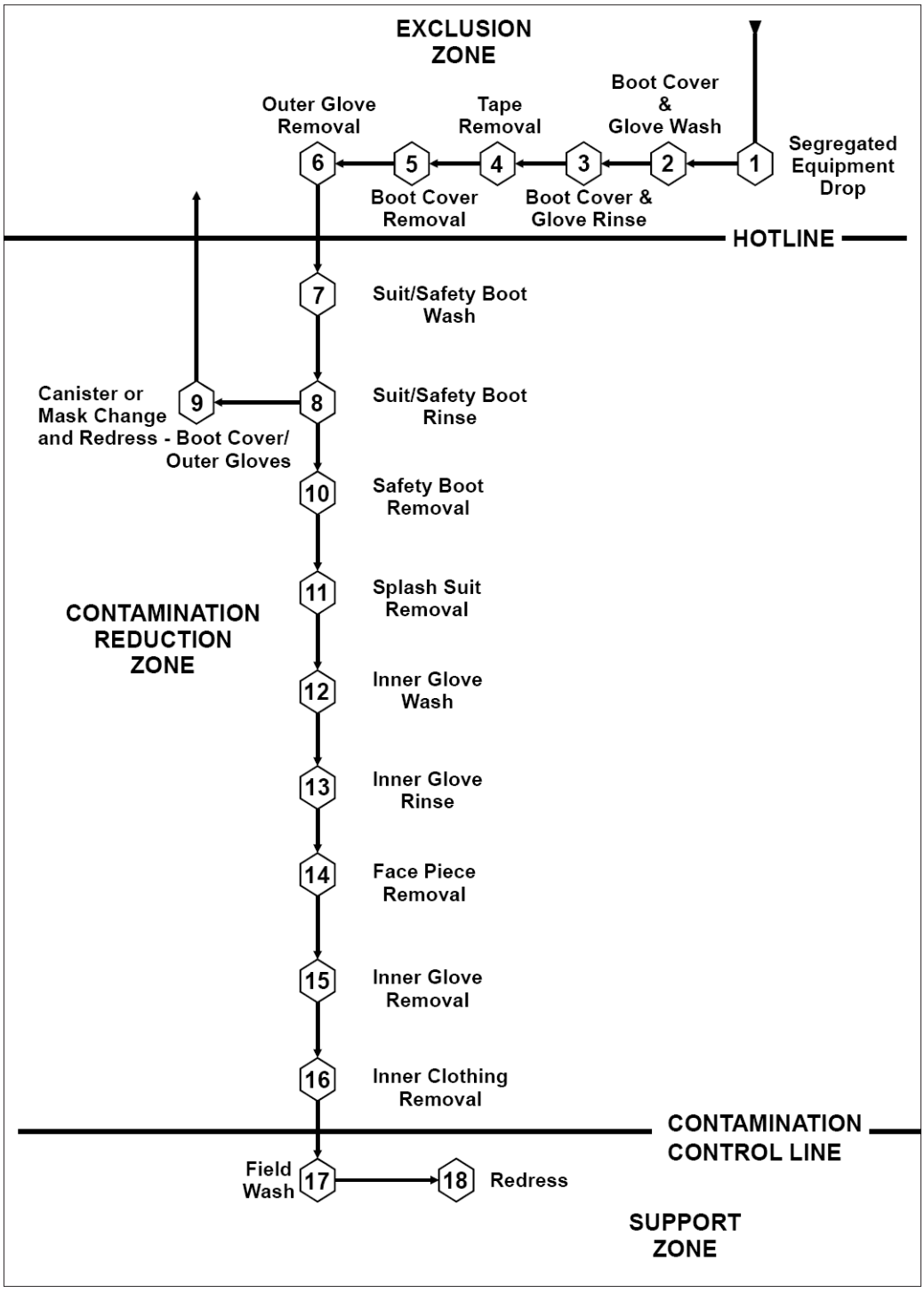
DECONTAMINATION OF PERSONNEL

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



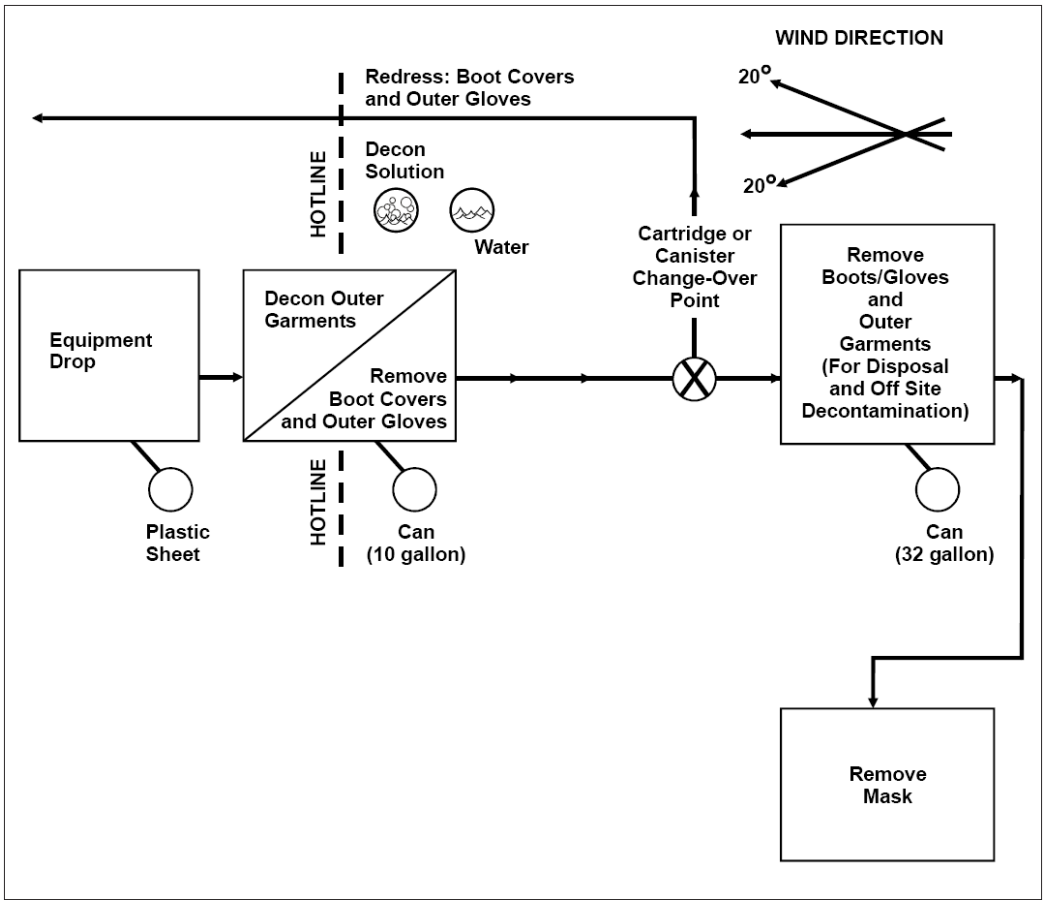
DECONTAMINATION OF PERSONNEL

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



Author: Meghan Platt, P.E.
Reviewer: Scott Smith, P.E.

RESIDUALS MANAGEMENT

A. PURPOSE/SCOPE:

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

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

B. EQUIPMENT/MATERIALS:

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

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

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

C. PROCEDURE:

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

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

RESIDUALS MANAGEMENT

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

D. QA/QC REQUIREMENTS:

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

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

RESIDUALS MANAGEMENT

E. SPECIAL CONDITIONS:

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

F. REFERENCES:

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

G. APPENDICES/FORMS:

Not Applicable

END OF SOP

Final Check by C. Burns 10/26/15

Author: Meghan Platt, P.E.
Reviewer: Scott Smith, P.E.

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 4ºC from sample collection until laboratory analysis.
14. Package and ship samples per SOP #607.

D. QA/QC REQUIREMENTS:

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

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

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

Volatile Organic Compounds:

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

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 CaCO3	305.1	2310B	Cool to 4 deg C	P or G	14 Days	100 mL
Alkalinity	-----	2320B	Cool to 4 deg C	P or G	14 Days	100 mL
Alkalinity as CaCO3	310.1	2320B	Cool to 4 deg C	P or G	14 Days	100 mL
Ammonia	350.2/.3	4500-NH3 B,E	Cool to 4 deg C, H2SO4 to pH<2	P or G	28 Days	400 mL
Aromatic Hydrocarbons	602	8021B	1:1 HCl to pH <2, Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	14 Days	40 mL
Biochemical Oxygen Demand	405.1	5210B	Cool to 4 deg C	P or G	48 Hrs.	500 mL
Bromide	300	-----	None	P or G	28 Days	250 mL
Calcium	-----	3120B	HNO3 to pH<2	P or G	6 Months	100 mL
Calcium- Hardness	200.7	3111B	HNO3 to pH<2	P or G	6 Months	100 mL
Carbamates	531.1	-----	Cool to 4 deg C, 0.08% Na2S2O3 if residual chlorine present	G, screw cap Teflon faced silicone septum	14 Days	100 mL mL
Carbonaceous BOD	-----	5210B	Cool to 4 deg C	P or G	48 Hrs.	1000 mL
Chloride	300	4500-CL D 4110	Cool to 4 deg C	P or G	28 Days	100 mL
Chloride, Residual Disinfectant	-----	4500Cl-G	Cool to 4 deg C	P or G	Analyze Immediately	200 mL
COD	410.4	5220D	H2S04 to pH<2, Cool to 4 deg C	P	28 days	250 mL
Color	-----	2120B	Cool to 4 deg C	P or G	24 Hrs	100 mL
Conductivity	-----	2510B	Cool to 4 deg C	P or G	28 Days	100 mL
Cyanide	335.4	4500-CN C&E	Cool to 4 deg C NaOH pH>12	P or G	14 Days	250 mL
Cyanide	335.2	9010B, 9012A, 9014	Cool to 4 deg C, NaOH to pH>12 0.6 g ascorbic acid if residual chlorine present	P or G	Sulfide absent, 14 days; sulfide present 24 Hrs	250 mL
Cyanide, Amenable	335.1					
Dioxin	-----	8280A	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
DRO	-----	8015B	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
Escherichia Coli	-----	9222B	0.008% Na2S203 if residual chlorine present 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% Na2S203 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% $Na_2S_2O_3$ 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, H_2SO_4 to pH<2	G	28 Days	500 mL
Pseudomanas Aeruginosa	-----	9213E	Cool to 4 deg C 0.008% $Na_2S_2O_3$ 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% $Na_2S_2O_3$ if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	14 Days	40 mL
Radiological	-----	-----	HNO_3 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% $Na_2S_2O_3$ 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-SO_4	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 (SO_3)	377.1	-----	None Required	G, Bottle and Top	Analyze immediately	50 mL
Surfactants (MBAS)	425.1	-----	Cool to 4 deg C	P or G	48 Hrs.	250 mL

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
TDS			Cool to 4 deg C	P	7 days	500 mL
Temperature	-----	2550B	None	P or G	Analyze Immediately	1000 mL
Temperature	170.1	-----	None Required	G, Bottle and Top	Analyze immediately	1000 mL
Total Kjeldahl Nitrogen	353.3/.1	4500Norg-C	H2S04 to pH<2 , Cool to 4 deg C	P	28 days	250 mL
Total Coliform	-----	9221D	0.008% Na2S203 if residual chlorine present 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.
Semivolatile Organics	-----	8270C	Cool to 4 deg C	G, Amber	14 Days	8 oz.

Table 1

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Sulfate	-----	9035, 9036, 9038	Cool to 4 deg C	P or G	28 Days	8 oz.
Sulfides	-----	9215	Cool to 4 deg C	P or G	7 Days	8 oz.
TCLP Metals	-----	1311, 6010B, 6020, 7000A, 7470A	Cool to 4 deg C	G, Amber	180 Days (Hg 28 days)	8 oz
TCLP Herbicides	-----	1311	Cool to 4 deg C	G, Amber	14 Days	8 oz.
TCLP Pesticides	-----	1311	Cool to 4 deg C	G, Amber	14 Days	8 oz.
TCLP Semivolatile Organics	-----	1311, 8270C, 8081A, 8151A	Cool to 4 deg C	G, Amber Teflon Lined	14 Days	8 oz.
TCLP Volatile Organics	-----	1311, 8260B	Cool to 4 deg C	G, Amber VOA Vial Teflon Lined	14 Days	8 oz.
Temperature	-----	2550	-----	P	Analyze Immediately	4 oz.
TOC		Lloyd Kahn Method	Cool to 4 deg C	G, Amber	14 days	4 oz.
Total Coliform	-----	9131	Cool to 4 deg C	Sterile, P or G	6 Hrs	4 oz.
Total Coliform	-----	9132	Cool to 4 deg C	Sterile, P or G	6 Hrs	4 oz.
Total Cyanide	-----	9013	Cool to 4 deg C	P or G	14 Days	8 oz.
Volatile Organic Compounds	-----	8260B	Cool to 4 deg C Check individual state regulations for proper preservative. NJ (methanol), PA (encore samplers), NY (cool to 4 deg C)	G, wide mouth, teflon liner	14 Days	4 oz.
Volatile Organic Compounds	-----	8021		G, wide mouth, teflon liner	14 Days	4 oz.
CLP Sampling and Holding Time Information						
Cyanide (aqueous)	ILM04.1		NaOH to pH>12, Cool to 4 deg C	P	12 Days VTSR	1000ml
Cyanide**	ILM04.1		Cool to 4 deg C	G		8 oz
Mercury (aqueous)	ILM04.1		HNO3 to pH<2, Cool to 4 deg C	P	26 Days VTSR	1000ml
Mercury (solid/soils)	ILM04.1		Cool to 4 deg C	G		8 oz
Metals (aqueous)	ILM04.1		HNO3 to pH<2, Cool to 4 deg C	P	180 Days VTSR	1000ml
Metals (solid/soils)	ILM04.1		Cool to 4 deg C	G		8 oz
PCBs (aqueous)	OLM04.2		Na2S203, Cool to 4 deg C	G	See Note 7	1000ml
PCBs (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Pesticides (aqueous)	OLM04.2		Na2S203, Cool to 4 deg C	G	See Note 7	1000ml
Pesticides (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Semivolatile Organic Compounds (aqueous)	OMLO4.2		Cool to 4 deg C	G	See Note 8	1000ml
Semivolatile Organic Compounds (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Volatile Organic Compounds (aqueous)	OLM04.2		HCL pH < 2, Cool to 4 deg C	G	W/preservative: 10 days VTSR; W/O: 7 days VTSR	40ml
Volatile Organic Compounds (solid/soils)	OLM04.2		Cool to 4 deg C	G	10 Days VTSR	4 oz

Table 1

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

Notes:

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

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

A. PURPOSE/SCOPE:

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

B. EQUIPMENT/MATERIALS:

QA/QC samples require the following materials:

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

C. PROCEDURE:

The following are types of QA/QC samples.

1. Duplicate Sample

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

Example:

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

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

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

2. Field Blank

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

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

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

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

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

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

3. Equipment Blank

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

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

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

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

4. Matrix Spike/Matrix Spike Duplicate Sample

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

Example:

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

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

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

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

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

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

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

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

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

D. 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:

III Winners Circle
Albany, NY 12205
Phone: (518) 453-4500
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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 4ºC	180 days (28 days for mercury)
	EPA Method 8082A	PCBs	3	1/1/1	0	0	0	4 oz glass wide	Cool to 4ºC	14 days
	EPA Method 8081A	TCL Pesticides	3	1/1/1	0	0	0	4 oz. glass wide	Cool to 4ºC	14 days
	EPA Method 537 (Mod.)	PFAS (full list) (21 compounds)	3	1/1/1	0	0	0	8 oz plastic wide	Cool to 4ºC	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 (±2°C) in sealed coolers.

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

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

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

6.2 SAMPLE DOCUMENTATION IN THE LABORATORY

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number by the laboratory. The laboratory sample custodian will record the client name, number of samples and date of receipt of samples in the Sample Control 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 (>±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 ≤30% RPD. Acceptance criteria for duplicate water samples will be ≤20% RPD between field and laboratory data.

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

10.2 ACCURACY

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

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

A = The analyte determined experimentally from the spike sample.
B = The background level determined by a separate analysis of the unspiked sample.
C = The amount of spike added.

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

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

10.3 REPRESENTATIVENESS, COMPLETENESS AND COMPARABILITY

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

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

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

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

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**

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 EALUATION

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	• 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.	• 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
		• Exposure to loud noise	• 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	• 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.	• 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	• 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	• Use safe work practices • Don proper PPE • Have a first aid kit readily available at site
All personnel	Heavy lifting	Back injuries from lifting	• 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	• Wear cool, light clothing • Hydrate regularly • Take frequent breaks in cool areas
All personnel	All field activities	Fire (general)	• Identify location of fire extinguisher(s) – contractor sourced • Keep ignition sources away from flammable materials and atmospheres.
All personnel	All field activities	Noise Exposure	• Wear hearing protection if you must shout to hear someone who is standing one foot or less away.
All personnel	All field activities	Contact with heavy equipment and traffic	• 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	• Stay alert to all on-site activities • Report suspicious activities to PM and/or CTI Agri-Cycle
All personnel	All field activities	Ticks	• Avoid unnecessary entry into tall grass and brushy areas. • Wear insect repellents containing DEET or Permethrin.

Affected Personnel	Task/Operation	Hazards	Hazard Control
			• 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)	• 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	• 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	• 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	• Avoid actions which increase the risk of encountering a snake (e.g., overturning logs, rocks, etc.).
All personnel	All field activities	Rodents	• Avoid contact with rodents and burrowing animals.
All personnel	All field activities	Arachnids	• Avoid actions which increase the risk of encountering arachnids (e.g., overturning logs, placing hands in dark places).
All personnel	All field activities	Physically Damaging Plants (e.g., briars, thistles)	• Remove plants prior to implementing the work activity. • Use briar resistant pants or chaps if working in dense thorny vegetation.

All personnel	All field activities	Poisonous Plants	• 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	• 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. 202.13[1]; Center for Disease Control and Prevention (CDC) Guidance Documents on COVID-19 https://www.cdc.gov/; CHA Intranet COVID-19 Information Portal https://intranet.cha-llp.com/cms/news/.

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. • 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	• 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 • 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	• 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

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

bing maps

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

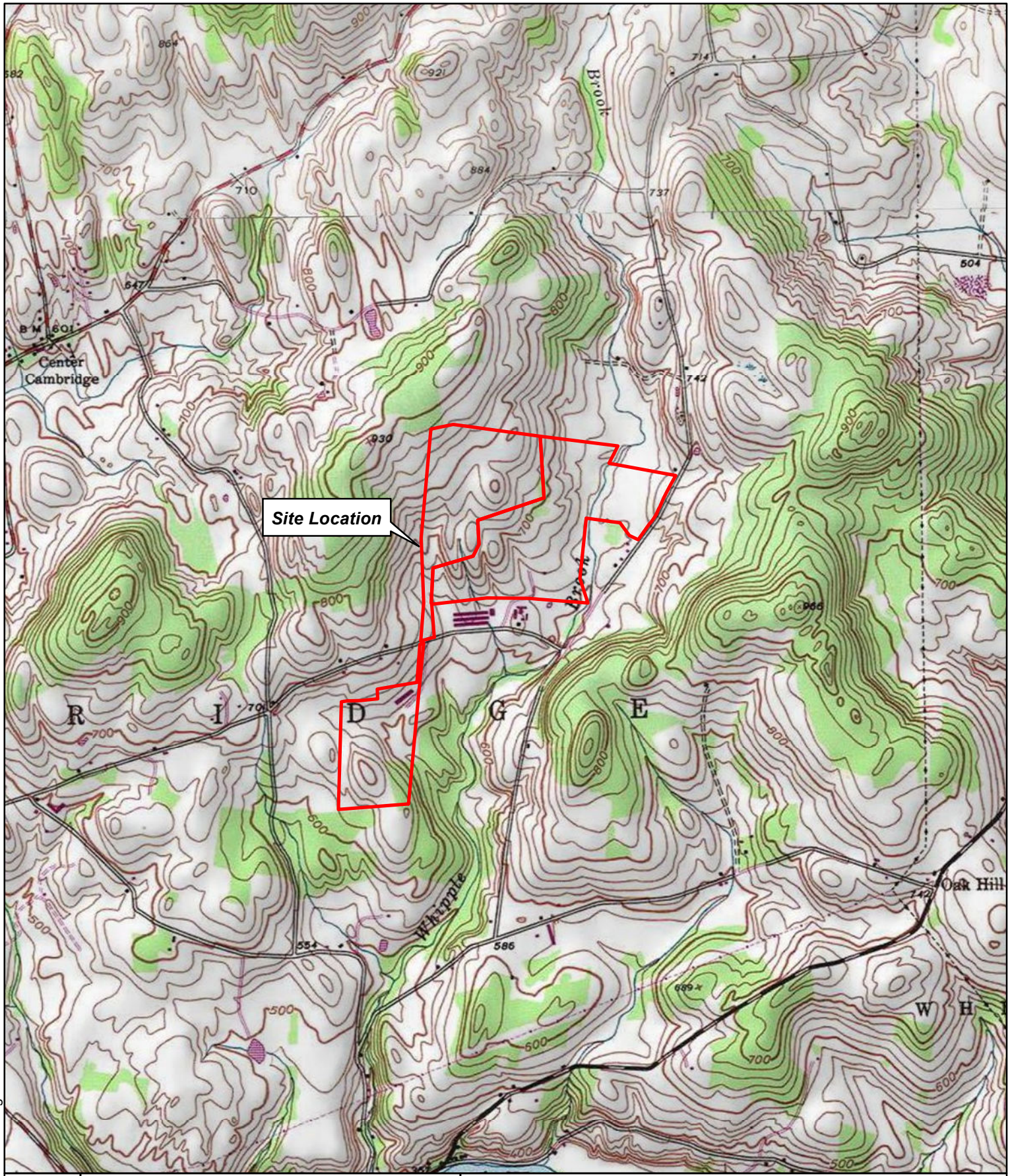
Type your route notes here

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** • *Entering Vermont*	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
16.	Arrive The last intersection is Hospital Dr	

B **Southwestern Vermont Medical Center**



N

CHA

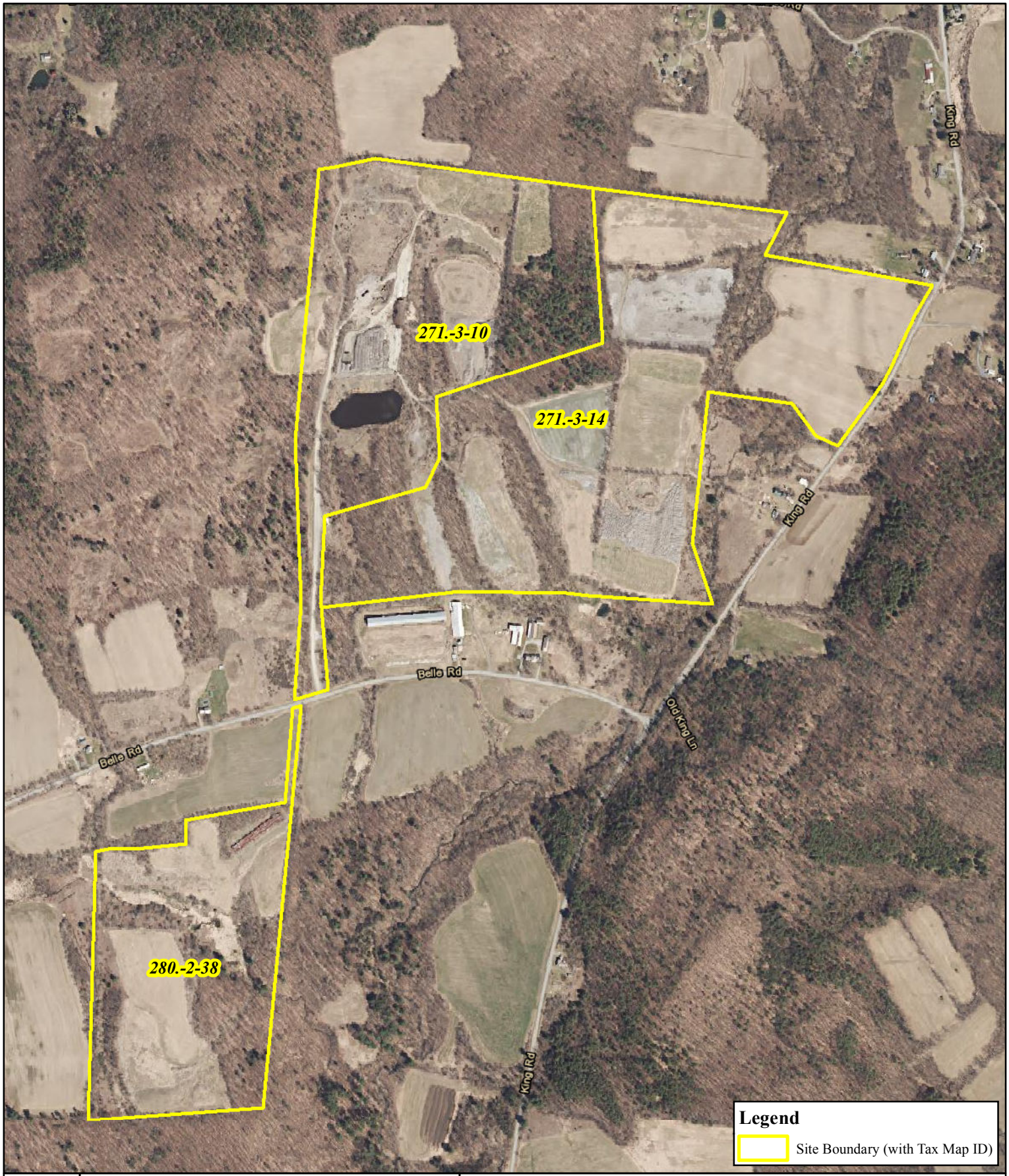
Figure 1
Site Location Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 2000'

CHA Project No. 057581

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

Date Saved: 7/21/2020 • Author: D.Bargovic



N

CHA

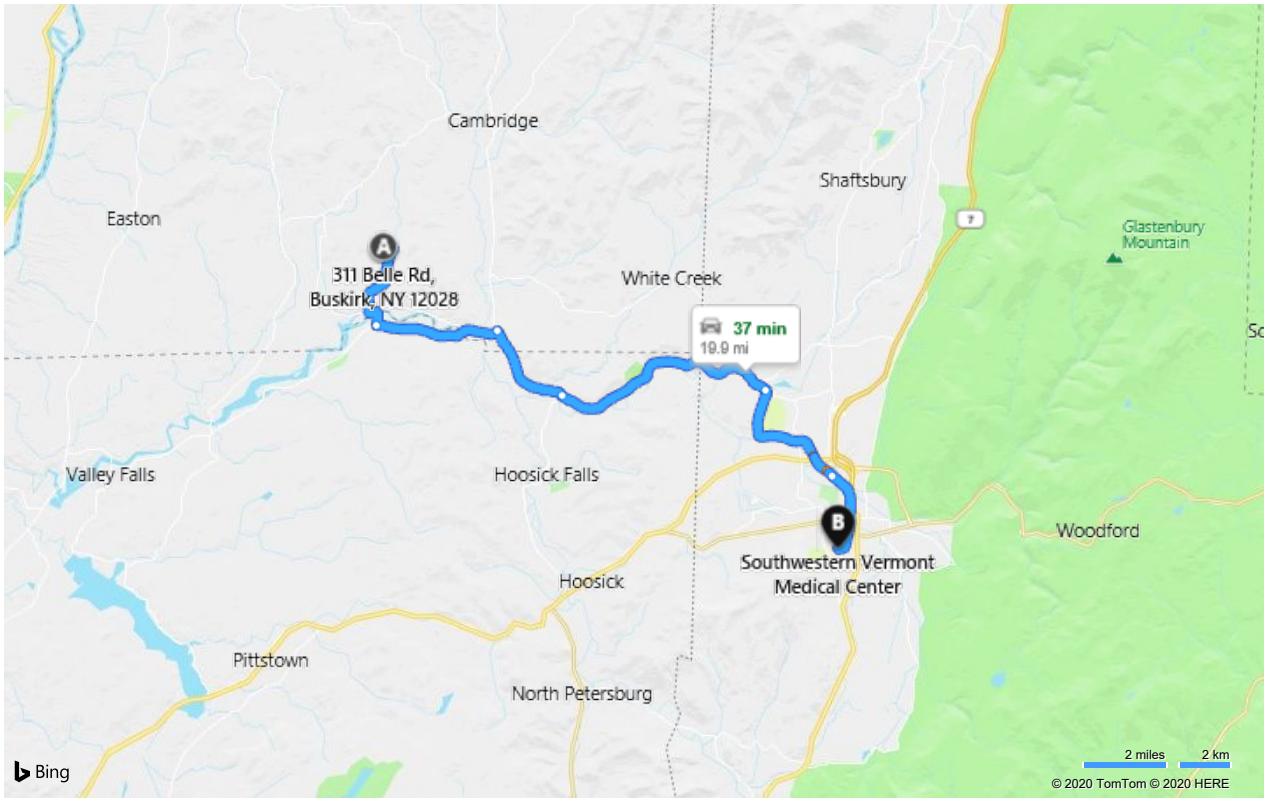
Figure 2
Site Boundary Map
CTI Agri-Cycle Composting Facility
308 & 311 Belle Road, Buskirk
Town of Cambridge, Washington County, New York

Scale 1" = 800'

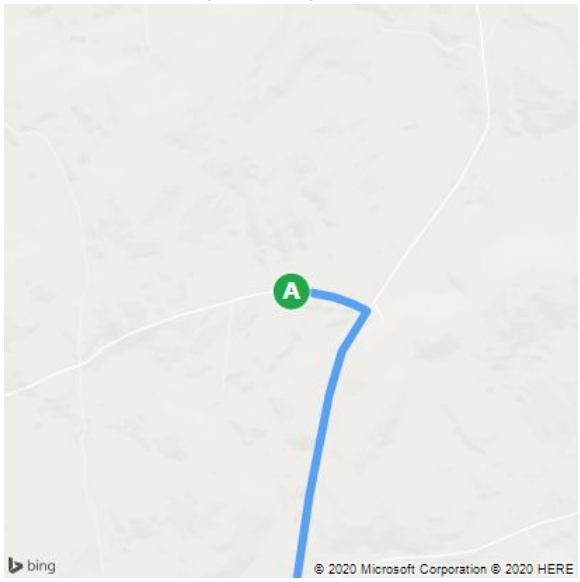
CHA Project No. 057581

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

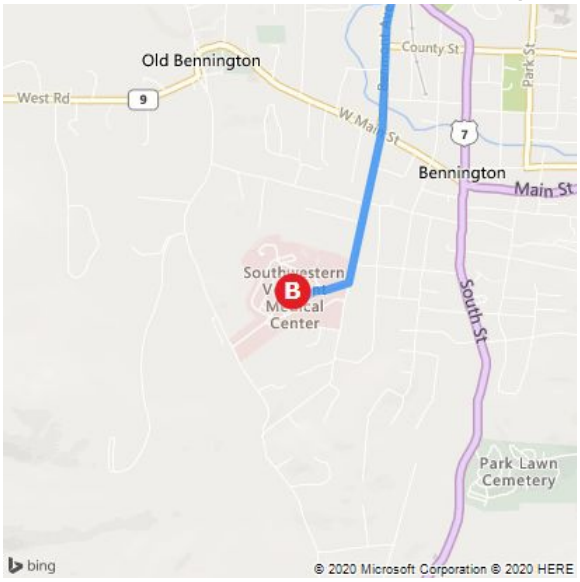
Date Saved: 7/21/2020 • Author: E.Butterfield



A **311 Belle Rd, Buskirk, NY 12028**



B **Southwestern Vermont Medical Center, 1...**



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:** *Complete a Site Health & Safety Plan per Task*	
Description of Work: *Be Specific:*			
Key Personnel: *Responsibilities:*	*Project Manager*	*Field Team Leader*	*Site Safety Officer*
Description of Hazards:			

*The Daily Jobsite Safety Brief must be completed *before* work begins daily or Scope of Work changes*

Weather: ______

All staff have reviewed and signed site and safety plan	☐Yes ☐No	All staff have proper PPE	☐Yes ☐No
Hazards and precautions have been discussed	☐Yes ☐No	Safety Controls in place	☐Yes ☐No

Additional Notes/Comments: ______

Signed: ______ **Date/Time:** ______

Signed: ______ **Date/Time:** ______

Signed: ______ **Date/Time:** ______

Weather: ______

All staff have reviewed and signed site and safety plan	☐Yes ☐No	All staff have proper PPE	☐Yes ☐No
Hazards and precautions have been discussed	☐Yes ☐No	Safety Controls in place	☐Yes ☐No

Additional Notes/Comments: ______

Signed: ______ **Date/Time:** ______

Signed: ______ **Date/Time:** ______

Signed: ______ **Date/Time:** ______

Weather: ______

All staff have reviewed and signed site and safety plan	☐Yes ☐No	All staff have proper PPE	☐Yes ☐No
Hazards and precautions have been discussed	☐Yes ☐No	Safety Controls in place	☐Yes ☐No

Additional Notes/Comments: ______

Signed: ______ **Date/Time:** ______

Signed: ______ **Date/Time:** ______

Signed: ______ **Date/Time:** ______

APPENDIX B

JHA Quick Cards

CHA Consulting, Inc.

Job Hazard Analysis

Environmental Sampling/Outdoor Hazards

Task	Hazard Type and Description	Hazard Control
Working in hot environments	Heat disorders including heat cramps, heat exhaustion, and heat stroke	Employers can control this hazard by providing heat stress training to exposed employees, providing access to shade, and allowing employees to gradually get used to hot environments. Employees working in hot environments are advised to take breaks in cool rest areas, rotate physically demanding tasks, save most demanding work for cooler times of day, and utilize the heat index chart to determine exposure risk. Be sure that every employee working in the hot environments is drinking one cup of water ever fifteen minutes. Recognize the signs such as above normal body temperature, headaches, nausea, cramping, fainting, increased heart rate, and pale as well as clammy skin
	Sunburn	The risk of sunburn is higher when working at high elevations, or when working around water (from reflection). In these conditions, you can be burned even in overcast conditions; therefore, wear protective clothing and use sunscreen
High wind events	Severe wind events can create	Employees should avoid areas

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

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

		hands where you cannot see what is on the ground (for example if you are stepping over a log and you cannot see what's on the other side). If you encounter a rattle snake do not pick it up- give it a wide berth and walk around it. If bitten, seek immediate professional medical attention and remove jewelry. If bitten on an extremity lower than the heart, cover wound with a sterile band while seeking medical attention.
	Bears	If you encounter a bear, be alert but stay calm, and give it as much room as possible. Try to leave the area, but DO NOT RUN. Back away slowly. If the bear follows, stop and hold your ground: wave your arms to make yourself look big and talk in a normal voice. Work in teams of two to deter bear attacks. If the bear makes contact, surrender: fall to the ground and play dead (a bear will break off an attack once it feels the threat has been eliminated). If the bear continues to bite after you assume a defensive posture. Their attack is predatory and you should fight back vigorously
	Mountain Lions	Be alert, calm, and do not panic. If you see a mountain lion, do not run as it may stimulate its predatory nature. Instead, shout and wave arms to let it know that you are not prey: fight back

	Tick bites	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)
	Roughskin Newts	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
	Bee stings	If you know or suspect you are allergic to bee stings, carry appropriate allergy kits prescribed by a doctor for treating anaphylactic shock. Carry and take diphenhydramine (Benadryl). Follow the label instructions for allergy control. Inform your supervisor if you suspect you are allergic. Watch for ground nests
Travel movement or work in area with poison oak or poison ivy	Allergic reaction to poison oak/poison ivy plants	Learn to recognize poison oak. Avoid contact by using ivy block and wearing long pants and long-sleeve shirts if traveling in dense areas. If skin contact is made, flush the area with cold water as soon as possible. Do not flush your skin with warm water or soap as it can open your pores and increase the reaction. To wash and rinse use Tecnu or similar product with cold water to remove oils
Encountering irrigation	Unfriendly encounters with	Do not wear uniforms and carry a

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

OSHA® QUICK CARD™

Protecting Workers from Heat Stress

Heat Illness

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

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

Risk Factors for Heat Illness

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

Symptoms of Heat Exhaustion

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

Symptoms of Heat Stroke

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

To Prevent Heat Illness, Your Employer Should

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

U.S. Department of Labor

For more information:

OSHA® Occupational Safety and Health Administration

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

OSHA 3154-06R 2014

OSHA® QUICK CARD™

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

How You Can Protect Yourself and Others

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

What to Do When a Worker is Ill from the Heat

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

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

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

U.S. Department of Labor

For more information:

OSHA® Occupational Safety and Health Administration

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

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 *(provide address, if available)*

List the Nature of the Employee's Injury & Body Parts Affected (Indicate whether a similar work-related injury has occurred in the past)**:**

Explain What the Employee Was Doing When the Incident Occurred:

Describe How the Incident Occurred:

List any Applicable Objects That Were Directly Involved in the Injury *(i.e. motor vehicle, etc):*

Did the Employee Stop Work Due to the Injury?	If Yes, Has the Employee Returned to Work?

Medical Treatment *(if known)*

Did the Employee Seek Medical Treatment?	Date of First Medical Treatment	Location of Treatment *(provide address, if available)*	Type of Facility *(i.e. emergency room, hospital, urgent care, doctor's office)*	What Type of Treatment

Acknowledgment

Employee Signature:	Date:

Supervisor (or Witness) Name (Printed):	Supervisor (or Witness) Signature:

RETURN COMPLETED FORM TO MEGAN ROBERTSON IN HUMAN RESOURCES

PHONE NUMBER - (518) 453-8750

FAX NUMBER – (518) 453-2889

E-MAIL ADDRESS – MROBERTSON@CHACOMPANIES.COM

cc: Health & Safety
M. Platt

CHA (Your Location) Office

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

1) **<u>If any injury occurs, no matter how minor:</u>**

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

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

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

2) **<u>For any accident, incident, safety hazard or near miss (no injury occurs)</u>**

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

'Report' means phone, leave voicemail or email as appropriate.

Megan Robertson (Director of HR Operations)	1-518-453-8750 – Office phone 1-518-453-2889 – Fax <u>mrobertson@chacompanies.com</u>	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 <u>mrudzinski@chacompanies.com</u>	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 ($\mu g/m^3$) 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 µg/m³ 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 µg/m³, 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 µg/m³, 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.