Confirmation Investigation Work Plan

Tonawanda Coke Corporation

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GHD | 651 Colby Drive Waterloo Ontario N2V 1C2

002428 | Report No 21 | August 18 2016

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1. Introduction

Pursuant to the Order on Consent and Administrative Settlement (Index # B9-85-02-77B) entered into between Tonawanda Coke Corporation ("TCC") and the New York State Department of Environmental Conservation ("NYSDEC") for the parcel located at 3800 River Road, Tonawanda, New York, NYSDEC and TCC have agreed that additional sampling be performed at Operable Unit 3 – Site 108 ("Site 108" or the "Site") prior to finalizing the Focused Feasibility Study ("FFS") that was submitted to the NYSDEC on October 16, 2015. The need for additional investigations was further documented in a May 4, 2016 letter from NYSDEC to TCC's outside counsel.

The primary focus of the requested sampling is to provide further insight into:

- The soil conditions around the former tank farm.
- The contents of the three on-Site aboveground storage tanks.
- The sediment quality in the upstream area of the Niagara River embayment, as well as in the middle of the embayment.
- The sediment quality in the on-Site ditch.
- The soil quality beneath the coal / coke / breeze area near the Niagara River that is planned for removal.
- The soil quality on and below the surface of the Site.

This Confirmation Investigation Work Plan provides the details of the sampling planned to confirm the conditions on the Site to support the finalization of the Focused Feasibility Study. This Work Plan has been prepared in accordance with the NYSDEC document DER-10, "Technical Guidance for Site Investigation and Remediation," dated May 2010 (DER-10).

The Confirmation Investigation Work Plan is organized as follows:

- Section 1 - Introduction: The introduction presents an overview of the work proposed for the project.
- Section 2 - Site Background and History: Descriptions of the Site location, physical conditions, and current and historic use.
- Section 3 - Objective: Definition of the objective for the work to be conducted.
- Section 4 - Proposed Site Investigation: The Work Plan for the proposed investigation.
- Section 5 - Schedule: Preliminary project schedule.

The Health and Safety Plan (HASP), and Quality Assurance Project Plan (QAPP), for the planned work are provided as Appendices A and B, respectively, to this Work Plan.

2. Site Background

The TCC Plant, which is located at 3875 River Road in Tonawanda, New York, was owned and operated from 1917 through 1947 by Semet-Solvay Company, a subsidiary of Allied Chemical and Dye Corporation. In 1947, Semet-Solvay Company was merged into Allied Chemical Corporation, which owned and operated the plant until January 27, 1978, when it was sold to TCC.

Since 1917, manufacturing processes used at the plant included: by-products coking; light oil distillation; ammonia recovery; and benzene, toluene, and xylene extraction. Prior to TCC's acquisition of the property in 1978, a few areas of the site were historically used for the disposal of wastes. In 1973, the Semet-Solvay Division was granted permission by the Erie County Health Department to establish a new refuse disposal area located at 3800 River Road, Tonawanda, New York (now referred to as Site 108). This Site was eventually filled with refuse, wood, scrap polyethylene, and ceramic saddle packing from refining equipment. Site 108 is located on the west side of River Road, and extends to the Niagara River, as shown on Figure 2.1. Site 108 is heavily overgrown with mature trees, shrubs, and tall grasses. There are no occupied buildings on Site 108. TCC does have one building still in use that houses certain electrical equipment and pumps tied to facility operations.

Site 108 also includes a former tank farm consisting of the shells of three large above ground storage tanks, each 40 to 50 feet in diameter. The tanks have not been used since TCC purchased the Site from Allied Chemical. In addition, prior operations at Site 108 included the unloading of coke, coal, and coal tar that was delivered by boat. The coal was transported to the facility's main operation by underground conveyor and/or piping systems. Similar to the former tank farm, these operations ceased prior to the Site's acquisition.

3. Objective

The primary objective of the Confirmation Sampling Program is to gather the data necessary to complete the characterization of the Site conditions to finalize the Focused Feasibility Study. The proposed investigation will be focused in specific areas where there is still some uncertainty of the chemical concentrations associated with historic use of the Site. Upon completion of the investigation, the Focused Feasibility Study will be re-examined to determine whether any changes are appropriate, with a final revised version to be submitted to the agency by November 30, 2016.

4. Proposed Investigation Activities

The proposed investigation activities include surface and subsurface soil sampling, surface and subsurface sediment sampling, the excavation of test trenches, and visual observations.

4.1 Tank Farm Area Soil Conditions

The former tank farm area will be investigated to determine the conditions in the soil around the tanks. The investigation will be performed using a backhoe to excavate trenches around the

perimeter of the tanks at the 8 locations shown on Figure 4.1. These initial test trenches will be located about 10 feet from the edge of the tank. Each test trench will be on the order of approximately 10 feet in length, and will extend to a depth that at least intercepts the groundwater table, unless such depth compromises the integrity of the adjacent tanks. The primary intent of the test trenches is to be able to delineate the extent of tar and/or visually impacted soil presence, if any exists.

The exposed faces and base of the excavations will be visually examined to delineate the presence of tar and/or impacted soil, if any. The observations will be logged and photographed. If tar or other heavily impacted soil presence from the tanks is encountered, additional test trenches will be excavated at a further distance from the tanks. These additional test trenches will be limited to the minimum amount necessary to attempt to delineate the areal extent of such material in preparation for the tank remediation that will follow. The material encountered in the test trenches will also be scanned with a photoionization unit (PID) and the readings will be recorded in the field notes.

At each location, if no tar or visibly impacted soil is present, only a representative sample of the non-impacted soil will be collected for Target Compound List (TCL) Semi Volatile Organic Compounds ("SVOC") analysis. If tar and/or visually impacted material are identified, a sample will be taken for TCL SVOC analysis, as well as a sample of soil from the soil one foot below the tar or visibly impacted soil.

The excavated material will be placed on polyethylene sheeting adjacent to the excavation. Tar, non-aqueous phase liquid ("NAPL"), and other grossly impacted soil material will be separately stockpiled during the excavation process. For the purposes of this Work Plan, such material will be disposed off-site consistent with the requirements of DER-10. Non-impacted material placed on polyethylene sheeting shall separately be returned to the excavation in the reverse order from which it was removed upon completion of the test trench.

At the present time, the dikes that surround the former tank farm retain precipitation within the bermed areas. The water within the enclosed dike areas has been sampled and confirmed to meet surface water discharge quality criteria (with the possible exception of trace levels (up to 16 ppt) of alpha-BHC and gamma-BHC in one sample). The test results from the surface water samples collected from within the dike areas on May 25, 2016 are presented in Table 4.1. The dike area will be allowed to dry out as much as possible prior to initiating the test trench program.

Prior to excavating the test trenches, the water within the dikes will be pumped over the dike and carefully discharged onto the surrounding ground surface in a manner that promotes infiltration into the surrounding soil. The pump intake will be contained within a filtered control area that is designed to minimize sediment uptake into the pumped water. Upon completion of the dewatering of the diked areas, a backhoe will be used to remove portions of the dike walls to allow the enclosed areas to freely drain to the surrounding areas in the future, so long as the dikes are not necessary for secondary containment of the tanks. This determination will be made in consultation with the NYSDEC.

4.2 Tank Content Investigation

The three above-ground tanks on Site 108 have never been used by TCC, so the contents of the tanks are unknown. To prepare for the planned demolition of the tanks, TCC plans to access the tanks and inspect them. The inspection will be conducted in two parts as follows:

- **Step 1)** Observation of the tank material construction and integrity

  The tanks will be visually inspected to determine their condition and accessibility. To the extent that access to the inside of the tanks can be performed easily and safely, the inspection will proceed to Step 2. Otherwise, Step 2 will be performed at a later date in conjunction with the tank demolition program when the manpower requirements, accessibility, and safety requirements can be more effectively met.

- **Step 2)**
  - Observation for the presence of liquid within the tank
  - Measurement of the depth of liquids, if present
  - Measurement of the thickness of tar, if present
  - Measurement of the thickness of solids, if present
  - Determination of the tank bottom condition, if possible

Access into each tank, and inspection within the tank, will follow proper tank work procedures, with particular attention to health and safety aspects.

If any liquid, tar and/or other solid material is present in the tank, individual samples will be collected and analyzed for TCL SVOCs.

This investigation work is being done in conjunction with Order on Consent and Administrative Settlement, Index # B9-85-02-77B, and any sampling or related activities in no circumstance represent an intent by TCC to actively manage any of the materials inside the tanks.

4.3 Embayment Sediment Sampling

A series of samples were collected from the embayment area of the Niagara River in 2009. The locations where samples were collected during that event are presented in Figure 4.2. Sediment samples will be collected from eight new locations. Samples from these eight locations will be collected at the following depths: 0 to 0.5 feet; 1.5 to 2 feet; and 2.5 to 3 feet. These eight new sampling locations are also presented on Figure 4.2.

These samples will be collected with a split spoon sampler (or equivalent) that is hand driven or vibrated to depth. The sampling team will consist of at least two sampling technicians and one shore attendant. The sampling will only be performed during calm water conditions and all applicable health and safety procedures will be strictly followed.

Three of the sediment samples will be analyzed for a full suite of parameters, including TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL metals (plus cyanide), and Total Organic Carbon. The

remainder of the samples will only be analyzed for TCL SVOCs, TAL metals, and Total Organic Carbon.

4.4 On-Site Ditch Sediment Sampling

Samples of the sediment in the on-Site ditch have historically been collected at the two locations shown on Figure 4.3. To further understand the conditions in the on-Site ditch, eight additional ditch sampling locations have been selected for sediment sample collection. Five of the sample locations are within the wet/ponded areas and the remaining three samples are located in the ditch itself. At each location, two samples will be collected. The first sample will be collected from the 0 to 0.5 feet interval and the second from a depth of 1 to 1.5 feet. In some areas, it may not be possible to collect the samples due to hard base surfaces. At those locations, the sampling location can be field relocated to a nearby area such that at least the upper 0 to 0.5 feet sample can be collected.

Each upper sample will be collected with a clean trowel. The deeper sample will be collected by carefully displacing the upper one foot of soil to expose the underlying sediment. A split spoon sampler (or equivalent) will then be used to collect the sample from a depth of 1 to 1.5 feet. Two of the samples will be analyzed for the full suite of parameters including TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL metals (plus cyanide), and Total Organic Carbon. The remainder of the samples will only be analyzed for TCL SVOCs, TAL metals, and Total Organic Carbon.

4.5 Soil Sampling

In order to provide additional information concerning the chemical concentrations that exist on the ground surface and in the subsurface areas, it is planned to collect some additional soil samples.

The area planned for removal of the coal / coke / breeze is shown on Figure 4.4. In order to determine the quality of the soil that will be left in place following removal of the coal / coke / breeze, a backhoe will be used to penetrate through the coal / coke / breeze material at four locations to the top of the underlying soil layer. A sample of the upper six inches of the underlying soil layer will be collected with a clean trowel at each location. The proposed subsurface sampling locations are presented in Figure 4.4. The samples will be analyzed for TCL SVOCs, TAL metals, and Total Organic Carbon. During the excavation, the excavated material will be placed onto a sheet of polyethylene and then returned to the excavation in the reverse order from which it was removed. The results of these samples will provide an indication of the soil quality that will remain after the coal / coke / breeze removal has been completed. It will also provide information on whether a cover will be needed over the underlying soil after the coal / coke / breeze has been removed.

In addition to the subsurface sampling locations, surface and subsurface soil samples will be collected from 15 additional sampling locations to provide further documentation on the soil quality on the Site. The proposed surface/subsurface soil sampling locations are also presented in Figure 4.4. The surface soil samples will be collected with a clean trowel from the upper two inches of soil immediately under any vegetation that is present. Two of the samples will be analyzed for a full suite of parameters, including TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL metals (plus cyanide), and Total Organic Carbon. The remainder of the surface soil samples will only be analyzed for TCL SVOCs, TAL metals, and Total Organic Carbon. At each surface soil sampling location, test pits will also be excavated to examine the soil conditions at depth. The excavations

will extend to the depth of native soils or to the maximum reasonable depth of the backhoe's reach or to two feet below the water table, whichever is least. The soils encountered will be examined and recorded (including PID readings). Once all of the test pits have been excavated, 15 individual samples of the types of materials encountered in the test pits will be collected for chemical analysis. The samples will be selected based on discussion between the GHD and NYSDEC field representatives. Two of the collected samples will be analyzed for a full suite of parameters including TCL VOCs, TCL SVOCs, TCL pesticides, PCBs, TAL metals (plus cyanide), and Total Organic Carbon. The remainder of the samples will only be analyzed for TCL SVOCs, TAL metals, and Total Organic Carbon.

The excavated material will be placed on polyethylene sheeting adjacent to the excavation. Tar, NAPL, and other grossly impacted soil material will be separately stockpiled during the excavation process. For the purposes of this Work Plan, such material will be disposed off-site consistent with the requirements of DER-10. Non-impacted material placed on polyethylene sheeting shall separately be returned to the excavation in the reverse order from which it was removed upon completion of the test pit. It is noted that the sample locations shown on Figure 4.4 are approximate and that the actual locations may be relocated to fit the field conditions encountered.

4.6 Analytical Sample Collection

Soil and sediment samples will be collected, as described in the previous sections, and summarized on Table 4.2.

Sample bottles and preservation requirements are detailed in the Quality Assurance Project Plan (QAPP). Samples will be placed on ice in laboratory-supplied coolers immediately after collection and labeling. Samples will be delivered to the laboratory by courier under approved Chain of Custody procedures.

A unique sample numbering system will be used to identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. The sample numbering system to be used is described as follows:

Example:	SO-02428-mmddyy-XXX
Where:	SO: Designates Sample Type (SO = Soil)
02428:	GHD Project Number
mmddyy:	Date of Collection (e.g., 08/04/14)
XXX:	Unique Sample Number

Quality control (QC) samples will also be numbered with a unique sample number.

4.7 Waste Management

All wastes that are generated during the investigation will be stored, transported, and disposed in accordance with applicable state and federal regulations. Every effort will be made to minimize the amount of waste for disposal. It is anticipated that the following wastes will be generated during the investigation:

Decontamination Fluids

The first step in cleaning sampling equipment will involve scraping all adhering soil from the sampling tool. If necessary, decontamination water will be generated during sampling activities to ensure equipment is free of potential contaminants between sample locations. Decontamination water from sampling tools will be collected and handled in accordance with proper waste management procedures.

If it is not possible to completely scrub the sampling equipment clean, then other decontamination fluids can be used. Such fluids will be contained and handled in accordance with applicable regulations. As an alternative to cleaning, disposable sampling equipment can be used at each individual location.

The backhoe bucket will be cleaned by scraping any adhering soil back into the excavation from which it came. If it is necessary to clean the bucket with water (as will be required following the final test trench/pit), the wash water will be allowed to drain back into the excavation that exhibited the most tar / visibly impacted soil.

Personal Protection Equipment

Personal protection equipment (PPE) will be generated during implementation of the field activities. PPE will be placed into DOT approved 55-gallon open top drums for storage prior to appropriate off-Site disposal as non-hazardous waste. Domestic waste will be discarded in the appropriate on-Site municipal waste dumpster.

4.8 Investigation Report

Following completion of the investigation activities, an Investigation Report will be prepared presenting the results. The Report will include all background information, the analytical and testing data collected during the investigation, and an evaluation of the current Site conditions. Data will be presented in both tabulated and graphic forms.

5. Schedule

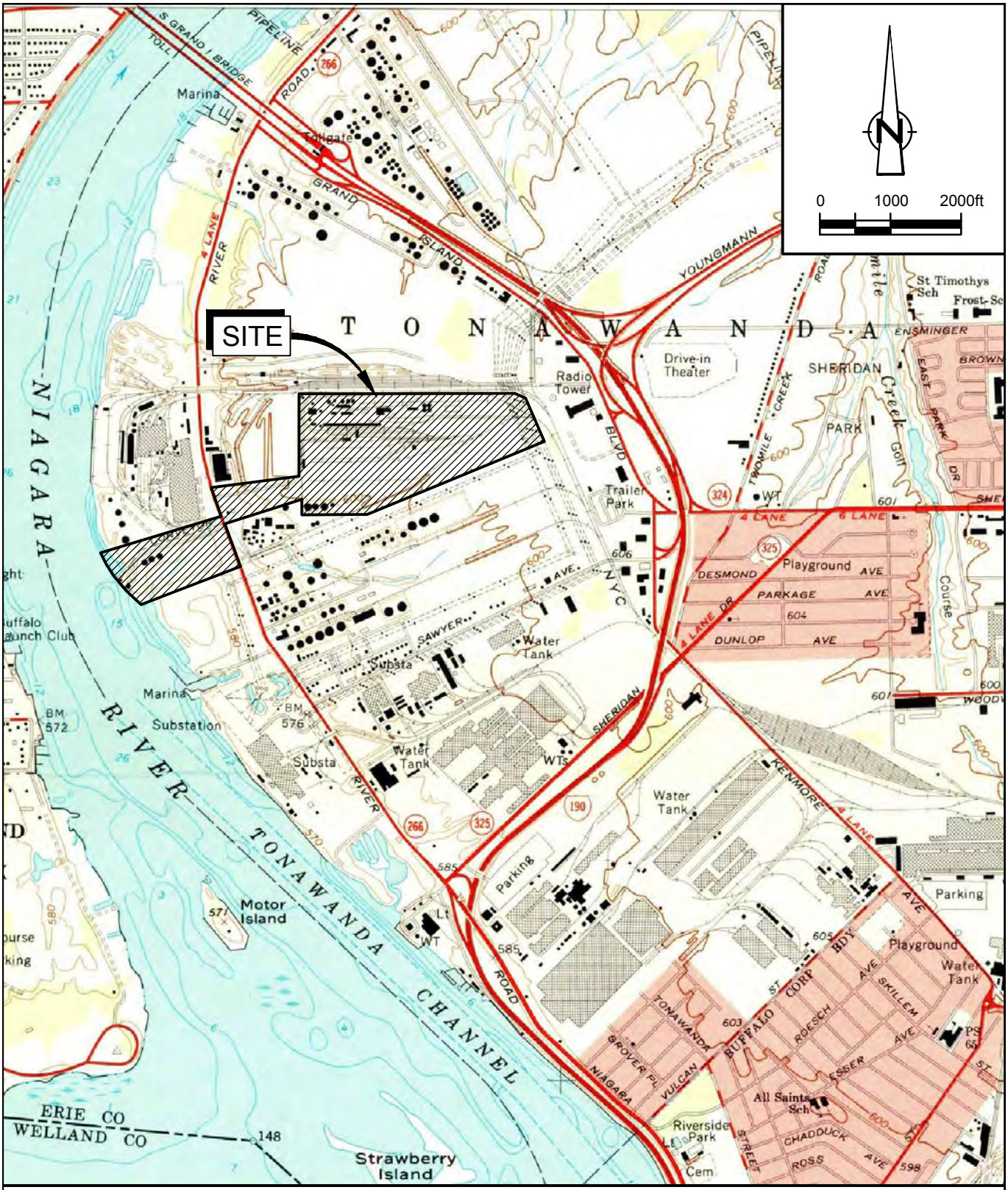
The preliminary project schedule for the Investigation is as follows:

- July 29, 2016 — Submittal of Work Plan to NYSDEC (resubmitted on Aug 19)
- July 29 to Aug 18 — Review of Work Plan by NYSDEC and meeting with TCC to discuss scope
- Aug 19 — NYSDEC approval of Work Plan
- Aug 16 to 26 — Preparations for implementation of sampling plan
- Aug 29 to Sept 2 — Sample collection
- Sept 3 to 21 — Sample analyses
- Sept 22 to 23 — Data validation

- Sept 26 to Oct 14 Report preparation
- Oct 14 Report submission to NYSDEC
- Oct 28 Meeting between NYSDEC and TCC to discuss the results prior to submission of the revised FFS
- Nov 30 Submittal of Final FFS

6. References

NYSDEC, 2010. DER-10 Technical Guidance for Site Investigation and Remediation, New York State Department of Environmental Conservation, May 2010

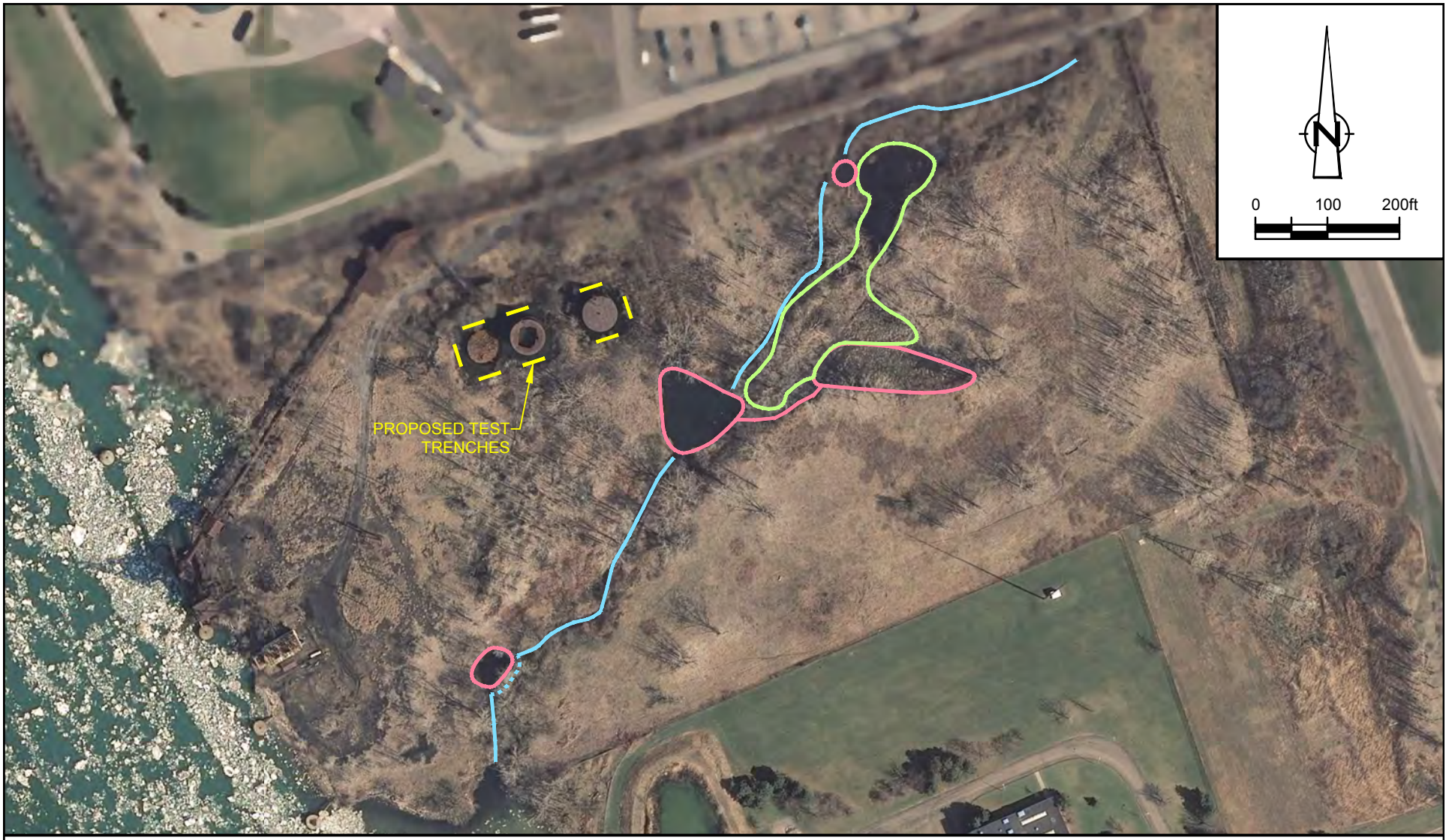


SOURCE: USGS QUADRANGLE MAP:
BUFFALO NW, NEW YOR:

figure 2.1

SITE LOCATION

Tonawanda Coke



LEGEND

WET AREA

DITCH

PONDED AREA

GHD

figure 4.1

PROPOSED TEST TRENCH LOCATIONS

Tonawanda Coke

02428-05(021)GN-WA002 AUG 1□, 2016

figure 4.2

PROPOSED EMBAYMENT
SEDIMENT SAMPLING LOCATIONS
Tonawanda Coke

02428-05(021)GN-WA003 AUG 15, 2016

LEGEND

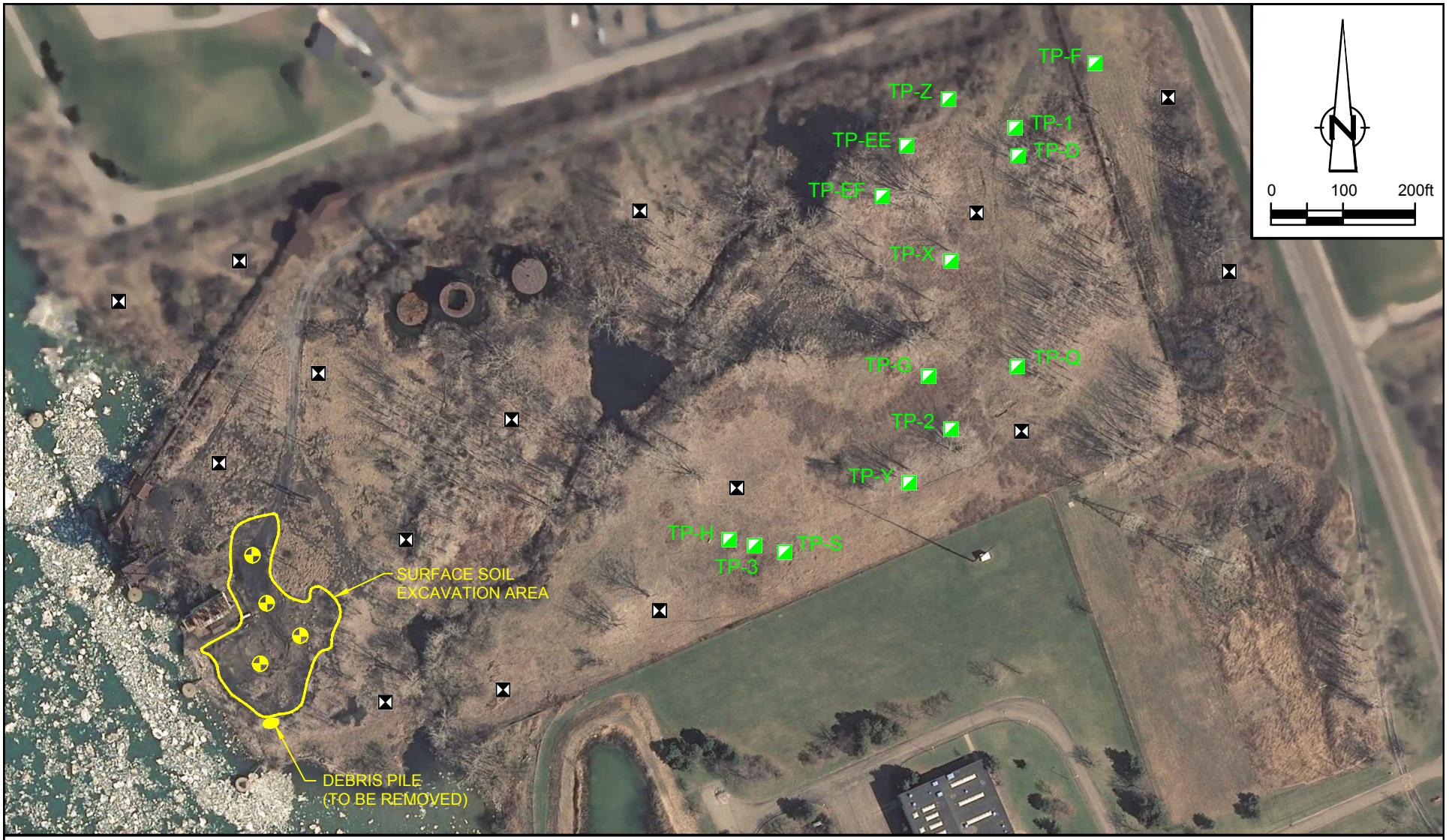
- WET AREA
- PONDED AREA
- DITCH
- PROPOSED SEDIMENT SAMPING LOCATION
- HISTORIC SEDIMENT SAMPING LOCATION

figure 4.3

PROPOSED DITCH SEDIMENT SAMPLING LOCATIONS

Tonawanda Coke

02428-05(021)GN-WA004 AUG 1□, 2016



LEGEND

- SUBSURFACE SAMPLING LOCATION
- SURFACE SAMPLING / TEST PIT LOCATION
- HISTORIC TEST PIT LOCATION

figure 4.4

SOIL SAMPLING LOCATIONS

Tonawanda Coke

02428-05(021)GN-WA005 AUG 19, 2016

Table 4.1

Water Sample Results – Tank Farm Area
Tonawanda Coke Corporation
Tonawanda, NY

	Location ID:	East Bermed Location	West Bermed Location
	Sample Name:	WS-2428-052516-DT-002	WS-2428-052516-DT-001
	Sample Date:	05/25/2016	05/25/2016
Parameters	**Unit**		
Volatile Organic Compounds			
1,1,1-Trichloroethane	µg/L	5.0 U	5.0 U
1,1,2,2-Tetrachloroethane	µg/L	5.0 U	5.0 U
1,1,2-Trichloroethane	µg/L	5.0 U	5.0 U
1,1-Dichloroethane	µg/L	5.0 U	5.0 U
1,1-Dichloroethene	µg/L	5.0 U	5.0 U
1,2-Dichloroethane	µg/L	5.0 U	5.0 U
1,2-Dichloroethene (total)	µg/L	10 U	10 U
1,2-Dichloropropane	µg/L	5.0 U	5.0 U
2-Chloroethyl vinyl ether	µg/L	25 U	25 U
Acrolein	µg/L	100 U	100 U
Acrylonitrile	µg/L	50 U	50 U
Benzene	µg/L	5.0 U	5.0 U
Bromodichloromethane	µg/L	5.0 U	5.0 U
Bromoform	µg/L	5.0 U	5.0 U
Bromomethane (Methyl bromide)	µg/L	5.0 U	5.0 U
Carbon tetrachloride	µg/L	5.0 U	5.0 U
Chlorobenzene	µg/L	5.0 U	5.0 U
Chloroethane	µg/L	5.0 U	5.0 U
Chloroform (Trichloromethane)	µg/L	5.0 U	5.0 U
Chloromethane (Methyl chloride)	µg/L	5.0 U	5.0 U
cis-1,3-Dichloropropene	µg/L	5.0 U	5.0 U
Dibromochloromethane	µg/L	5.0 U	5.0 U
Ethylbenzene	µg/L	5.0 U	5.0 U
Methylene chloride	µg/L	5.0 U	5.0 U
Tetrachloroethene	µg/L	5.0 U	5.0 U
Toluene	µg/L	5.0 U	5.0 U
trans-1,3-Dichloropropene	µg/L	5.0 U	5.0 U
Trichloroethene	µg/L	5.0 U	5.0 U
Vinyl chloride	µg/L	5.0 U	5.0 U
Semivolatile Organic Compounds			
1,2,4-Trichlorobenzene	µg/L	9.6 U	9.5 U
1,2-Dichlorobenzene	µg/L	9.6 U	9.5 U
1,2-Diphenylhydrazine	µg/L	9.6 U	9.5 U
1,3-Dichlorobenzene	µg/L	9.6 U	9.5 U
1,4-Dichlorobenzene	µg/L	9.6 U	9.5 U
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	µg/L	4.8 U	4.7 U
2,4,6-Trichlorophenol	µg/L	4.8 U	4.7 U
2,4-Dichlorophenol	µg/L	4.8 U	4.7 U
2,4-Dimethylphenol	µg/L	4.8 U	4.7 U
2,4-Dinitrophenol	µg/L	9.6 U	9.5 U
2,4-Dinitrotoluene	µg/L	9.6 U	9.5 U
2,6-Dinitrotoluene	µg/L	4.8 U	4.7 U
2-Chloronaphthalene	µg/L	4.8 U	4.7 U
2-Chlorophenol	µg/L	4.8 U	4.7 U
2-Nitrophenol	µg/L	4.8 U	4.7 U
3,3'-Dichlorobenzidine	µg/L	4.8 U	4.7 U
4,6-Dinitro-2-methylphenol	µg/L	9.6 U	9.5 U
4-Bromophenyl phenyl ether	µg/L	4.8 U	4.7 U
4-Chloro-3-methylphenol	µg/L	4.8 U	4.7 U
4-Chlorophenyl phenyl ether	µg/L	4.8 U	4.7 U
4-Nitrophenol	µg/L	14 U	14 U
Acenaphthene	µg/L	4.8 U	4.7 U
Acenaphthylene	µg/L	4.8 U	4.7 U

Table 4.1

Water Sample Results – Tank Farm Area
Tonawanda Coke Corporation
Tonawanda, NY

	Location ID:	East Bermed Location	West Bermed Location
	Sample Name:	WS-2428-052516-DT-002	WS-2428-052516-DT-001
	Sample Date:	05/25/2016	05/25/2016
Parameters	**Unit**		
Semivolatile Organic Compounds (continued)			
Anthracene	µg/L	4.8 U	4.7 U
Benzidine	µg/L	77 U	76 U
Benzo(a)anthracene	µg/L	4.8 U	4.7 U
Benzo(a)pyrene	µg/L	4.8 U	4.7 U
Benzo(b)fluoranthene	µg/L	4.8 U	4.7 U
Benzo(g,h,i)perylene	µg/L	4.8 U	4.7 U
Benzo(k)fluoranthene	µg/L	4.8 U	4.7 U
bis(2-Chloroethoxy)methane	µg/L	4.8 U	4.7 U
bis(2-Chloroethyl)ether	µg/L	4.8 U	4.7 U
bis(2-Ethylhexyl)phthalate (DEHP)	µg/L	9.6 U	9.5 U
Butyl benzylphthalate (BBP)	µg/L	4.8 U	4.7 U
Chrysene	µg/L	4.8 U	4.7 U
Di-n-butylphthalate (DBP)	µg/L	4.8 U	4.7 U
Di-n-octyl phthalate (DnOP)	µg/L	4.8 U	4.7 U
Dibenz(a,h)anthracene	µg/L	4.8 U	4.7 U
Diethyl phthalate	µg/L	4.8 U	4.7 U
Dimethyl phthalate	µg/L	4.8 U	4.7 U
Fluoranthene	µg/L	4.8 U	4.7 U
Fluorene	µg/L	4.8 U	4.7 U
Hexachlorobenzene	µg/L	4.8 U	4.7 U
Hexachlorobutadiene	µg/L	4.8 U	4.7 U
Hexachlorocyclopentadiene	µg/L	9.6 U	9.5 U
Hexachloroethane	µg/L	4.8 U	4.7 U
Indeno(1,2,3-cd)pyrene	µg/L	4.8 U	4.7 U
Isophorone	µg/L	4.8 U	4.7 U
N-Nitrosodi-n-propylamine	µg/L	4.8 U	4.7 U
N-Nitrosodimethylamine	µg/L	9.6 U	9.5 U
N-Nitrosodiphenylamine	µg/L	4.8 U	4.7 U
Naphthalene	µg/L	4.8 U	4.7 U
Nitrobenzene	µg/L	4.8 U	4.7 U
Pentachlorophenol	µg/L	9.6 U	9.5 U
Phenanthrene	µg/L	4.8 U	4.7 U
Phenol	µg/L	4.8 U	4.7 U
Pyrene	µg/L	4.8 U	4.7 U
Pesticides/PCBs			
4,4'-DDD	µg/L	0.047 U	0.049 U
4,4'-DDE	µg/L	0.047 U	0.049 U
4,4'-DDT	µg/L	0.047 U	0.049 U
Aldrin	µg/L	0.047 U	0.049 U
alpha-BHC	µg/L	0.015 JB	0.049 U
Aroclor-1016 (PCB-1016)	µg/L	0.057 U	0.057 U
Aroclor-1221 (PCB-1221)	µg/L	0.057 U	0.057 U
Aroclor-1232 (PCB-1232)	µg/L	0.057 U	0.057 U
Aroclor-1242 (PCB-1242)	µg/L	0.057 U	0.057 U
Aroclor-1248 (PCB-1248)	µg/L	0.057 U	0.057 U
Aroclor-1254 (PCB-1254)	µg/L	0.057 U	0.057 U
Aroclor-1260 (PCB-1260)	µg/L	0.057 U	0.057 U
beta-BHC	µg/L	0.047 U	0.049 U
Chlordane	µg/L	0.47 U	0.49 U
delta-BHC	µg/L	0.047 U	0.049 U
Dieldrin	µg/L	0.047 U	0.049 U
Endosulfan I	µg/L	0.047 U	0.049 U
Endosulfan II	µg/L	0.047 U	0.049 U

Table 4.1

Water Sample Results – Tank Farm Area
Tonawanda Coke Corporation
Tonawanda, NY

	Location ID:	East Bermed Location	West Bermed Location
	Sample Name:	WS-2428-052516-DT-002	WS-2428-052516-DT-001
	Sample Date:	05/25/2016	05/25/2016
Parameters	**Unit**		
Pesticides/PCBs (continued)			
Endosulfan sulfate	µg/L	0.047 U	0.049 U
Endrin	µg/L	0.047 U	0.049 U
Endrin aldehyde	µg/L	0.047 U	0.049 U
gamma-BHC (lindane)	µg/L	0.016 J	0.049 U
Heptachlor	µg/L	0.047 U	0.049 U
Heptachlor epoxide	µg/L	0.047 U	0.049 U
Toxaphene	µg/L	0.47 U	0.49 U
Metals			
Antimony	mg/L	0.020 U	0.020 U
Arsenic	mg/L	0.015 U	0.015 U
Beryllium	mg/L	0.0020 U	0.0020 U
Cadmium	mg/L	0.0020 U	0.0020 U
Chromium	mg/L	0.0040 U	0.0040 U
Copper	mg/L	0.034	0.0017 J
Lead	mg/L	0.010 U	0.010 U
Mercury	mg/L	0.00020 U	0.00020 U
Nickel	mg/L	0.010 U	0.0016 J
Selenium	mg/L	0.025 U	0.025 U
Silver	mg/L	0.0060 U	0.0060 U
Thallium	mg/L	0.020 U	0.020 U
Zinc	mg/L	0.012	0.0042 J
General Chemistry			
Cyanide (total)	mg/L	0.010 U	0.0051 J
Cyanide (free)	µg/L	5.0 U	5.0 U

Notes:

U - Not detected at the associated reporting limit.
J - Estimated Concentration.
B - Also detected in laboratory blank.

Table 4.2

Proposed Sampling Suummary
Tonawanda Coke Corporation
Tonawanda, NY

Sample Location	Number of Samples	Analysis
Tank Farm - Tar	up to 8	SVOC
Tank Farm - Impacted Soil	up to 8	SVOC
Tank Farm - Unimpacted Soil	8	SVOC
Tanks - Tar	up to 3	SVOC
Tanks - Liquid	up to 3	SVOC
Tanks - Solids	up to 3	SVOC
Embayment Sediment	21	SVOC, TOC, Metals
Embayment Sediment	3	SVOC, VOC, Metals, PCB, Pesticides, TOC
Ditch Sediment	14	SVOC, TOC, Metals
Ditch Sediment	2	SVOC, VOC, Metals, PCB, Pesticides, TOC
Soil	30	SVOC, TOC, Metals
Soil	4	SVOC, VOC, Metals, PCB, Pesticides, TOC

Appendices

Appendix A
Health and Safety Plan

Emergency Contact List and Hospital Route Map

Fire Department	911
Police Department	911
Ambulance	911
Hospital: Kenmore Mercy Hospital	(716) 447-6121
GHD Incident Reporting Hotline	(866) 529-4886
National Response Center (NRC)	(800) 424-8802
Poison Information	(800) 764-7661
Utility Locating Commission (One Call Nationwide)	811
Agency for Toxic Substances & Disease Registry (24 Hours)	(404) 488-4100
U.S. EPA Emergency Response	(800) 424-8802
State of New York Emergency Response Commission	(513) 457-9996
NYSDEC Site Representative (TBD)	(716) 851-7220
GHD Project Manager (Jim Kay)	(519) 884-0510
GHD Regional Corporate Safety and Health Manager (Craig Gebhardt)	(716) 297-6150
Contractor Site Superintendent (TBD)	TBD
Contractor Safety and Health Officer (TBD)	TBD

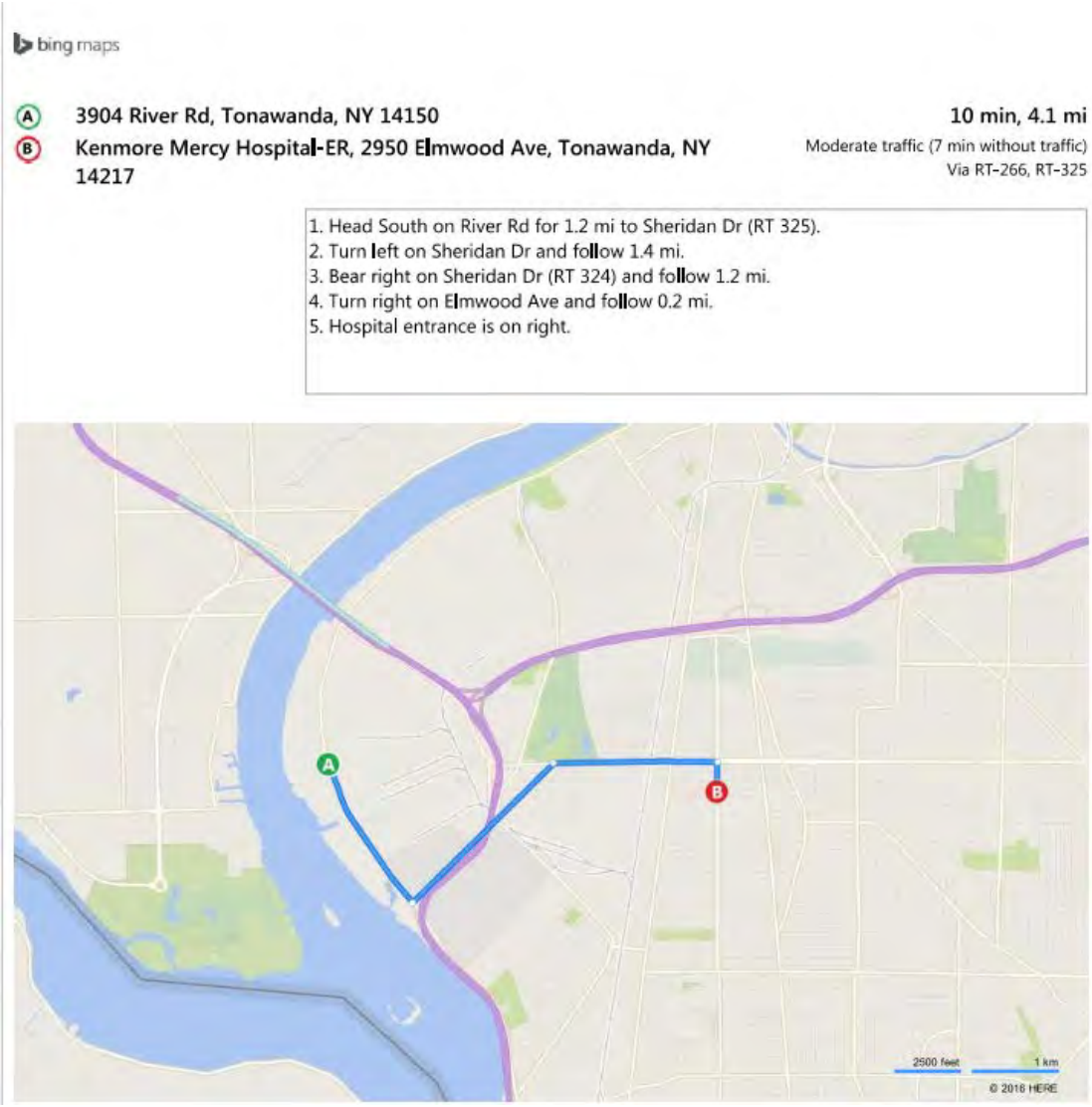


Figure 11.1 Hospital Route Map

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1. Introduction

This Health and Safety Plan (HASP) describes the health and safety procedures and emergency response guidelines that will be implemented during field activities at the Tonawanda Coke Corporation (Site) in Tonawanda, New York, NYSDEC Site #915055. An Emergency Response Plan and Community Air Monitoring Plan are included as part of this HASP. This HASP shall be implemented and adhered to during all field activities that are presented in the Work Plan.

The Site is located at 3875 River Road, Tonawanda, New York. Figures presenting the Site Location and Site Plan are included in the Work Plan.

This HASP will be provided to any Contractors selected to perform work in support of the field activities. The selected Contractors will be required to develop and implement a HASP, which at a minimum meets all the requirements set forth in this document.

The scope of work to be completed includes the following:

- Mobilization and demobilization of labor, materials, and equipment to and from the Site, which include Site preparation/setup.
- Shallow upland soil sampling.
- Physical assessment of the above-ground storage tanks and characterization of the tank contents, if possible.
- Sediment sampling within the Niagara River embayment.
- Sediment sampling of the on-Site ditch(s).
- Sediment sampling from on-Site ponds.
- Subsurface soil sampling from test trenches.

During a portion of these activities, personnel may come in contact with waste materials, chemicals, debris, soils, groundwater, surface water, sediment, and wash waters, which may contain hazardous substances. This HASP has been developed to minimize direct contact by project personnel with materials potentially having chemical presence by ensuring:

i) The communication of the contents of this HASP to project personnel.

ii) The elimination of unsafe conditions. Efforts shall be initiated to identify conditions that can contribute to an accident and to remove exposure to these conditions.

iii) The review all activities before beginning the task/job, after an incident, and/or any unusual circumstances. Stop activities to think about the task, analyze the task hazards, determine methods to reduce risk, and review the results with affected personnel.

iv) The review of existing and the development of new Job Safety Analysis (JSA) forms for each project work activity. Supervisors and affected personnel are responsible for the development and any on-going revisions of project JSAs. JSAs for all known work activities are presented Attachment A.

v) The reduction of unsafe acts. Project personnel shall make a conscious effort to work safely. A high degree of safety awareness must be maintained so those safety factors involved in a

task become an integral part of the task. Supervisory personnel shall ensure that project personnel committing unsafe acts are held accountable via counseling, mentoring, and, if necessary, reprimand.

vi) The frequent inspection of project activities. Regular safety inspections of the work site, materials, and equipment by qualified persons ensure early detection of unsafe conditions. Safety and health deficiencies shall be corrected as soon as possible, and project activities shall be temporarily suspended until the appropriate corrective actions are taken. Documentation of the daily inspections and corrective actions taken should be kept with the project files.

For the purpose of this HASP, activities performed at the Site involving contact with materials, which potentially have an elevated chemical presence will be considered contaminated operations requiring the use of Personal Protective Equipment (PPE). A detailed description of the required PPE is presented in Section 6.1 and is also identified on each JSA form.

The applicability of this HASP extends to all project personnel who will be on Site, including State and Federal Agency personnel, contractor personnel, subcontractor personnel, and visitors to the Site.

All project activities at the Site will be conducted in accordance with the provisions of an approved Site-specific HASP. A copy of the Site-specific HASP and employer-specific Standard Operating Procedures (SOPs) will be maintained on Site whenever activities are in progress.

1.1 Project Organization

All personnel conducting activities on Site must conduct their activities in compliance with all applicable Safety and Health standards as specified by OSHA including, but not limited to, the OSHA 29 CFR 1910, 29 CFR 1926. Project personnel must also be familiar with the procedures and requirements in their approved Site-specific HASP and the applicable procedures found within their company's SOP's and Safety and Health Policy Manual. In the event of any conflicting safety procedures/requirements, personnel shall implement those safety practices, which afford the highest level of safety and protection.

Project Management and Safety Organization

Project Manager – Jim Kay

The Project Manager (PM) shall be responsible for the overall implementation of the HASP, and for ensuring that all health and safety responsibilities are carried out in conjunction with this project. This shall include, but is not limited to, review and approval of the HASP; qualifying/directing subcontractors relative to safety and health performance; coordinating all safety and health submittals; providing the appropriate technical information to write submittals; and consultation with the selected contractor's Corporate Safety and Health Manager with regards to appropriate changes to the HASP.

Site Safety & Health Officer (SHO) – TBD

The SHO is the person who, under the supervision of the PM and the contractor's Corporate Safety and Health Manager, shall be responsible for the communication of the Site requirements to project personnel and any subcontractor personnel. The SHO will have prior experience in working at

hazardous waste sites and is responsible for carrying out the health and safety responsibilities by making sure that:

i) He/she is onsite at all times during the project work activities.

ii) All necessary clean-up and maintenance of safety equipment is conducted by project personnel.

iii) Emergency services are contacted when necessary.

iv) A Site-specific Hazard Communication (HAZCOM) Program is maintained on Site.

v) Project safety forms attached to the HASP are correctly completed and filed.

vi) A pre-entry briefing is conducted, which will serve to familiarize project personnel with the procedures, requirements, and provisions of this HASP.

vii) All necessary records are maintained in the project files (e.g., air monitoring results, calibration log sheets, incident reports, daily toolbox meeting sheets, daily safety logbook entries, training certificates and/or certifications, etc.).

viii) Daily safety meetings are held and documented.

ix) Safe work practices for project personnel are enforced.

x) Safety of any visitors who enter the Site is ensured.

xi) Communication is maintained with the PM.

xii) Orders the immediate shutdown of project activities in the case of a medical emergency, unsafe condition, or unsafe practice.

xiii) Designates work areas and define minimum PPE requirements.

xiv) Provides the safety equipment, PPE, and other items necessary for project personnel.

xv) Conducts the required worker and community air monitoring programs.

xvi) Enforces the use of required safety equipment, PPE, and other items necessary for project personnel safety.

xvii) Ensures that there is a competent person in place who will be supervising excavation work.

xviii) Conducts job Site inspections with the Construction Superintendent (CS) or Site Supervisor (SS) as a part of quality assurance for safety and health.

xix) Reports safety and health concerns to the selected contractor's management as necessary.

Emergency Coordinator (EC) - TBD

The SHO or his/her designate will act as the EC. The EC shall be able to implement the emergency procedures and is responsible for implementing the following activities in the event of an emergency:

i) The EC shall immediately respond to all imminent or actual emergency situations. The EC shall notify all project personnel and emergency response agencies, identify the problem, assess the health or environmental hazards, and take all reasonable measures to stabilize the situation.

ii) The EC shall take all reasonable measures necessary to ensure that fire, explosion, emission or discharge does not occur, re-occur, or spread. These measures may include stopping operations, collecting and containing released materials, and/or removing or isolating containers.

iii) The EC shall develop Emergency Evacuation Routes on a daily bases and communicate them to all project personnel.

iv) The EC shall also be responsible for follow-up activities after any incident such as the cleanup of the affected area, maintenance and decontamination of emergency equipment, and completion and submission of an incident report.

Construction Superintendent (CS) / Site Supervisor (SS) - TBD

Health and safety is a line management responsibility, and as such, the CS and/or SS will implement and support the overall onsite direction and enforcement of the health and safety for this project. The CS and/or SS must meet the requirements of the "competent person" as per the OSHA regulations. The CS and/or SS will report to the PM for this project.

The CS and/or SS is the person who, under the supervision of the PM, shall be responsible for the communication of the Site requirements to project personnel and subcontractors, and is responsible for carrying out the health and safety responsibilities by making sure that:

i) All underground utilities have been properly located prior to initiating work activities

ii) Each work area is secured with fencing at the end of each day.

iii) All necessary cleanup and maintenance of safety equipment is conducted by project personnel.

iv) JSA forms are developed, reviewed, and revised accordingly.

v) Project personnel stop, think about, act accordingly and review the work activities that they are about to start before initiating activities.

vi) Project safety forms attached to the HASP are properly completed and then filed.

vii) A pre-entry briefing is conducted for all project personnel, which will serve to familiarize everyone with the procedures, requirements, and provisions of this HASP.

viii) Orders the immediate shutdown of project activities in the case of a medical emergency, unsafe condition, or unsafe practice.

ix) Provides the safety equipment, PPE, and other items necessary for project personnel.

x) Enforces the use of required safety equipment, PPE, and other items necessary for personnel or community safety.

xi) Conducts job site inspections as a part of quality assurance for safety and health.

xii) Reports safety and health concerns to the selected contractor's PM as necessary.

xiii) Is responsible for the overall implementation of the HASP, and ensuring that all health and safety responsibilities are carried out during the project work activities. This shall include, but is not limited to, review and approval of any subcontractor HASPs, communication of Site requirements to Subcontractor personnel, and consultation with the PM regarding appropriate changes to the HASP.

xiv) The CS and/or SS also have the responsibility for enforcing safe work practices for all project personnel.

xv) A competent person oversees all excavation and trenching work to ensure that work is completed in accordance with the OSHA Standards presented in 1926 Subpart P.

xvi) The CS and/or SS watch all personnel for any ill effects, especially those symptoms caused by heat stress and/or chemical exposure.

xvii) The CS and/or SS oversee the safety of any visitors who enter the Site.

Regional Safety & Health Manager (CSHM) – Craig Gebhardt

The RSHM is an individual who is trained as a health and safety professional, works full-time in a health and safety role, and who serves in a consulting role to the PM, SHO, and CS and/or SS regarding potential health and safety issues.

Equipment Operators

All equipment operators are responsible for the safe operation of heavy equipment. Operators are responsible for inspecting their equipment on a daily basis to ensure safe performance. Brakes, hydraulic lines, backup alarms, and fire extinguishers must be inspected routinely throughout the project. Documentation of daily inspections will be required via an equipment inspection checklist. Heavy equipment inspections will be submitted to the CS for review and subsequently placed in the project files. Unsafe conditions/acts are to be immediately reported to the CS. Equipment will be taken out of service if an unsafe condition occurs.

Project Personnel Safety Responsibilities

Project personnel are responsible for their own safety as well as the safety of those around them and shall use any equipment provided in a safe and responsible manner, as directed by their supervisor. Project personnel will follow the policies set forth in this HASP and those in their employer-specific SOPs and Safety and Health Program.

Project personnel are directed to take the following actions when appropriate:

i) Review all activity hazards and preventative measures before initiating work.

ii) Assist in the development/revision of JSA forms that are appropriate to their current work activities.

iii) Suspend any operations that may cause an imminent health hazard to project personnel.

iv) Inspect tools and other equipment before each use or as the manufacturer and/or OSHA mandates.

v) Correct job site hazards when possible without endangering life or health.

vi) Report safety and health concerns to the SHO CS and/or SS.

Subcontractors

Selected subcontractor(s) will be responsible for providing a CS and/or SS ("competent person") and a SHO to direct their activities and to meet all applicable OSHA Regulations. This may be the same individual if so qualified. These individuals will be responsible for ensuring that all contract specifications are met, including those related to project health and safety. Subcontractors will be

responsible for the health and safety of their personnel, which includes following all applicable OSHA Regulations and the subcontractors' Site-specific HASP(s). Subcontractors will be required to attend an initial Site briefing and subsequent daily safety meetings.

Authorized Visitors

Authorized Visitors shall be provided with all known information with respect to the project operations and hazards, as applicable to the purpose of their visit.

2. Site Characterization and Potentially Hazardous Compounds

The Site has been impacted with coal tar wastes including PAHs, organic solvents, phenols, and heavy metals. It has been determined that the following list of chemicals represents the Chemicals of Concern (COCs) at the site:

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- Methylene Chloride
- Acetone
- 1,2-Dichloroethene
- Vinyl Chloride
- 2-Methylnaphthalene
- Anthracene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Fluoranthene
- Fluorene
- Naphthalene
- Phenanthrene
- Pyrene
- Dibenzofuran

Table A.1 shows the properties of the compounds listed above.

3. Basis for Design

Regulations set forth by OSHA in Title 29, CFR, Parts 1910 and 1926 (29 CFR 1910 and 1926) form the basis of this HASP. Emphasis is placed on Section 1926.65 (Hazardous Waste Operations and Emergency Response), 1910 Subpart I (Personal Protective Equipment), 1910 Subpart Z (Toxic and Hazardous Substances), 1926 Subpart O (Motor Vehicles, Mechanized Equipment, and Marine Operations), and 1926 Subpart F (Excavations). Some of the specifications within this section are in addition to the OSHA regulations, and reflect the positions of U.S. EPA, and the National Institute for Occupational Safety and Health (NIOSH), regarding safe operating procedures at hazardous waste sites.

The health and safety of the public and Site personnel and the protection of the environment will take precedence over cost and scheduling considerations for all project work.

4. Personnel Training

4.1 General

Project personnel shall complete hazardous waste operations and emergency response training (HAZWOPER), as required by the OSHA Standard 29 CFR 1926.65. Project personnel shall also initially receive a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Personnel who completed their training more than 12 months prior to the start of this project shall have also completed an 8-hour HAZWOPER refresher course within the past 12 months. The CS and or SS shall complete the additional 8 hours of training that is required for managers and/or supervisors along with any "competent persons" training that may be needed for required work.

Additional safety training for specific tasks/activities may include safety training for excavation safety. Further safety training may also be required based on the scheduled scope of work. This safety training is to be conducted and documented before any tasks that require additional training are initiated. It is the responsibility of the SHO and CS and/or SS to ensure that personnel have the necessary training and skills prior to activity assignment. Task safety training requirements are included on each JSA form.

4.2 Basic 40-Hour Course

The following is a list of the topics typically covered in a 40-hour training course:

i) General safety procedures

ii) Physical hazards (fall protection, noise, heat stress, cold stress)

iii) Names and job descriptions of key personnel responsible for Site health and safety

iv) Safety, health, and other hazards typically present at hazardous waste sites

v) Use, application, and limitations of PPE

vi) Work practices by which employees can minimize risks from hazards

vii) Safe use of engineering controls and equipment on site

viii) Medical surveillance requirements

ix) Recognition of symptoms and signs, which might indicate overexposure to hazards

x) Worker right-to-know (Hazard Communication OSHA 1926.59/1910.1200)

xi) Routes of exposure to contaminants

xii) Engineering controls and safe work practices that may be implemented

xiii) Components of a project HASP

xiv) Decontamination practices for personnel and equipment

xv) Confined space entry procedures

xvi) General emergency response procedures

4.3 Supervisor Course

Management and supervisors (i.e., the CS and SS), who work at the Site are required to receive an additional 8 hours of training in topics that are pertinent to the management of hazardous waste operations, which typically includes:

i) Instruction in detailed project safety and health procedures dealing with emergencies

ii) PPE programs

iii) The implementation of specialized emergency response procedures

iv) Air monitoring techniques

4.4 Site-Specific Training

All project personnel attending the initial safety meeting will accomplish the project-specific training on the contents of this HASP before work begins. The review will include a discussion of the chemical, physical, and biological hazards that may be present at the Site, the protective equipment and safety procedures to be used and followed, and emergency procedures that will be implemented at the Site. The Training Acknowledgment Form that project personnel will sign off on is presented in Attachment B (Project Safety Forms).

4.5 Daily Safety Meetings

Daily safety meetings (tailgate safety talks) will be held to cover the work that is anticipated to be accomplished each day, the associated hazards, the protective clothing and procedures required to minimize exposure to these hazards, and the required emergency response procedures. The CS, SS and/or SHO will present these meetings prior to beginning the day's fieldwork. No work will be performed in an Exclusion Zone (EZ) before the daily safety meeting has been held. Additional safety meetings shall also be held prior to initiating new tasks, and repeated if new hazards are encountered. The form for documenting the daily safety meetings is also found in Attachment B.

4.6 First Aid and CPR

At least one individual current in First Aid/CPR will be assigned to the work crew for every 10 individuals working at the Site and will be immediately available during all field activities to provide assistance as necessary. Refresher training in First Aid and CPR is required to keep the

certificate current. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens. Blood-borne pathogen training should be included as part of the First Aid/CPR training course delivered by the training provider.

5. Medical Surveillance

In accordance with the requirements detailed in 29 CFR 1926.65 and 29 CFR 1910.134, all project personnel who will come in contact with potentially contaminated materials will have received medical surveillance by a licensed physician or physician's group.

Medical records for all project personnel will be maintained by their respective employers. The medical records will detail the tests that were taken and will include a copy of the consulting physician's statement regarding the tests and the individual's suitability for work as per the employer's medical surveillance program which is to be in accordance with 29 CFR 1926.65.

The medical records will be available to the employee or his designated representative upon written request, as outlined in 29 CFR 1910.1020.

If it becomes necessary to use subcontractors, they will also provide certifications to the SHO showing that their personnel involved in Site activities have all necessary medical examinations prior to commencing work. The certifications will show proof of medical surveillance and respiratory fit testing. Personnel not obtaining medical certification will not perform work within contaminated areas.

Interim medical surveillance will be completed if an individual exhibits poor health or high stress responses due to any project activity or when accidental exposure to elevated concentrations of contaminants occur.

6. Personal Protective Equipment

PPE will be required to safeguard project personnel from various hazards. Varying levels of protection may be used depending on the level of contaminants and the degree of any physical hazard. This section presents the various levels of personal protection and defines the conditions of use for each level. Subcontractor Site-specific HASPs, if required, will adequately address PPE concerns for each specific task activity based on their proposed scope of work.

6.1 Levels of Protection

Protection levels are determined based upon chemical and physical hazards present in the work area. The specific protection levels to be employed at the Site for each work task are presented on each JSA form, which are presented in Attachment A.

6.1.1 Level D Protection

The minimum level of protection that will be required for all project personnel will be Level D. Level D will only be used in clean areas where there is no potential for exposure to the contaminants of concern. The following equipment is to be worn as Level D PPE:

i) Work clothing as prescribed by the weather

ii) Steel toed work boots meeting American National Standard Institute (ANSI) Z41

iii) Safety glasses or goggles, meeting ANSI Z87

iv) Leather work gloves

v) High visibility safety vest (Class II) when working near moving equipment

vi) Hard hat, meeting ANSI Z89

vii) Hearing protection when noise levels exceed 85 dBA. Hearing protection will have a minimum Noise Reduction Rating (NRR) of at least 20 dBA

6.1.2 Modified Level D Protection

Modified Level D will be worn when airborne contaminants are not present at levels where respiratory protection is required, but where project activities present an increased potential for skin contact with hazardous substances. The following equipment is to be worn as Modified Level D:

i) Tyvek® coveralls or polyethylene coated Tyvek® coveralls (if liquids/splash hazards are present)

ii) Steel toed work boots meeting ANSI Z41

iii) Neoprene, or polyvinyl chloride (PVC) overboots

iv) Safety glasses or goggles

v) Hard hat

vi) Face shield in addition to safety glasses or goggles when projectiles and/or splashing liquids pose a hazard

vii) Disposable nitrile inner gloves (NDEX 8005, as manufactured by Best, or equivalent)

viii) Nitrile over gloves

ix) Hearing protection (if necessary)

x) A high visibility safety vest (Class II) when working near moving equipment

6.1.3 Level C Protection

Level C protection will be required when the airborne concentration of suspected contaminants are present in the worker's breathing zone at sustained levels of greater than 1 part per million (ppm) of organic vapor as measured with a photoionization detector (PID) or 5mg/m3 of particulate as measured by a particulate monitor.

The following equipment will be used for Level C protection:

i) Full-face air purifying respirator (APR) with organic vapor/acid gas cartridges in combination with particulate filters (P-100) which are NIOSH approved (MSA GME P100 cartridges or equivalent)

ii) Polyethylene coated Tyvek® or Saranex® hooded suit (if liquids/splash hazards are present) or Tyvek® coveralls, ankles, and cuffs taped to boots and gloves

iii) nitrile over glove, as manufactured by Best or equivalent

iv) inner nitrile disposable gloves (NDEX 8005, as manufactured by Best, or equivalent)

v) safety toe work boots, ANSI approved

vi) chemical resistant neoprene or rubber boots with steel toes, or latex/PVC booties over safety toe shoes

vii) hard hat, ANSI approved

viii) hearing protection (if necessary)

ix) a high visibility safety vest (Class II)

6.1.4 Level B Protection

Level B protection is not expected to be worn but would be required if sustained airborne concentrations of suspended organic vapors are greater than 1 ppm in the presence of vinyl chloride or 50 ppm in the absence of vinyl chloride. The action level necessitating Level B protection may be revised subject to determination of the compounds triggering the Level B protection requirement.

The following equipment will be used for Level B protection:

i) Supplied air respirator (NIOSH approved). Respirators may be positive pressure-demand self-contained breathing apparatus (SCBA), or positive pressure-demand airline respirator (with 5-minute escape bottle for immediately dangerous to life and health (IDLH) situations)

ii) Polyethylene coated Tyvek® or Saranex® hooded coverall with ankles and cuffs taped to boots and gloves

iii) Nitrile over gloves, as manufactured by Best or equivalent

iv) Inner nitrile disposable gloves (NDEX 8005, as manufactured by Best, or equivalent)

v) Safety toe work boots, ANSI approved

vi) Chemical resistant neoprene or rubber boots with steel toes, or latex/PVC booties over safety toe shoes

vii) Hard hat, ANSI approved

viii) Hearing protection (if necessary)

ix) A high visibility safety vest (Class II) if exposed to moving heavy equipment

6.1.5 Selection of PPE

Equipment for personal protection will be selected based on the potential for contact, Site conditions, ambient air quality, and the judgment of the PM, CS, SS, SHO and the RSHM. The PPE used will be chosen to be effective against the compound(s) present on the Site.

Additional specialized PPE such as flotation devices and hip waders may be required for some tasks and are identified on the JSAs found in Attachment A.

6.2 Respiratory Protection

Respiratory protection is an integral part of personnel health and safety at sites with potential airborne contamination.

6.2.1 Site Respiratory Protection Program

The Site respiratory protection program will consist of the following:

i) All project personnel who may use respiratory protection will have an assigned respirator.

ii) All project personnel who may use respiratory protection will have been fit tested and trained in the use of a full-facepiece APR within the past 12 months.

iii) All project personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the SHO prior to commencement of Site work.

iv) Only cleaned, maintained, NIOSH approved respirators are to be used on this Site.

v) If respirators are used, the respirator cartridge is to be properly disposed of at the end of each work shift, prior to expected breakthrough or when breathing becomes labored (filter load-up occurs).

vi) Contact lenses may be worn with a full-face respirator.

vii) All project personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not interfere with the sealing surface of the respirator.

viii) Respirators will be inspected and a negative pressure test performed prior to each use.

ix) After each use, the respirator will be wiped with a disinfectant cleansing wipe or washed during a formal respirator cleaning procedure. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the facepiece.

Respiratory protection may be required during some of the project activities. This is to ensure worker protection from potentially contaminated particulates, SVOCs, and VOCs. It is expected that Modified Level D personal protection will be worn during the majority of the project activities involving the handling of impacted materials. However, the SHO will make the determination of the acceptable level of protection based upon the results of the air-monitoring program.

A photoionization detector (PID) with a 10.6 or greater eV lamp will be used to determine if organic vapors are present. A background reading will be established prior to commencing work activities at each active work area. When VOCs are detected in the worker breathing zones, colorimetric tubes

will be used to determine if benzene or vinyl chloride is present. If present, work activities will cease until a review of additional engineering controls has been completed by the Project team. The results of the air sampling will be reviewed to ensure that the proper respiratory protection procedures are being implemented.

Action levels to determine the level of respiratory protection necessary for organic vapors are based on the sustained (15-minute) concentration of Site contaminants measured within the breathing zone. The action levels and appropriate respiratory protection are referenced in Table A.2 of this document. The PID action levels have been set based on the presence of the known VOCs, which have been identified at the Site. However, if the ambient concentrations of organic vapors are due to identifiable substances, the level of respiratory protection may be altered by the SHO.

The appropriate air purifying respirator cartridges to be used at the Site are a combination organic vapor/acid gas and P-100 cartridge. The cartridge must be of the same manufacturer as the respirator face piece.

A particulate meter will also be utilized to determine airborne dust/particulate concentrations. Action levels to determine the level of respiratory protection necessary for dust levels are based on the concentration of Site contaminants that may potentially be attached to the dust that are measured within the breathing zone. The action levels and appropriate respiratory protection for particulates are included in Table A.2 of this document.

6.3 Using PPE

Depending upon the level of protection selected for this project, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Level B or Level C PPE is used.

All personnel entering the EZ must put on the required PPE in accordance with the requirements of this plan. When leaving the EZ, PPE will be removed in accordance with the procedures listed, to minimize the spread of contamination.

6.3.1 Donning Procedures

These procedures are mandatory only if Level B or Level C PPE is used on the project:

i) Remove bulky outerwear. Remove street clothes and store in clean location.

ii) Put on work clothes or coveralls.

iii) Put on the required chemical protective coveralls.

iv) Put on the required chemical protective boots or boot covers.

v) Tape the legs of the coveralls to the boots with duct tape.

vi) Put on the required chemical protective gloves.

vii) Tape the wrists of the protective coveralls to the gloves.

viii) Don the required respirator and perform appropriate fit check.

ix) Put hood or head covering overhead and respirator straps and tape hood to facepiece.

x) Check and secure all seams.

xi) Don remaining PPE, such as hard hat.

When these procedures are instituted, one person (bottle watch/decontamination attendant) must remain outside the work area to ensure that each person entering has the proper protective equipment.

6.3.2 Doffing Procedures

The following procedures are only mandatory if Level B or C PPE is required for this project. Whenever a person leaves a Level B or C work site, the following decontamination sequence will be followed:

i) Upon entering the Contamination Reduction Zone (CRZ) rinse contaminated materials from the boots or remove contaminated boot covers

ii) Clean reusable protective equipment

iii) Remove protective garments, equipment, and respirator. All disposable clothing should be placed in a covered container, which is labeled

iv) Clean the respirator using the appropriate method as determined by the SHO

v) Wash hands, face, and neck and shower as soon as possible at the end of the day

vi) Proceed to clean area and dress in clean clothing

vii) Clean and disinfect respirator for next use

All disposable equipment garments, and PPE must be placed in covered containers and labeled for disposal. See Section 10.0 for detailed information on decontamination procedures.

6.4 Selection Matrix

The level of personal protection selected will be based upon real-time air monitoring of the work environment and an assessment by the SHO and CS and/or SS of the potential for skin contact with contaminated materials. The PPE selection matrix is given in each JSA form that is presented in Attachment A. This matrix is based upon information available at the time this plan was written.

6.5 Duration of Work Tasks

The duration of activities involving the usage of PPE will be established by the SHO based upon ambient temperature and weather conditions, the capacity of personnel to work in the designated level of PPE (heat stress, see Section 8.3) and the limitations of the protective equipment (i.e., ensemble permeation rates, life expectancy of air purifying respirator cartridges, etc.).

All rest breaks will be taken in the Support Zone (SZ) after full decontamination and PPE removal. Rest breaks will be observed based upon the heat stress monitoring guidelines presented in Section 8.3.

6.6 Limitations of Protective Clothing

PPE ensembles have been selected to provide protection against contaminants at anticipated concentrations. However, no protective garment, glove, or boot is chemical-proof, nor will it afford

protection against all chemical types. Permeation of a given chemical through PPE is a complex process governed by contaminant concentrations, environmental conditions, physical condition of the protection garment, and the resistance of a garment to a specific contaminant. Chemical permeation may continue even after the source of contamination has been removed from the garment.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all Site personnel using PPE:

i) When using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift

ii) Inspect all clothing, gloves, and boots both prior to and during use for:

   a. Imperfect seams

   b. Non-uniform coatings

   c. Tears

   d. Poorly functioning closures

iii) Inspect reusable garments, boots, and gloves both prior to and during use for:

   a. Visible signs of chemical permeation

   b. Swelling

   c. Discoloration

   d. Stiffness

   e. Brittleness

   f. Cracks

   g. Any sign of puncture

   h. Any sign of abrasion

Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of contaminants will not be reused.

Project personnel also carry certain responsibilities for their own health and safety, and are required to observe the following safe work practices:

i) Familiarize themselves with this HASP

ii) Use the "buddy system" when working in exclusion zones

iii) Use the safety equipment in accordance with training received, labeling instructions, and common sense

iv) Maintain safety equipment in good condition and proper working order

v) Refrain from activities that would create additional hazards (e.g., smoking, eating, etc., in restricted areas, leaning against dirty, contaminated surfaces)

vi) Smoking, eating, and drinking will be prohibited except in designated areas. These designated areas may change during the duration of the project to maintain adequate

separation from the active work area(s). Designation of these areas will be the responsibility of the SHO

vii) Soiled disposable outerwear shall be removed and placed into a covered container prior to washing hands and face, eating, using lavatory facilities, or leaving the Site

7. Site Control

Site control is provided by the implementation of the following measures:

i) The PM, SHO, CS and/or SS are to be advised of the dates and purpose of all field activities

ii) All visitors must sign in and sign out each time they access the Site

iii) The selected contractor will ensure that a secure fence is in place around each active work area during the project activities

7.1 Authorization to Enter

All personnel working in exclusion zones (EZs) must have completed hazardous waste operations initial training as defined under OSHA Regulation 29 CFR 1926.65. They shall also have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations in order to enter a Site area designated as an EZ or contaminant reduction zone (CRZ). Personnel without such training or medical certification may enter the designated support zone (SZ) only. The SHO will maintain a list of authorized persons; only personnel on the authorized list will be allowed within the EZ or CRZ.

7.2 Site Orientation and Hazard Briefing

No person will be allowed in the general work area during project activities without first being given a Site orientation and hazard briefing. This orientation will be presented by the SHO, and will consist of attending an initial safety meeting. This training will cover the chemical, physical, and biological hazards, protective equipment, safe work procedures, and emergency procedures for the project. A Training Acknowledgment Form for documentation purposes is presented in Attachment B. In addition to this meeting, daily safety meetings will be held each day before work begins. All individuals on Site, including visitors, must document their attendance to this briefing as well as to each daily safety meeting on the form that is also included in Attachment B.

7.3 Certification Documents

A training and medical certification file will be established for the project and kept on Site during all project activities. The 40-hour training, update, and respirator fit test certificates, as well as current medical clearance for all project field personnel will be maintained within that file. Subcontractor personnel, if needed, will provide a copy of their training, respirator fit test, and medical certification to the selected contractor's SHO prior to the start of fieldwork.

7.4 Entry Requirements

In addition to the authorization, hazard briefing and certification requirements listed above, no person will be allowed to enter the Site unless he/she is wearing the minimum SZ PPE as described

in Section 6.0. Personnel entering the EZ or CRZ must wear the required PPE for those locations as identified on each JSA form.

7.5 Emergency Entry and Exit

Individuals who must enter the Site on an emergency basis will be briefed of the hazards by the SHO. All hazardous activities will cease in the event of an emergency and any sources of emissions will be controlled, if possible.

Individuals exiting the Site because of an emergency will gather in a safe area, as determined by the SHO for a head count. The SHO is responsible for ensuring that all individuals who entered the work area have exited in the event of an emergency. See Section 11.0 of this HASP for additional information.

7.6 Contamination Control Zones

Contamination control zones are maintained to prevent the spread of contamination and to prevent unauthorized people from entering hazardous areas.

7.6.1 Exclusion Zone (EZ)

The EZ consists of the specific work area, or may be the entire area of suspected contamination. All employees entering the EZ must use the required PPE, and must have the appropriate training and medical clearance for hazardous waste work. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Barrier tape, fencing, or other appropriate means will identify the location of each EZ.

7.6.2 Contamination Reduction Zone (CRZ)

The CRZ or transition area will be established to perform decontamination of personnel and equipment and to provide a buffer zone around the EZ. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in the CRZ (or a separate CRZ decontamination area) that may be set up to better address equipment decontamination. The decontamination of all personnel will be performed on Site in the CRZ that is adjacent to each EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the SZ.

7.6.3 Support Zone (SZ)

The SZ is a clean area outside of the CRZ located to prevent project personnel from exposure to hazardous substances. Eating and drinking will be permitted in the support area only after proper decontamination. Smoking will not be allowed in any portion of the SZ.

8. Activity Hazard/Risk Analysis and General Safety Practices

This section identifies and evaluates the potential chemical, physical, and biological hazards, which may be encountered while conducting project activities. Specific JSA forms (see Attachment A)

have been developed to address the hazards associated with anticipated project activities, which are outlined in Section 1.0 of this HASP.

NOTE: If a non-routine task or previously unidentified task becomes necessary then a JSA that addresses the new task shall be developed and implemented before initiating the new activity.

In addition to the chemical hazards identified in Table A.1 of this HASP, physical and biological hazards may exist at the Site including: potential heat/cold stress; hazards presented by the use of heavy equipment; underground/overhead utility hazards; hazards presented by excavations/trenches; fall hazards; biological hazards including, poison ivy, mosquitoes, ticks, bees, wasps, snakes; uneven terrain and slippery surfaces; electrical and other hazardous energy sources, hazards presented by undertaking hot work and the use of decontamination equipment. It will be the responsibility of the SHO and all project personnel to identify the physical and/or biological hazards posed by the various project activities that they are partaking in and implement all necessary preventative measures.

8.1 General Practices

Additional general safety practices to be implemented are as follows:

i) A copy of the HASP must be at the project Site, in a location readily available to all personnel

ii) All project personnel must use the buddy system (working in pairs or teams)

iii) Food, beverages, or tobacco products must not be present or consumed in the EZ and CRZ. Cosmetics must not be applied within these zones

iv) Emergency equipment such as eyewash, fire extinguishers, etc., must be removed from storage areas and staged in readily accessible locations

v) Contaminated waste, debris, and clothing must be properly contained and legible and understandable precautionary labels must be affixed to the containers

vi) Removing contaminated soil or waste debris from protective clothing and/or equipment using compressed air, shaking, or any other means that disperses contaminants into the air is prohibited

vii) Containers must be moved only with the proper equipment, and must be secured to prevent dropping or loss of control during transport

viii) Visitors to the Site must be instructed to stay outside of the EZ and CRZ and remain within the SZ during the extent of their stay. Visitors must be cautioned to avoid skin contact with surfaces, which are contaminated or suspected to be contaminated

8.1.1 Buddy System

All project personnel shall use the buddy system. Visual contact must be maintained between project team members at all times, and personnel must observe each other for signs of chemical exposure and heat stress. Indications of adverse effects include, but are not limited to:

i) Changes in complexion and skin coloration

ii) Changes in coordination

iii) Excessive salivation and papillary response

iv) Changes in speech pattern

Team members must also be aware of potential exposure to possible safety hazards, unsafe acts, or noncompliance with safety procedures. Personnel shall inform their partners, fellow team members, SHO, CS and/or the SS of non-visible effects of exposure to toxic materials. The symptoms of such exposure may include:

i) Headaches

ii) Dizziness

iii) Nausea

iv) Blurred vision

v) Cramps

vi) Irritation of eyes, skin, or respiratory tract

If protective equipment or noise levels impair communications, pre-arranged hand signals must be used for communication. Personnel must stay within line of sight of another team member. Downrange field teams in conjunction with the "buddy" system will use the following hand signals. These signals are very important when working with heavy equipment. The entire field team shall know them before operations commence.

Signal	Meaning
Hand gripping throat	Out of air; Can't breathe
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK; I'm all right; I understand
Thumbs down	No; Negative

8.1.2 Sanitation

Sanitation at the Site will be maintained according to OSHA and Department of Health requirements.

8.1.3 Break Area

Breaks must be taken in the SZ, away from the active work area after project personnel go through decontamination procedures. There will be no eating, drinking, or chewing gum in any area other than the SZ.

8.1.4 Potable Water

The following rules apply for all project field operations:

i) An adequate supply of potable water will be provided in each CRZ. Potable water must be kept away from hazardous materials, contaminated clothing, and contaminated equipment

ii) Portable containers used to dispense drinking water must be capable of being tightly closed, and must be equipped with a tap dispenser. Water must not be drunk directly from the container, nor dipped from the container

iii) Containers used for drinking water must be clearly marked and not used for any other purpose

iv) Disposable cups must be supplied, and both a sanitary container for unused cups and a receptacle for disposing of used cups must be provided

8.1.5 Washing Facilities

Access to facilities for washing one's hands, face and neck before eating, drinking, or smoking will be provided.

8.1.6 Lavatory

If permanent toilet facilities are not available, an adequate number of portable chemical toilets will be provided.

8.1.7 Trash Collection

Trash collected from the CRZ will be separated as potentially contaminated waste. Trash collected in the support and break areas will be disposed of as non-hazardous waste. Trash receptacles will be set up in the CRZ and in the SZ.

8.2 Chemical Exposure

Preventing exposure to toxic chemicals is a primary concern. Chemical substances can enter the unprotected body by inhalation, skin absorption, ingestion, or through a puncture wound (injection). A contaminant can cause damage at the point of contact or can act systematically, causing a toxic effect at a part of the body distant from the point of initial contact. The Site chemical contaminants of concern and their properties are identified in Table A.1.

Chemical exposures are generally divided into two categories: acute and chronic. Symptoms resulting from acute exposures usually occur during or shortly after exposure to a sufficiently high concentration of a contaminant. The concentration required to produce such effects varies widely from chemical to chemical. The term "chronic exposure" generally refers to exposures to "low" concentrations of a contaminant over a long period of time. The "low" concentrations required to produce symptoms of chronic exposure depend upon the chemical, the duration of each exposure, and the number of exposures. For a given contaminant, the symptoms of an acute exposure may be completely different from those resulting from chronic exposure.

For either chronic or acute exposure, the toxic effect may be temporary and reversible, or may be permanent (disability or death). Some chemicals may cause obvious symptoms such as burning, coughing, nausea, tearing eyes, or rashes. Other chemicals may cause health damage without any such warning signs (this is a particular concern for chronic exposures to low concentrations). Health effects such as cancer or respiratory disease may not become evident for several years or decades after exposure. In addition, some toxic chemicals may be colorless and/or odorless, may dull the sense of smell, or may not produce any immediate or obvious physiological sensations. Thus, a worker's senses or feelings cannot be relied upon in all cases to warn of potential toxic exposure.

The effects of exposure not only depend on the chemical, its concentration, route of entry, and duration of exposure, but may also be influenced by personal factors such as the individual's smoking habits, alcohol consumption, medication use, nutrition, age, and sex.

An important exposure route of concern at the Site is inhalation. The lungs are extremely vulnerable to chemical agents. Even substances that do not directly affect the lungs may pass through lung tissue into the bloodstream, where they are transported to other vulnerable areas of the body. Some toxic chemicals present in the atmosphere may not be detected by human senses (e.g., they may be colorless, odorless, and their toxic effects may not produce any immediate symptoms). Respiratory protection is therefore extremely important if there is a possibility that the work site atmosphere may contain such hazardous substances. Chemicals can also enter the respiratory tract through punctured eardrums. Where this is a hazard, individuals with punctured eardrums should be medically evaluated specifically to determine if such a condition would place them at an unacceptable risk and preclude their working at the task in question.

Direct contact of the skin and eyes by hazardous substances is another important route of exposure. Some chemicals directly injure the skin. Some pass through the skin into the bloodstream where they are transported to vulnerable organs. Abrasions, cuts, heat, and moisture enhance skin absorption. The eye is particularly vulnerable because airborne chemicals can dissolve in its moist surface and be carried to the rest of the body through the bloodstream (capillaries are very close to the surface of the eye). Wearing protective equipment, not using contact lenses in contaminated atmospheres (since they may trap chemicals against the eye surface), keeping hands away from the face, and minimizing contact with liquid and solid chemicals can help protect against skin and eye contact.

Although ingestion should be the least significant route of exposure at the Site, it is important to be aware of how this type of exposure can occur. Deliberate ingestion of chemicals is unlikely; however, personal habits such as chewing gum or tobacco, drinking, eating, smoking cigarettes, and applying cosmetics at the Site may provide a route of entry for chemicals.

The last primary route of chemical exposure is injection, whereby chemicals are introduced into the body through puncture wounds (e.g., by stepping or tripping and falling onto contaminated sharp objects). Wearing safety shoes, avoiding physical hazards, and taking common sense precautions are important protective measures against injection.

Chemical Hazard Controls

Airborne exposure or contact with the contaminants of concern at the Site shall be controlled by:

i) Skin contact with chemicals may be controlled by use of the proper PPE and good housekeeping procedures. The proper PPE (e.g., polycoated Tyvek®, gloves) as described in Section 6.0 of this HASP shall be worn for all activities where contact with potentially harmful media or materials is anticipated.

ii) Monitoring air concentrations for volatile organic chemicals and particulates shall be conducted in the breathing zone with a PID with an 11.7 eV lamp or greater and a particulate monitor, as discussed in Section 9.0.

iii) Contact the CSHM for additional information regarding a particular product's or activity's exposure hazards.

iv) Using respiratory protection as appropriate, in areas known to have concentrations above the specified action level.

Hazard Communication

Personnel required to handle or to use hazardous materials as part of their job duties will be trained and educated in accordance with the Hazard Communication Standard. The training shall include instruction on the safe usage, and handling procedures of hazardous materials, how to read and access Material Safety Data Sheets (MSDSs), and the proper labeling requirements.

The MSDSs for those chemicals in use at the Site will be available to project personnel. The SHO will be responsible for maintaining a copy of all MSDSs on Site.

8.3 Heat Stress

Heat stress is caused by a number of interacting factors including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load, and in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Heat Rashes

Heat Rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment.

Heat Cramps

Heat Cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much and too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3 percent NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for six to eight hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate-electrolyte replacement liquids is effective in minimizing physiological disturbances during recovery.

Heat Exhaustion

Heat Exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, moist skin, heavy sweating, dizziness, nausea, headache, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat Stroke

Heat Stroke is the most serious form of heat stress. Heat stroke occurs when the body's system of temperature regulation fails and the body's temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion, irrational behavior, loss of consciousness, convulsions, a lack of sweating (usually), hot, dry skin, and an abnormally high body temperature, e.g., a rectal temperature of 41°C (105.8°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

Heat Stress Safety Precautions

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described below.

Adjusted Temperature[(1)]	Work-Rest Regimen Normal work Ensemble [(2)]	Work-Rest Regimen Impermeable Ensemble
90°F (32.°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° to 90°F (30.8°C to 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° to 87.5°F (28.1° to 30.8°C)	After each 90 minutes of work	After each 60 minutes of work

Adjusted Temperature[1]	Work-Rest Regimen Normal work Ensemble [2]	Work-Rest Regimen Impermeable Ensemble
77.5° to 82.5°F (25.3° to 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° to 77.5°F (30.8° to 32.2°C)	After each 150 minutes of work	After each 120 minutes of work

Notes:

(1) Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F=ta °F + (13 x percent sunshine). Measure air temperature (ta) with a standard thermometer, with the bulk shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows).

(2) A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

In order to determine if the work rest cycles are adequate for the personnel and specific Site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one-third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any Site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

i) Project personnel will be encouraged to drink plenty of water and electrolyte replacement fluids throughout the day.

ii) On-Site drinking water will be kept cool (50 to 60°F).

iii) A work regimen that will provide adequate rest periods for cooling down will be established, as required.

iv) All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.

v) Cooling devices such as vortex tubes or cooling vests should be used when personnel must wear impermeable clothing in conditions of extreme heat.

vi) Project personnel shall be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.

vii) A shaded rest area must be provided. All breaks should take place in the shaded rest area.

viii) Project personnel must not be assigned to other tasks during breaks.

ix) Project personnel must remove impermeable garments during rest periods. This includes Tyvek® garments.

x) All project personnel must be informed of the importance of adequate rest, acclimation (usually takes about 2 hours/day for 1-2 weeks to become acclimated), and proper diet in the prevention of heat stress disorders.

8.4 Sun Exposure

Overexposure to sunlight is a common concern when field activities occur during warm weather conditions. Overexposure can occur on clear, sunny days as well as on overcast and cloudy days. Ultraviolet (UV) rays from the sun can cause skin damage or sunburn, but can also result in vision problems, allergic reactions, and other skin concerns. Two types of UV rays are emitted from the sun: UVA and UVB rays.

UVB rays cause sunburn, skin cancer, and premature aging of the skin. UVB rays stimulate tanning but are also linked to other problems such as impaired vision, skin rashes, and some allergic and other reactions to certain drugs. Extra care should be taken if activities are to be conducted on or near water. Sunlight reflected off the surface of the water is intensified resulting in accelerated effects. The following steps should be taken to protect against overexposure to sunlight:

i) Always use sunscreen: Apply a broad-spectrum sunscreen with Sun Protection Factor (SPF) of at least 15 or higher liberally on exposed skin. Reapply every 2 hours or more. Even waterproof sunscreen can come off when you towel off or sweat.

ii) Cover up: Wearing tightly woven, loose-fitting, and full-length clothing is a good way to protect your skin from UV rays.

iii) Wear a hat: A hat with a wide brim offers good sun protection to your eyes, ears, face, and the back of your neck – areas particularly prone to overexposure to the sun.

iv) Wear sunglasses that block 99 to 100 percent of UV radiation: Sunglasses that provide 99 to 100 percent UVA and UVB protection will greatly reduce sun exposure that can lead to cataracts and other eye damage. Check the label when buying sunglasses.

v) Seek shade: Shade is a good source of protection, but keep in mind that shade structures (e.g., trees, umbrellas, canopies) do not offer complete sun protection.

vi) Limit time in the midday sun: The sun's rays are strongest between 10 a.m. and 4 p.m. Whenever possible, limit exposure to the sun during these hours.

8.5 Cold Stress

Cold stress is similar to heat stress in that it is caused by a number of interacting factors including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Fatal exposures to cold have been reported in individuals failing to escape from low environmental air temperatures or from immersion in low temperature water. Hypothermia, a condition in which the body's deep core temperature falls significantly below 98.6°F (37°C), can be life threatening. A drop in core temperature to 95°F (35°C) or lower must be prevented.

Air temperature is not sufficient to determine the cold hazard of the work environment. The wind chill must be considered as it contributes to the effective temperature and insulating capabilities of clothing. The equivalent chill temperature should be used when estimating the combined cooling

effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the body's core temperature.

The body's physiologic defense against cold includes constriction of the blood vessels, inhibition of the sweat glands to prevent loss of heat via evaporation, glucose production, and involuntary shivering to produce heat by rapid muscle contraction.

The frequency of accidents increases with cold temperature exposures as the body's nerve impulses slow down, individuals react sluggishly, and numb extremities make for increased clumsiness. Additional safety hazards include ice, snow blindness, reflections from snow, and possible skin burns from contact with cold metal.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 95°F (35°C). This must be taken as a sign of danger to the individuals on site, and cold exposures should be immediately terminated for any individual when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Predisposing Factors for Cold Stress

There are certain predisposing factors that make an individual more susceptible to cold stress. It is the responsibility of the project team members to inform the SHO/SS to monitor an individual, if necessary, or use other means of preventing/reducing the individual's likelihood of experiencing a cold related illness or disorder.

Predisposing factors that will increase an individual's susceptibility to cold stress are listed below:

- Dehydration: The use of diuretics and/or alcohol, or diarrhea can cause dehydration. Dehydration reduces blood circulation to the extremities.
- Fatigue during Physical Activity: Exhaustion reduces the body's ability to constrict blood vessels. This results in the blood circulation occurring closer to the surface of the skin and the rapid loss of body heat.
- Age: Some older and very young individuals may have an impaired ability to sense cold.
- Poor Circulation: Vasoconstriction of peripheral vessels reduces blood flow to the skin surface.
- Heavy Work Load: Heavy workloads generate metabolic heat and make an individual perspire even in extremely cold environments. If perspiration is absorbed by the individual's clothing and is in contact with the skin, cooling of the body will occur.
- The Use of PPE: PPE usage that traps sweat inside the PPE may increase an individual's susceptibility to cold stress.
- Lack of Acclimatization: Acclimatization, the gradual introduction of workers into a cold environment, allows the body to physiologically adjust to cold working conditions.
- History of Cold Injury: Previous injury from cold exposures may result in increased cold sensitivity.

Prevention of Cold Stress

There are a variety of measures that can be implemented to prevent or reduce the likelihood of individuals developing cold related ailments and disorders. These include acclimatization, fluid and

electrolyte replenishment, eating a well-balanced diet, wearing warm clothing, the provision of shelter from the cold, thermal insulation of metal surfaces, adjusting work schedules, and personnel education.

- Acclimatization: Acclimatization is the gradual introduction of workers into the cold environment to allow their bodies to physiologically adjust to cold working conditions. However, the physiological changes are usually minor and require repeated uncomfortably cold exposures to induce them.
- Fluid and Electrolyte Replenishment: Cold, dry air can cause individuals to lose significant amounts of water through the skin and lungs. Dehydration affects the flow of blood to the extremities and increases the risk of cold injury. Warm, sweet, caffeine-free, non-alcoholic drinks and soup are good sources to replenish body fluids.
- Eating a Well Balanced Diet: Restricted diets including low salt diets can deprive the body of elements needed to withstand cold stress. Eat high-energy foods throughout the day.
- Warm Clothing: It is beneficial to maintain air space between the body and outer layers of clothing in order to retain body heat. However, the insulating effect provided by such air spaces is lost when the skin or clothing is wet.
- Work/Rest Regimes: Schedule work during the warmest part of the day, if possible. Rotate personnel and adjust the work/rest schedule to enable individuals to recover from the effects of cold stress.

The parts of the body most important to keep warm are the feet, hands, head, and face. As much as 40 percent of body heat can be lost when the head is exposed.

8.6 Earthwork - Excavation and Trenching

Project activities (test trenching) will involve excavation work. Prior to initiating excavation activities, the CS is responsible for making sure that the following conditions are in place:

i) Ensure that all above and underground utilities have been properly located prior to initiating work activities.

ii) Ensure that the Safety Inspection Checklist for Excavations has been completed prior to allowing project personnel to enter any excavation.

iii) Ensure that the proper fencing materials are available to secure each active work area.

The selected contractor's competent person shall observe all excavation and trenching operations where project personnel will enter. The competent person shall be responsible for evaluating, classifying and inspecting excavation and trenching operations to prevent possible cave-in and entrapment, and to avoid other hazards presented by excavation activities.

It is the responsibility of the CS and SHO to implement the following components of the selected contractor's Excavation and Trenching Safety Program as they relate to project activities:

i) Ensure that all excavations are completed in accordance with the approved Excavation and Trenching Safety Program.

ii) Ensure that the proper protective materials and equipment are available and being used to complete the excavation and/or trenching procedures

iii) Ensure that the necessary inspections of the excavation are completed as required.

Personnel who are required to enter or work in excavations greater than 5 feet in depth must be protected from the hazards of cave-ins. This requires the use of sloping and/or shoring systems that comply with State and Federal OSHA standards. Excavation and trenching operations require pre-planning to develop appropriate designs for such systems. The selected contractor will make the appropriate plans.

The estimated location of all underground installations shall be determined before digging begins. If there are any nearby buildings, walls, sidewalks, trees, or roads that may be threatened or undermined by the excavation, where the stability of any of these items may be endangered by the excavation, they must be removed or supported by adequate shoring, bracing, or underpinning.

Excavations may not go below the base of footings, foundations, or retaining walls, unless they are adequately supported or a person who is registered as a PE has determined that they will not be affected by the soil removal. OSHA recommends using civil engineers or those with licenses in a related discipline and experience in the design and use of sloping and shoring systems. PE qualifications shall be documented in writing and available at the Site.

The selected contractor's Excavation and Trenching Safety Program and the OSHA Excavation Standard (29 CFR 1926 Subpart P) will be followed during all excavation activities and provide detailed information regarding such activities.

Access and Egress

Personnel access and egress from trench and/or excavations are as follows:

i) A stairway, ladder, ramp, or other means of egress must be provided in excavations greater than four feet deep and for every 25 feet of lateral travel.

ii) All ladders shall extend three feet above the top of the excavation.

Atmosphere Monitoring and Testing

Air quality is measured by the following three parameters:

i) Oxygen concentration

ii) Flammability

iii) Organic vapors

There is a potential for hazardous atmospheres to exist in each proposed excavation. As such, project personnel will not be allowed to be exposed to any hazardous atmosphere. Whenever potentially hazardous atmospheres are suspected in excavations, the competent person shall test the atmosphere. A gas monitor capable of measuring the oxygen level, lower explosive limit (LEL) and toxicity will be used to take readings prior to and while workers are in any excavation. A hazardous atmosphere is defined as one that could contain less than 19.5 percent of oxygen, concentrations of hazardous substances greater than their permissible exposure level (PEL) including carbon monoxide and a LEL reading greater than ten percent. A forced air ventilator will first be used to pump fresh air into the excavation and to push out (purge) any potentially contaminated air.

In the event that an unusual odor or liquid is suspected in excavations, the competent person shall stop work and arrange for air quality assessment and mitigation, if necessary.

Daily Inspections

The competent person shall perform daily inspections of excavations, the adjacent areas, and all protective systems for situations that could potentially result in slope failure.

The competent person shall inspect, evaluate, and document (a form is provided in Attachment B) the inspection of the excavation on an Excavation Inspection Checklist at the following intervals:

i) Prior to the start of work, after each extended halt in work, and as needed throughout the shift as new sections of the excavation is opened.

ii) After every rainstorm and other natural or man-made event that may increase the load on the walls of the excavation, or otherwise affect their stability.

The competent person shall stop the work and instruct all project personnel to leave the excavation when any potential hazards are detected. The competent person has the authority to immediately suspend work if any unsafe condition is detected.

8.7 Heavy Equipment Safety

Personnel operating heavy equipment (such as drill rigs or backhoes) and personnel working in the vicinity of heavy equipment shall adhere to the following practices:

i) Heavy equipment is to be inspected when equipment is initially mobilized/delivered to a job site or after it is repaired and returned to service to ensure that it meets all manufacturer and OSHA specifications.

ii) Heavy equipment is to be inspected on a daily basis. Documentation of this daily pre-operational inspection is to be filed with the project files.

iii) Heavy equipment is only to be operated by authorized, competent operators.

iv) Seat belts are to be provided on heavy equipment that is not designed for stand up operation.

v) Equipment/vehicles whose payload is loaded by a crane, excavator, loader, etc. will have a cab shield and/or canopy to protect the operator.

vi) Personnel will not be raised/lowered in buckets.

vii) Personnel will not ride on fender steps or any place outside the cab.

viii) Before leaving the equipment controls, ensure that the equipment is in its safe resting position. For a backhoe, apply the parking brake, put the front loader bucket down on ground level, and ensure that the rear excavator bucket is locked in the travel position. Bulldozers and scraper blades, loader buckets, dump bodies, and similar equipment will be fully lowered or blocked when not in use.

ix) Before raising any booms, buckets, etc., check for overhead obstructions.

x) Project personnel involved in the operation shall not wear any loose-fitting clothing, which has the potential to be caught in moving machinery.

xi) Personnel shall wear high visibility safety vests, steel-toed shoes, safety glasses, hearing protection, and hard hats during heavy equipment operations.

xii) When moving heavy equipment or when working in tight quarters, a spotter will be used.

Overhead Electrical Clearances

If excavation work is conducted in the vicinity of overhead power lines, the power to the lines must be shut off or the equipment must be positioned and blocked such that no part, including cables, can come within the minimum clearances as follows:

Nominal System Voltage	Minimum Required Clearance
0 to 50 kV	10 Feet
51 to 100 kV	12 Feet
101 to 200 kV	15 Feet
201 to 300 kV	20 Feet
301 to 500 kV	25 Feet
501 to 750 kV	35 Feet
751 to 1,000 kV	45 Feet

8.8 Noise

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increase with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication, thereby increasing the risk of accidents on Site. The selected contractor's Hearing Conservation Program will be implemented for affected project personnel.

Control

All personnel must wear hearing protection with a Noise Reduction Rating (NRR) of at least 20 when noise levels exceed 85 dBA. When it is difficult to hear a co-worker at normal conversation distance, the noise level is approaching or exceeding 85 dBA, and hearing protection is necessary. All Site personnel who may be exposed to noise must also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss.

Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, barriers or increased distance will be used to minimize worker exposure to noise, if feasible.

8.9 Manual Lifting

When lifting objects, use the following proper lifting techniques:

i) Feet must be parted, with one foot alongside the object being lifted and one foot behind. When the feet are comfortably spread, a more stable lift can occur and the rear foot is in a better position for the upward thrust of the lift.

ii) Do not lift more than 50 pounds without the assistance of another individual.

iii) Use the squat position and keep the back straight - but remember that straight does not mean vertical. A straight back keeps the spine, back muscles, and organs of the body in correct alignment. It minimizes the compression of the guts that can cause a hernia.

iv) Grip is one of the most important elements of correct lifting. The fingers and the hand are extended around the object you're going to lift - using the full palm. Fingers have very little power - use the strength of your entire hand.

v) The load must be drawn close, and the arms and elbows must be tucked into the side of the body. Holding the arms away from the body increases the strain on the arms and elbows. Keeping the arms tucked in helps keep the body weight centered.

vi) The body must be positioned so that the weight of the body is centered over the feet. This provides a more powerful line of thrust and also ensures better balance. Start the lift with a thrust of the rear foot. Do not twist your back while lifting or moving heavy objects.

8.10 Hand and Power Tools

Hand Tools Requirements:

i) Hand tools must meet the manufacturer's safety standards.

ii) Hand tools must not be altered in any way.

iii) At a minimum, eye protection must be used when working with hand tools.

iv) Wrenches (including adjustable, pipe, end, and socket wrenches) must not be used when jaws are sprung to the point that slippage occurs.

v) Impact tools (such as drift pins, wedges, and chisels) must be kept free of mushroom heads.

vi) Wooden handles must be free of splinters or cracks and secured tightly to the tool.

Power Tools Requirements:

i) All power tools must be inspected regularly and used in accordance with the manufacturer's instructions and the tool's capabilities.

ii) Electric tools must not be used in areas subject to fire or explosion hazards, unless they are approved for that purpose.

iii) Portable electric tools must be connected to a Ground Fault Circuit Interrupter (GFCI) when working in wet areas.

iv) Proper eye protection must be used when working with power tools.

v) Personnel must be trained in the proper use of each specific tool.

vi) Any damaged or defective power tools must be immediately tagged and removed from service.

8.11 Adverse Weather Conditions

The SHO, CS and/or SS shall decide on the continuation or discontinuation of work based on current and pending weather conditions. Electrical storms, tornado warnings, and strong winds (approximately 40 mph) are examples of conditions that would call for the discontinuation of work and evacuation of site. Strong winds can generate hazardous conditions during the handling of materials.

In addition, no work with elevated super structures (e.g., operation of excavators etc.) will be permitted during any type of electrical storm or during wind events that have wind speeds exceeding 25 mph.

8.12 Working Near Water

Sediment sampling activities are to be performed while wading in the shallow water approximately 10 to 15 feet off the bank of the Niagara River, as well as in on-site ditches and ponds. All sediment sampling and sediment excavation activities shall be in compliance with OSHA 29 CRF 1926-106. The following safety guidelines shall be adhered to while conducting sediment sampling within the River:

- All personnel working on or near the bank of the River should be equipped with an approved personal flotation device.
- Prior to and after each use, the personal flotation device shall be inspected for defects which would alter their strength or buoyancy.
- Ring buoys with a minimum 90 feet of line must be readily available for emergency operations. The distance between buoys cannot exceed 200 feet.
- Due to the anticipated scope of work, a lifesaving skiff may be necessary. However, the SS in conjunction with the RSHM will evaluate current site conditions to determine if a skiff is required.
- Sediment sampling activities are only to be conducted in the presence of at least three GHD personnel, to include at a minimum a two-person sampling team and one on-shore attendant.
- Personnel entering the water should be equipped with a harness and lifeline that is tied to an appropriate structure on land.
- Personnel shall not enter the water in the spring while ice flows from Lake Erie are present. Much of the ice is not visible as flows below the surface of the River.
- Personnel shall not wade into the river further than waist deep. If sample locations or water conditions require entry into deeper water, sampling shall be deferred until conditions allow for safe entry or until a boat can be procured to safely access sampling locations.

8.13 Biological Hazards

Biological hazards may include poison ivy, snakes, thorny bushes, ticks, mosquitoes, and other pests.

8.13.1 Vegetation Overgrowth

Overgrown weeds, bushes, trees, grass and other vegetation are fire and safety hazards. There are a number of hidden hazards not immediately recognized due to the overgrowth of vegetation in areas where field activities may occur, including discarded junk, litter, and debris. Construction materials such as boards, nails, concrete, and other debris may be hidden beneath blades of tall grass, weeds, and bushes. Other hazards may include steep slopes, potholes, trenches, soft spots, dips, etc.; all dangerously concealed from the view of the individual walking or operating motorized equipment in the area. Additionally, there are biological hazards such as snakes, ticks, chiggers, and mosquitoes that breed in overgrowth conditions.

Here are some simple actions you can take:

i) Assess the work area and determine if the area requires vegetation clearance. Consider that overgrowth that extends above the lowest level of motorized equipment (i.e., bumper or fender) or 6 inches above your ankle has hidden hazards that you will not be able to readily identify.

ii) Determine if the area is safe to walk or whether you need motorized equipment. Consider the limitations of the equipment.

iii) Identify slip, trip, and fall hazards and remove from the general work area. Remember to give adequate clearance so that the items being removed do not pose future hazards.

iv) Adequately protect yourself against the hazards by wearing boots that protect the ankles, long pants, and using insecticides.

v) Consider the limitations of manual or mechanical equipment for the clearance of overgrowth, particularly the safety hazards when using sling blades, machetes, weed eaters, bush hogs, or other brush removing equipment.

Before taking any action, determine whether there any ecological issues that would affect or prevent the removal of overgrowth in protected areas such as wetlands, wildlife habitats, or sanctuaries for endangered and/or protected species.

8.13.2 Tick-Borne Diseases

Lyme Disease, Erlichiosis, and Rocky Mountain Spotted Fever (RMSF) are diseases transmitted by ticks and occur throughout the United States during spring, summer, and fall.

Lyme Disease: The disease commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island Minnesota, and Wisconsin. Few cases have been identified in other states.

Erlichiosis: The disease also commonly occurs in summer and is transmitted by the bite of infected ticks. "Hot spots" in the United States include New York, Massachusetts, Connecticut, Rhode Island Minnesota, and Wisconsin. Few cases have been identified in other states.

Primarily the Deer Tick transmits these diseases, which is smaller and redder than the common Wood Tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, swelling and pain in the joints, and eventually, arthritis. Symptoms of Erlichiosis include muscle and joint aches, flu-like symptoms, but there is typically no skin rash.

Control

Tick repellent containing diethyltoluamide (DEET) should be used in tick- infested areas, and pants legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling

action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

8.13.3 Poisonous Plants

Common Poison Ivy (Rhus radicans) grows as a small plant, a vine, and a shrub. Poison Ivy occurs in every state. The leaves always consist of three glossy leaflets. Poison Sumac (Rhus vernix) grows as a woody shrub or small tree 5 to 25 feet tall. It usually contains nine leaves, with eight paired leaves and one on top, and is common in swampy areas. The plants are potent sensitizers and can cause a mild to severe allergic reaction. This reaction is called contact dermatitis.

Dermatitis, in Rhus-sensitive persons, can result from contact with the milky sap found in the roots, stems, leaves, and fruit. The sap may retain its potency for months or years in a dry atmosphere, and can occur during any time of the year. The sap may also be carried by animals, equipment or apparel.

The best form of prevention is to avoid contact. This can occur by wearing long sleeves and gloves if necessary. Disposable clothing, such as Tyvek, is recommended in high-risk areas to avoid exposure from contaminated apparel. Barrier creams and cleaners are also recommended.

8.13.4 Insects

Construction work presents many opportunities to be exposed to a variety of insects. Many these insects may present health and safety hazards. Wasps, bees, spiders, and mosquitoes present the bulk of these hazards.

Bees and wasps present problems to people working outdoors due to being stung and having adverse reactions to the venom injected during the sting. Mosquitoes on the other hand cause hazards by transmitting disease(s) from other infected animals and humans.

It is important to recognize the venomous spiders (spiders dangerous to humans) that are present in your work environment. Inspect boots, clothing and other areas before using/entering, as spiders tend to hide in dark places. Many spiders are nocturnal.

Preventing Exposure

Preventing exposure to insects can be accomplished by the following:

i) Wearing proper clothing and PPE

ii) Inspecting work areas for wasp or bee nests prior to conducting work activities

iii) Awareness of regional insects and their behavioral habits

iv) Shaking out clothing and shoes and inspecting areas for spiders

v) Using repellants

Proper Clothing

While working outdoors it is important to wear proper clothing and PPE. Insects tend to be attracted to bright colors, floral, prints, black, white, green, tan and khaki colors. Also it is important to wear long pants and if possible a long-sleeved shirt. Personnel should tuck the pant bottoms into the tops of boots and use insect proof work gloves (leather, thick cloth, etc.).

Repellants

It is important to ensure that there is an adequate supply of insect repellent. Use insect repellent, which contains DEET. Apply it to any exposed skin as per the manufacturer's directions.

Reaction to insect bites can range from mild reactions to severe allergic reactions. In addition, mosquitoes may carry life-threatening diseases such as West Nile virus.

Bee (and Wasp) Stings

Reaction to bee stings may range from painful swelling, redness, itching all the way to shock. Swelling, redness, and itching should stop hurting within a day or two. Treatment for these items can be done at home. The treatment will involve initially removing any stinger left in the skin by scraping away from the skin and towards the venom sac (thus preventing one from squeezing more venom into the wound). Afterwards apply ice and anti-histamine cream. If irritation, swelling and/or pain persist seek medical attention.

If the victim of a bee sting is aware that they are allergic to bees, or if they begin to exhibit signs such as difficulty swallowing, difficulty breathing, abdominal cramps, nausea then they may be going into anaphylactic shock and will require medical treatment.

If personnel know that they are allergic to insects then they will be required to carry their own insect sting kit as directed by their personal physician. The victim must be taken to the hospital immediately.

Mosquito Bites

Mosquito bites can range from mild skin irritation to severe viral infections. One of the most common viruses that mosquitoes carry is the West Nile virus. West Nile virus can cause encephalitis (swelling of the brain) and meningitis (swelling of the spinal cord).

First symptoms are as follows: rapid onset of headaches, dizziness, difficulty swallowing, deep muscle aches, nausea, stiff neck, high-fever, high fever, confusion, muscle weakness. Once any of these symptoms are exhibited seek medical attention.

8.13.4.1 Poisonous Spiders

Black Widow

Black Widow spiders are not usually deadly (especially to adults) and only the female is venomous. The female spider is shiny black, usually with a reddish hourglass shape on the underside of her spherical abdomen. Her body is about 1.5 inches long while the adult male's is approximately half that. The spider's span ranges between 1 to 3 inches. The adult males are harmless, have longer legs, and usually have yellow and red bands and spots over their back, and the young black widows are colored orange and white. The bite of a black widow is often not painful and may go unnoticed. However, the poison injected by the spider's bite can cause severe reactions in certain individuals.

Symptoms

Spider bites can range from mild skin irritation to severe infections and tissue damage depending on the type of spider. New York State has only one spider that is considered dangerous to humans (the black widow). Symptoms that may be experienced include abdominal pain, profuse sweating,

swelling of the eyelids, pains to muscles or the soles of the feet, salivation and dry-mouth (alternating), and paralysis of the diaphragm. If a person is bitten, they should seek immediate medical attention. Clean the area of the bite with soap and water. Apply a cool compress to the bite location. Keep effected limb elevated to about heart level. Ask doctor if Tylenol or aspirin can be taken to relieve minor symptoms. Additional information can be obtained from the Poison Center (1-800-222-1222). Black widows are found throughout the tropics, U.S. and Canada.

8.13.5 Threatening Dogs

If you are approached by a frightened or menacing dog:

i) Do not attempt to run and don't turn your back.

ii) Stay quiet, and remember to breathe.

iii) Be still, with arms at sides or folded over chest with hands in fists.

iv) Slowly walk away sideways.

v) Don't stare a dog in the eyes, as this will be interpreted as a threat.

vi) Avoid eye contact.

vii) If you have a jacket, you could wrap it around your arm and should he snap, take the bite harmlessly.

viii) Try calling its bluff. Yell, "Sit!" "Stay!" or "Go home!" You might convince the dog that you are the stronger in the situation.

8.13.6 Rodents

Rodentia: (rats, mice, beavers, squirrels, guinea pigs, capybaras, coypu)

Rodents, or Rodentia, are the most abundant order of mammals. There are hundreds of species of rats; the most common being the black and brown rat.

The **Brown Rat** has small ears, blunt nose, and short hair. It is approximately 14 to 18 inches long (with tail). They frequently infest garbage/rubbish, slaughterhouses, domestic dwellings, warehouses, shops, supermarkets; in fact, anywhere there is an easy meal and potential nesting sites.

The **Black Rat** can be identified by its' tail, which is always longer than the combined length of the head and body. It is also slimmer and more agile than the Norwegian or Brown rat. Its size varies according to its environment and food supply.

The **House Mouse** has the amazing ability to adapt and it now occurs more or less in human dwellings. In buildings, mice will live anywhere and they are very difficult to keep out. Mice are also totally omnivorous; in other words, they will eat anything.

Rats and mice often become a serious problem in cold winter months when they seek food and warmth inside buildings. They may suddenly appear in large numbers when excavation work disturbs their in-ground nesting locations or their food source is changed.

There are six major problems caused by rats and mice:

i) They eat food and contaminate it with urine and excrement.

ii) They gnaw into materials such as paper, books, wood, or upholstery, which they use as nest material. They also gnaw plastic, cinder blocks, soft metals such as lead and aluminum, and wiring, which may cause a fire hazard.

iii) Rats occasionally bite people and may kill small animals.

iv) They, or the parasites they carry (such as fleas, mites, and worms), spread many diseases such as salmonella, trichinosis, rat bite fever, Hantavirus, Weils disease, and the bubonic plague.

v) Rats can damage ornamental plants by burrowing among the roots or feeding on new growth or twigs. They also eat some garden vegetables, such as corn and squash.

vi) Rats and mice are socially unacceptable. These rodents have been a problem for centuries, chiefly because they have an incredible ability to survive and are so difficult to eliminate. In addition, they are extremely compatible with human behavior and needs.

8.14 Aggressive or Menacing Behavior

When confronted by an individual whose behavior becomes aggressive or menacing, staff should remain as calm as possible. Avoid arguing with or physically confronting the individual. Attempt to distance yourself from the individual. Advise others in the area to leave the scene and request police assistance by having someone call 911. Use the team approach. A staff member who is physically unable to break away from an attacker should shout for help.

The use of physical force is justified when a person believes that such force is necessary to protect himself or herself against the use or imminent use of unlawful physical force by another person. The use of physical force is also justified in the defense of another party, such as a co-worker, who is being subjected to unlawful physical force. Staff members can use any technique of legal self-defense in order to halt or distract an attacker until law officers arrive on the scene.

Should an aggressor only be interested in the taking or damaging of property, do not interfere. Obtain a description of the individual to provide to local authorities, including height, weight, race, sex, clothing, accent, unusual markings such as tattoos, facial piercings, scars, hair color, and weapon, if any.

File an Incident Report with your immediate supervisor who will forward same accordingly.

9. Air Monitoring Program

This section of the HASP presents the requirements for conducting air monitoring at the Site. The air-monitoring program is designed to ensure protection for personnel working on Site as well as the surrounding community. The on-Site monitoring program will be conducted by the SHO and will consist of monitoring project personnel exposures to VOCs and dust/particulate matter. A Community Air Monitoring Plan will also be conducted at the Site and is presented in Attachment C. The air monitoring program will be completed with the use of real-time direct reading instruments.

Inhalation hazards are caused from the intake of vapors and contaminated dust. Air monitoring shall be performed during ground intrusive activities and during the handling and movement of all soils (both potentially impacted and clean). The purpose of air monitoring is to identify and quantify airborne contaminants in order to determine the level of worker protection needed. Initial screening for identification is often qualitative, but the determination of its concentration (quantification) must wait subsequent testing. Two principle approaches are available for identifying and/or quantifying airborne contaminants:

i) The use of real-time (on-Site) reading instruments (i.e., photoionization detector [PID])

ii) Laboratory analysis of air samples obtained by the use of various sampling equipment and methods

Direct reading instruments may be used to rapidly detect VOCs, and dusts. They are the primary tools of initial site characterization. The information provided by direct reading instruments could be used to institute appropriate measures (i.e., PPE, evacuation), and determine the most appropriate equipment for future monitoring. All direct reading instruments have inherent constraints in their ability to detect hazards. It is imperative that direct reading instruments are operated, and the data interpreted by qualified individuals who are thoroughly familiar with the particular devices, operating principles and limitations. At hazardous waste sites, where unknown and multiple contaminants are the rule rather than the exception, instrument readings should be interpreted conservatively. The following guidelines may facilitate accurate recording and interpretation:

i) Calibrate instruments according to the manufacturer's instruction before and after each use.

ii) Develop chemical response curves if the instrument manufacturer does not provide these. Response curves/response factors are necessary to adapt PID action levels to actual PID readings when a specific contaminant of concern is detected via air sampling and/or colorimetric evaluation.

iii) Remember that the instrument readings have limited value where contaminants are unknown. When reading unknown contaminants, report them as "needle deflection", or "positive instruments response", or "units", rather than a specific concentration (i.e., PPM). Conduct additional monitoring at any location where a positive response occurs.

iv) A reading of zero should be reported as "no instrument response" rather than "clean" because quantities of the chemicals may be present that are not detectable by the instrument.

v) The survey should be repeated with several detection systems to maximize the number of chemicals detected.

The data collected throughout the monitoring effort shall be used to determine the appropriate levels of protection.

9.1 Site Air Monitoring

During invasive activities, the SHO will perform air monitoring to evaluate the exposure of project personnel to chemical and physical hazards, verify the effectiveness of engineering controls, evaluate the effectiveness of Site control measures, and to determine the proper level of PPE. During the progress of activities, the SHO will monitor the levels of VOCs and particulate levels on an hourly basis or more frequently as necessary based on Site conditions. The following monitoring equipment will be used for this purpose:

i) A PID equipped with an 10.6 or greater eV lamp

ii) A combination oxygen, combustible gas and carbon monoxide instrument (for entering excavations)

iii) A particulate monitor

An EZ perimeter air monitoring program will be implemented. PID and particulate monitoring will be conducted on an hourly basis or more frequently as necessary at the perimeter of the EZ in order to evaluate the effectiveness of Site control measures and verifies the integrity of the Site's clean areas. If necessary, the SHO in conjunction with the SS will adjust the EZ and CRZ boundaries.

In the event that an EZ perimeter air sample identifies readings that are above background conditions then air monitoring readings will also be taken at the Site perimeter. The SHO will evaluate all air sampling results and modify operating conditions on the Site as necessary to ensure all potentially exposed receptors are within safe limits.

All instruments will be calibrated on a daily basis in accordance with the manufacturer's guidelines. Records of all calibrations and real-time measurements will be kept in a bound field logbook or documented via air monitoring and calibration log sheets. All air monitoring data collected by SHO will be filed and made available upon request.

9.1.1 Real-Time VOC Monitoring

The SHO will continuously monitor for the presence of VOCs during the handling of impacted materials and intrusive activities. PID readings will be taken in and around all EZs. In addition, a combination oxygen, combustible gas and carbon monoxide instrument will be used to monitor the air in any excavation prior to and during personnel entry into the excavation. Action levels for upgrading or downgrading of PPE have been established and Table A.2 presents the action levels for the on-Site Air Monitoring Program.

An action level is a point at which increased protection or cessation of activities is required due to the concentration of contaminants in the work area. Most activities shall be initiated in Level D. The appropriate actions will be taken at designated action levels.

In addition to the action levels, an upgrade to Level C or evacuation of the immediate area is required if:

i) Any symptoms occur

ii) Sustained readings (15 minutes or greater) occur in the worker's breathing zone that are above the applicable action levels

iii) Requested by an individual performing the task

iv) Any irritation to eye, nose, throat, or skin occurs

9.1.2 Particulate Monitoring

The particulate action levels are located in Table A.2. Dust control measures (water spray, etc.) should be implemented at the Site to control visible dust emissions. All readings should be taken in the worker's breathing zone.

9.1.3 Oxygen, Combustible Gas, and Carbon Monoxide Monitoring

Air monitoring for oxygen, combustible gas, and carbon monoxide will also be conducted during excavation and during other activities where oxygen deficient, elevated carbon monoxide readings, and/or flammable atmospheres may be encountered. The point of excavation and the immediate work area around these activities must be monitored to ensure that an adequate level of oxygen is present, and to determine if a flammable atmosphere exists, especially prior to and during any entry into an excavation. All work activity must stop where monitoring indicates the flammable vapor concentration is 10 percent of the lower explosive limit (LEL) at a location with a potential ignition source. Such an area must be ventilated to reduce the concentration to an acceptable level.

Action levels for combustible gases, oxygen, and carbon monoxide are provided in Table A.2.

10. Decontamination Procedures

In general, everything that enters the EZ at this Site must either be decontaminated or properly discarded upon exit from the EZ. All personnel, including any State and local officials must enter and exit the EZ through the CRZ. Prior to demobilization, potentially contaminated equipment will be decontaminated on a wash pad (decontamination pad) and the equipment will be inspected by the SHO before it is moved into the clean zone. A temporary decontamination facility will be constructed at the Site. Any material that is generated by decontamination procedures will be collected and stored in a designated area in the EZ until disposal arrangements are made.

The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for heavy equipment and for any reusable PPE is Alconox/Liquinox soap. The MSDSs for Liquinox and any other chemical containing products brought to the Site will be maintained on Site by the SHO.

10.1 Equipment Decontamination Procedures

All equipment that comes in contact with waste material must be decontaminated within the CRZ by high-pressure water cleaner upon exit from the EZ. Decontamination procedures will include knocking soil/mud from machines; water brush scrubbing using a solution of water and Liquinox; and a final water rinse. Personnel shall wear Level C or Modified Level D protection, as determined by the SHO, when decontaminating equipment. All decontamination wash water and residues will be carefully collected and disposed of in accordance with the appropriate environmental regulations. Following decontamination and prior to exiting from the EZ, the SHO shall be responsible for ensuring that the item has been sufficiently decontaminated. This inspection shall be included in the Site log.

10.2 Personnel Decontamination Procedures

Procedures for decontamination must be followed to prevent the spread of contamination and to eliminate the potential for chemical exposure. Personnel decontamination will be completed in accordance with the procedures that are presented below. Potentially contaminated PPE and trash will be stored in covered and labeled containers until disposal arrangements are made. It will be kept separate from trash generated in clean areas of the Site.

All disposable equipment shall be doffed before meal breaks and at the conclusion of the workday and replaced with new equipment prior to commencing work. Spent PPE will be kept in covered containers.

Personnel decontamination will take place upon exiting the contaminated work area in the CRZ.

Modified Level D decontamination procedures are as follows:

Step 1 - Remove all visible contamination and loose debris by washing with clean water.

Step 2 - Remove all outer clothing that came in contact with the contamination (i.e., boot covers and outer gloves) and either dispose of in disposable container or wash in detergent solution and rinse.

Step 3 - Remove protective clothing; dispose of in disposable container.

Step 4 -Remove inner gloves, dispose of in disposable container.

Step 5 - Wash and rinse hands.

Level C decontamination procedures to be utilized as follows:

Step 1 - Remove all visible contamination and loose debris by washing with clean water.

Step 2 - Remove all outer clothing that came in contact with the contamination (i.e., boot covers and outer gloves) and either dispose of in disposable container or wash in detergent solution and rinse.

Step 3 - Remove protective clothing; dispose of in disposable container.

Step 4 - Remove respirator, sanitize prior to reuse.

Step 5 - Remove inner gloves; dispose of in disposable container.

Step 6 - Wash and rinse hands with soap and water.

11. Emergency Response and Contingency Procedures

It is essential that project personnel be prepared in the event of an emergency. Emergencies can take many forms; illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. The following sections outline the general procedures for emergencies.

Emergency information should be posted as appropriate. Radios will be provided for contact purposes. All emergencies will be reported to the appropriate emergency responders. They may give the selected contractor further direction as to the responsibilities during any emergency situation. In general, project personnel will shut down equipment and evacuate to a safe pre-determined meeting area (rally point) during Site emergencies.

The SHO will contact and meet on-Site with local emergency response agencies (e.g., fire department, police department, etc.) prior to initiating construction activities. The purpose of this meeting is to inform these local authorities of the nature of the work and potential risks, to ensure that these responders are equipped to respond to a Site emergency, and to identify and resolve any potential problems, concerns, or conflicts.

The SHO will be informed of Site hazards and activities prior to project initiation so those emergency situations can be handled most efficiently. A general orientation meeting to discuss emergency response procedures is to be held prior to initiating project activities.

The SHO will notify all project personnel of the emergency through radio/cell phone communications. Radios and cell phones will be taken to the rally point to enable further receipt of instruction(s) from the SHO.

11.1 Accident, Injury and Illness Reporting

Any work-related incident, accident, injury, illness, exposure, or property loss shall be immediately reported to your supervisor, the SHO and the SS. The SS and/or SHO will report the accident details to the RSHM and will submit a completed accident report form to GHD. The sample Incident Reporting Form is provided in Attachment B. The selected contractor may use their own company-specific form if they so choose. The report must be filed for the following circumstances:

i) Accident, injury, illness, or exposure to project personnel

ii) Injury to any subcontractor personnel

iii) Damage, loss, or theft of property

iv) Any motor vehicle accident regardless of fault, which involves a company vehicle, rental vehicle, or personal vehicle while the individual is acting in the course of employment

The SHO and PM will investigate occupational accidents resulting in employee injury or illness. This investigation will focus on determining the cause of the accident and modifying future work activities to eliminate the hazard.

All project personnel have the obligation and right to report unsafe work conditions, previously unrecognized safety hazards, or safety violations of others. If you wish to make such a report, it may be made orally to your supervisor or other member or management, or you may submit your concern in writing, either signed or anonymously.

11.2 Emergency Contacts

Fire Department 911

Police Department 911

Ambulance 911

Hospital: Kenmore Mercy Hospital ..... (716) 447-6121

See Figure 1 – Hospital Route Map Directions to the Hospital.

Communication between work areas and the command post, located within the CZ, will be via verbal communication, auto horn, or two-way radio. The SHO will use a mobile telephone to communicate with outside emergency and medical facilities.

The following signals shall be established for use with auto or compressed air-type horns:

i) 3 Blasts: evacuate exclusion zones and meet at the designated evacuation area

ii) An "All Clear" will be conveyed by radio communication

11.3 Additional Emergency Numbers

GHD Incident Reporting Hotline	(866) 529-4886
National Response Center (NRC)	(800) 424-8802
Poison Information	(800) 764-7661
Utility Locating Commission (One Call Nationwide)	811
Agency for Toxic Substances & Disease Registry (24 Hours)	(404) 488-4100
U.S. EPA Emergency Response	(800) 424-8802
State of New York Emergency Response Commission	(513) 457-9996
NYSDEC Site Representative (TBD)	(716) 851-7220
Project Manager (Jim Kay)	(519) 884-0510
Regional Corporate Safety and Health Manager (Craig Gebhardt)	(716) 297-6150
Contractor Site Superintendent (TBD)	TBD
Contractor Safety and Health Officer (TBD)	TBD

11.4 Emergency and First Aid Equipment

Emergency safety equipment will be available for use by project personnel and will be located and maintained on Site. The safety equipment will include, but is not limited to, the following:

i) Portable emergency eye wash and drench shower (pressurized)

ii) Two 20-pound ABC type dry chemical fire extinguishers

iii) Field eye wash/flush bottles

iv) Approved first-aid kit for a minimum of twenty personnel

v) Fire blanket

vi) Spill response kit containing absorbent materials (booms/socks, pads, and earth/clay), overpack drum, shop vacuum, and hand tools (shovel, rake/hoe, etc.)

vii) Portable air horn

11.5 Project Personnel Responsibilities During Emergencies

Safety and Health Officer (SHO)

As the administrator of the HASP, the SHO has primary responsibility for responding to and correcting emergency situations. The SHO will:

i) Take appropriate measures to protect personnel including: posting of acceptable Site evacuation routes, withdrawal from the EZ, total evacuation and securing of the Site or upgrading or downgrading the level of protective clothing and respiratory protection.

ii) Take appropriate measures to protect the public and the environment including isolating and securing the Site, preventing runoff to surface waters, and ending or controlling the emergency to the extent possible.

iii) Ensure that appropriate Federal, State, and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted.

iv) Ensure that appropriate decontamination treatment or testing for exposed or injured personnel is obtained.

v) Determine the cause of the incident and make recommendations to prevent the reoccurrence.

vi) Ensure that all required reports have been prepared.

11.6 Medical Emergencies

Any person who becomes ill or injured in the EZ must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed as much as possible without causing further harm to the patient. First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the SHO, SS and PM.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and a copy of the identified chemicals on Site to which they may have been exposed.

Any vehicle used to transport contaminated personnel, will be cleaned or decontaminated as necessary.

11.7 Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the SHO or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on Site.

If it is safe to do so, Site personnel should:

i) Report to the PM

ii) Use fire-fighting equipment available on Site

iii) Remove or isolate flammable or other hazardous materials, which may contribute to the fire

11.8 Spill Control and Countermeasures

If a spill has occurred, the first step is personal safety, then controlling the spread of contamination if possible. Project personnel will immediately contact Site management to inform them of the spill and activate emergency spill procedures.

General Spill Response Procedures

If a spill occurs, the following general procedures will be followed:

i) Notify the SHO, SS and PM

ii) Evacuate immediate area of spill

iii) Determine the needed level of PPE

iv) Don required levels of PPE and prepare to make entry to apply spill containment and control procedures

v) After obtaining the proper spill response tools (shovels, booms and pads, absorbent socks, etc.) and PPE, personnel will attempt to contain the spill so that it does not enter any conveyance (sewer, drainage ditch, etc.) that eventually discharges to surface water

vi) Locate and abate source of spill

vii) Absorb or otherwise clean up the spill and containerize the material, sorbent, and affected soils

viii) Clean and decontaminate the affected area(s)

ix) Replace used/spent spill kit contents

All spill material and debris will be managed in a manner that complies with applicable federal, state, and local environmental rules regarding recycling or disposal of wastes.

The SHO and SS have the authority to commit resources as needed to contain and control released material and to prevent its spread to off-Site areas.

12. Recordkeeping

The SHO shall establish and maintain records of all necessary and prudent monitoring activities as described below:

i) Name and job classification of the employees involved on specific tasks

ii) Records of fit testing and medical surveillance results for project personnel

iii) Records of all OSHA and other applicable safety training certifications for project personnel

iv) Records of daily Site safety inspections

v) Records of training acknowledgment forms and daily safety meetings

vi) Emergency report sheets describing any incidents or accidents

vii) Air monitoring equipment calibrations

viii) Air monitoring data

Table A.1

Properties of Potential Site Contaminants

Chemical Name (Synonyms)	Concentration at Site	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
cis-1,2-Dichloroethene Acetylene dichloride 1,2-Dichloroethylene CAS-540-59-0	2.7 ppm	TLV: 200 ppm PEL: 200 ppm STEL: NE IDLH: 1000 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Irritation of the eyes and respiratory tract. CNS depression. Exposure could cause lowering of consciousness. CHRONIC: Defatting of the skin. May cause damage to liver.	(FP) 36-39°F (VP) 180-265 mm (IP) 9.65 eV (UEL) 12.8% (LEL) 5.6%	Colorless liquid (usually a mixture of the cis and trans isomers) with a slightly acrid, chloroform-like odor.
Acetone 2-Propanone Methyl ketone Dimethyl ketone CAS-67-64-1	0.7 ppm	TLV: 500 ppm PEL:1,000 ppm STEL:750 ppm IDLH: 2,500 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Vapors irritating to eyes and respiratory tract. May cause headaches and dizziness, effects on CNS, liver, kidneys and gastrointestinal tract. CHRONIC: Prolonged contact causes defatting of the skin, possibly dermatitis. Substance may affect blood and bone marrow.	(FP) 0°F (VP) 180 mm (IP) 9.69 eV (UEL) 12.8% (LEL) 2.5%	Colorless liquid, with a fragrant mint-like odor.
Benzene Benzol CAS-71-43-2	66 ppm	TLV: 0.5 ppm [skin] PEL: 1 ppm STEL: 2.5 ppm IDLH: 500 ppm	Inhalation Absorption (skin) Ingestion	ACUTE: Irritation to eyes, skin, respiratory tract; dizziness; headache; nausea; staggered gait; fatigue, abdominal pain. CHRONIC: Defatting of the skin, may have effects on bone marrow and immune system, decrease in blood cells. Carcinogenic to humans.	(FP) 12°F (VP) 75 mm (IP) 9.24 eV (UEL) 7.8% (LEL) 1.2%	Colorless to light-yellow liquid with an aromatic odor. Solid below 42°F.
Chrysene CAS-65996-93-2 218-01-9	47 ppm	TLV: -(L) PEL: 0.2 mg/m3 benzene - soluable fraction STEL: NE IDLH: 80 mg/m3	Inhalation Skin contact Eye contact	ACUTE: Bronchitis. CHRONIC: Dermatitis, may cause damage to bladder, kidneys and lungs. Potential occupational carcinogen	(FP) Varies (VP) NE (IP) Varies (UEL) NE (LEL) NE	Black or dark brown amorphous residue. A polycyclic aromatic hydrocarbon (PAH). Pure chrysene is a colorless crystalline solid that is virtually insoluble in water. Animal Carcinogen.
Ethylbenzene Ethylbenzol EB CAS-100-41-4	60 ppm	TLV: 20 ppm PEL: 100 ppm STEL: NE IDLH: 800 ppm	Inhalation Ingestion Skin contact Eye contact	ACUTE: Causes irritation of the eyes, skin, mucous membranes, and respiratory tract. Effects on CNS. CHRONIC: Defatting of the skin, narcosis, and coma.	(FP) 55°F (VP) 7 mm (IP) 8.76 eV (UEL) 6.7% (LEL) 0.8%	Colorless liquid with an aromatic odor.

Notes:

FP	FP - Flash Point	PEL	PEL - OSHA Permissible Exposure Limit
IDLH	IDLH - Immediately Dangerous to Life ord Health	STEL	STEL - Short Term Exposure Limit
IP	IP - Ionization Potential	TLV	TLV - ACGIH Threshold Limit Value
NE	NE - Not Established (Information Not Available)	VP	VP - Vapor Pressure
NA	NA - Not Applicable	C	C - Ceiling Exposure Limit
CNS	CNS - Central Nervous System	[skin]	[skin] - potential for dermal absorption
PNS	PNS - Peripheral Nervous System	mm	mm - milimeters Hg (mercury)
ppm	ppm - parts per million	eV	eV - electrovolts
mg/m3	mg/m3 - miligrams per cubic meter		

Table A.1

Properties of Potential Site Contaminants

Chemical Name (Synonyms)	Concentration at Site	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Fluoranthene (PAH)	150 ppm	TLV: 0.2 mg/m3 PEL: 0.2 mg/m3 STEL: NE IDLH: NE	Absorption Inhalation Ingestion	ACUTE: Dermatitis and bronchitis CHRONIC: Cancer of lungs, skin, bladder and kidneys. Skin carcinogen.	(FP) NE (VP) NE (IP) NE (UEL) NE (LEL) NE	Colored needles, light yellow, fine crystals.
Methylene Chloride DMC Dichloromethane CAS-75-09-2	2.6 ppm	TLV: 50 ppm PEL: 25 ppm STEL: NE IDLH: 2,300 ppm	Inhalation Ingestion Absorption	ACUTE: Irritation of the eyes, skin and respiratory tract. Exposure could cause lowering of consciousness and formation of carboxyhemoglobin, fatigue and unnatural drowsiness. CHRONIC: Dermatitis. May cause damage to CNS and liver. Possible human carcinogen.	(FP) NE (VP) 350 mm (IP) 11.32 eV (UEL) 23.0% (LEL) 13.0%	Colorless liquid with a chloroform-like odor. Gas above 104°F.
Naphthalene Naphthalin Coal tar White tar CAS-91-20-3	270 ppm	TLV: 10 ppm PEL: 10 ppm STEL: 15 ppm IDLH: 250 ppm	Inhalation Ingestion Skin contact Absorption Eye contact	ACUTE: Levels above 10 ppm may cause: Inhalation - Headache, nausea, excessive sweating and vomiting; Skin - May cause irritation and if hypersensitive to naphthalene then severe irritation may occur; Eyes - Irritation. Direct contact may cause blurring vision and damage to the cornea; Ingestion - Nausea, vomiting, abdominal pain, bladder irritation, and brown or black coloration of urine. CHRONIC: Clouding of the eyes. Chronic skin problems in cases of hypersensitivity. Liver and kidney damage.	(FP) 174°F (VP) 0.08 mm (IP) 8.12 eV (UEL) 5.9% (LEL) 0.9%	Colorless to brown solid with an odor of mothballs. Sometimes found as a crystalline white solid. Shipped as a molten solid.
Polyaromatic Hydrocarbons PAHs Coal Tar Pitch Volatiles CAS-65996-93-2	1350 ppm (Maximum cumulative concentration)	TLV: 0.2 mg/m3 PEL: 0.2 mg/m3 STEL: NE IDLH: 80 mg/m3	Inhalation Ingestion	ACUTE: Bronchitis. CHRONIC: Dermatitis, may cause damage to bladder, kidneys and lungs. Potential occupational carcinogen.	(FP) Varies (VP) NA (IP) Varies (UEL) NA (LEL) NA	Black or dark brown amorphous residue. Properties vary depending upon specific compound.
Phenanthrene Coal tar pitch volatile CAS-65996-93-2	180 ppm	TLV: 0.2 mg/m3 PEL: 0.2 mg/m3 STEL: NE IDLH: 80 mg/m3	Inhalation Absorption Ingestion Skin/mucus membrane contact	ACUTE: Photosensitivity; nausea; headache; dizziness CHRONIC: Mutagen (may cause birth defects); eye damage. Potential occupational carcinogen.	(FP) 340 F (VP) 1 mm (IP) 7.8 eV (UEL) NE (LEL) NE	White crystalline solid with a faint aromatic odor

Notes:

FP	FP - Flash Point
IDLH	IDLH - Immediately Dangerous to Life ord Health
IP	IP - Ionization Potential
NE	NE - Not Established (Information Not Available)
NA	NA - Not Applicable
CNS	CNS - Central Nervous System
PNS	PNS - Peripheral Nervous System
ppm	ppm - parts per million
mg/m3	mg/m3 - miligrams per cubic meter
PEL	PEL - OSHA Permissible Exposure Limit
STEL	STEL - Short Term Exposure Limit
TLV	TLV - ACGIH Threshold Limit Value
VP	VP - Vapor Pressure
C	C - Ceiling Exposure Limit
[skin]	[skin] - potential for dermal absorption
mm	mm - milimeters Hg (mercury)
eV	eV - electrovolts

Table A.1

Properties of Potential Site Contaminants

Chemical Name (Synonyms)	Concentration at Site	Exposure Limits	Routes Of Entry	Symptoms/Health Effects	Chemical Properties	Physical Characteristics
Pyrene (PAH) CAS-65996-93-2	99 ppm	TLV: 0.2 mg/m3 PEL: 0.2 mg/m3 STEL: NE IDLH: NE	Absorption Inhalation	ACUTE: Dermatitis and bronchitis CHRONIC: Cancer of lungs, skin, bladder and kidneys. Skin carcinogen.	(FP) NE (VP) NE (IP) NE (UEL) NE (LEL) NE	Colorless to light yellow solid or off-white solid.
Toluene Methylbenzene Toluol CAS-108-88-3	140 ppm	TLV: 20 ppm PEL: 200 ppm STEL: NE IDLH: 500 ppm	Inhalation Ingestion Absorption	ACUTE: Irritation to eyes and respiratory tract. Ingestion may cause chemical pneumonitis. Affects CNS. Unconsciousness and cardiac dysrhythmia at high level exposures. CHRONIC: Defatting of the skin. Affects CNS. Enhanced hearing damage.	(FP) 40°F (VP) 21 mm (IP) 8.82 eV (UEL) 7.1% (LEL) 1.1%	Colorless liquid with a sweet, pungent, benzene-like odor.
Vinyl Chloride Chloroethene VCM Chloroethylene CAS-75-01-4	2.2 ppm	TLV: 1 ppm PEL: 1 ppm STEL: NE IDLH: NE	Inhalation Skin contact Eye contact	ACUTE: Irritation to eyes. Affects CNS. May cause unconsciousness. CHRONIC: Affects liver, spleen, blood and peripheral blood vessels, tissue and bones in fingers. Human carcinogen.	(FP) NA (gas) (VP) 3.3 atm (IP) 9.99 eV (UEL) 33.0% (LEL) 3.6%	Colorless gas or liquid (<7°F) with a pleasant odor at high concentrations.
Xylene (o;m;p isomers) CAS-106-42-3	100 ppm	TLV: 100 ppm PEL: 100 ppm STEL: 150 ppm IDLH: 900 ppm	Inhalation Absorption Ingestion	ACUTE: Irritation to eyes and respiratory tract. Ingestion may cause chemical pneumonitis. Affects CNS. CHRONIC: Defatting of the skin, lung damage resulting in chronic bronchitis. Affects CNS and blood.	(FP) 90/82/81°F (IP) 7/9/9 mm (IP) 8.56eV (UEL) 6.7% (LEL) 0.9%	Colorless liquid with an aromatic odor. (p-isomer solid <56°F).

Notes:

FP	FP - Flash Point
IDLH	IDLH - Immediately Dangerous to Life ord Health
IP	IP - Ionization Potential
NE	NE - Not Established (Information Not Available)
NA	NA - Not Applicable
CNS	CNS - Central Nervous System
PNS	PNS - Peripheral Nervous System
ppm	ppm - parts per million
mg/m3	mg/m3 - miligrams per cubic meter
PEL	PEL - OSHA Permissible Exposure Limit
STEL	STEL - Short Term Exposure Limit
TLV	TLV - ACGIH Threshold Limit Value
VP	VP - Vapor Pressure
C	C - Ceiling Exposure Limit
[skin]	[skin] - potential for dermal absorption
mm	mm - milimeters Hg (mercury)
eV	eV - electrovolts

Table A.2

On-Site Air Monitoring Program Action Levels
Health and Safety Plan
Tonawanda Coke Site, NYSDEC Site #915055

Monitoring Device	*Action Level*	*Action*
Photoionization Detector (PID)	**Benzene present in the Breathing Zone:**	Determine via Colorimetric Sampling
10.6 or greater eV lamp	<1.0 ppm or Background	Full-Face Respirator Available
Detector Tubes	≥1.0 ppm and ≤5 ppm	Full-face air purifying respirator Level C PPE MSA GME P100 Cartridge
	>5 ppm and <500 ppm	Supplied air respirator Level B PPE. Implement additional engineering controls
	≥500 ppm	Shut down activities. Notify SHO. Implement additional engineering controls
	Benzene not present in the Breathing Zone:	Determine via Colorimetric Sampling
	<10 ppm or Background	Full-Face Respirator Available
	≥10 ppm and <50 ppm	Wear Full-Face Respirator - Level C PPE
	≥50 ppm and <1,000 ppm	Wear Supplied Air Respirator - Level B PPE, Implement Additional Engineering Controls
	≥1,000 ppm	Shut down activities. Notify SHO. Implement additional engineering controls
	Vinyl Chloride present in the Breathing Zone:	Determine via Colorimetric Sampling
	<1 ppm or Background	No Action Required - Continue Monitoring
	≥1 ppm	Level B - Continue Monitoring
Dust/Particulate - (Impacted Soils/Sludges/Sediments)	<2.0 mg/m³ or Background	Full-Face Respirator Available
	≥2.0 mg/m³ and <50 mg/m³	Wear Full-Face Respirator - Level C PPE
	>50 mg/m³	Wear Supplied Air Respirator - Level B PPE, Implement Additional Engineering Controls
Hydrogen Sulfide	>5 ppm	Shut down activities. Notify SHO. Implement additional engineering controls
Carbon Monoxide	>35 ppm	Shut down activities. Notify SHO. Implement additional engineering controls
Combustible Gas Indicator	>10 Percent LEL	Cease operations and move to a safe place. Notify SHO. Do not continue working until conditions are constantly below 10 percent LEL
Oxygen Meter	<19.5 Percent or >23.5 Percent When oxygen levels are outside this range, percent LEL readings are not reliable	Cease operations and move to a safe place. Notify SHO. Do not continue working until oxygen levels are between 19.5 and 23.5 percent

If GHD is unable to identify/quantify the contaminants, supplied air will be required when the PID reading is greater than background, as the contaminant will be unknown and NIOSH, OSHA, and the manufacturer's use requirements for Level C (air purifying respirators) will not be met. If PID readings subside, workers can downgrade as necessary. GHD will upgrade to supplied air and attempt to obtain additional information for possible chemicals present in GHD's work area. The Owner will need to provide/obtain additional information as to the identity of the contaminant(s) in order to permit the use of Modified D and/or Level C.

Notes:

SHO Safety and Health Officer
LEL Lower Explosive Limit
PPE Personnel Protective Equipment
ppm parts per million

Attachments

Attachment A
Job Safety Analyses (JSAs)

Job **Safety Analysis (JSA)**

Boat Safety

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Sampling activities on water				
Key equipment:	Sunglasses, sun screen; CSA approved Life Jacket or PFD				
Task-specific training:	Towing and Trailering, Boating Safety				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☐ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☐ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☐ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		*see key equipment

Project development team		Modified by	Reviewed by	Date
Name	Signature			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Mob equipment to boat launch	• Over loading boat capacity • Inclement weather • Lifting hazards • Manual material handling • Back injury • Pinch points • Moving or flying projectiles inside vehicle while transporting equipment • Slip/trip/fall hazards • Fuel spill	• Review boat capacity and complete weight survey including personnel and gear • Monitor weather forecasts • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Ensure all equipment is properly secured during transport • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing • Refuel in appropriate location, no sparks or static buildup • Practice STAR	Competent operator and Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
2	Launch boat	• Lifting hazards • Manual material handling • Back injury • Pinch points • Moving or flying projectiles inside vehicle while transporting equipment • Slip/trip/fall hazards • Fuel spill • Drowning	• Practice STAR • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing • Review JSA for proper fueling • Wear appropriate PFD or life vest • Bring boating safety kit	Competent operator	
3	Navigate boat to site	• Causing unnecessary wake • Running aground • Disturbing others • Drowning	• Obey posted signage • Follow channel marked with buoys • Follow proper boating etiquette • Practice STAR • Wear appropriate PFD or life vest • Bring boating safety kit • Remain seated	Competent operator	
4	Perform sampling activities	• Tipping boat • Boating traffic	• Remain seated when operating; If the boat tips over, remain with the boat • Be aware of surroundings, verify water depth in shallow waters	Field Staff	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
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Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Confined Space Entry of ASTs

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Construction activities				
Key equipment:	Four gas or five gas monitors, rescue equipment, communication devices, first aid kit, CSE Permit, CSE Co-ordination Document, CSE Hazard Assessment Form				
Task-specific training:	Air Monitoring, CSE Operations, PPE, First Aid				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☒ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☒ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☒ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Prepare to enter confined space	• Low oxygen levels • Flammable or explosive conditions • Organic vapors • Limited access • Falls • Engulfment • Limited communication • Injury or death	• Ensure that a CSE Hazard Assessment has been completed and review prior to issuing the CSE Permit • Ensure CSE Permit is completed, and all hazards controlled • Ensure that CSE crew is adequately trained • If more than one contractor is entering the space, ensure that a Coordination Document has been completed and reviewed by all • Use SMART/STAR, pre entry briefing, check qualifications, review plan and rescue, and document this meeting • Consult the site specific HASP and confined space entry procedures • Ensure the gas meter selected is correct for the items identified • Ensure meter has been properly calibrated and documented • Ensure retrieval and safety equipment is correct for the tasks and in good order • Enter area to perform work only when you are certain conditions are safe; only workers current in confined space training may enter • If uncertain or untrained on the specific meter being used or if you have concerns over meter functioning correctly or you receive readings of concern, exercise SWA, relocate to a safe area, and contact your site supervisor or regional safety supervisor • Follow specific procedures outlined in the Hasp and confined space entry procedures to ensure there is no risk of engulfment, entrapment, or hazardous atmosphere • Reduce distance traveled when carrying materials • Make sure grip is adequate; use gloves to enhance grip when necessary • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing	Senior Field Team Leader/Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
2	Continued monitoring of work area	• Low oxygen levels • Flammable or explosive conditions • Organic vapors • Limited access • Falls • Engulfment • Limited communication • Injury or death	• While performing work tasks keep meter with you and record readings at predetermined times • Stay in constant communication with your attendant • If job conditions change or meter alarms, exercise SWA, move to a safe location, notify the site supervisor, and reevaluate the task • If emergency evacuation is required, initiate rescue procedures • Re-enter only when certain safe conditions exist • Do not enter if a permit is not completed and signed by the entry supervisor	Field Staff/Entrant	
3	Completion of work or end of work day	• Low oxygen levels • Flammable or explosive conditions • Organic vapors • Limited access • Falls • Engulfment • Limited communication • Injury or death	• Perform post entry briefing, document readings and time; complete and file paper work • Ensure entrance to confined space is blocked and post signage to prevent unauthorized entry or accidental falls • Remove and safely store retrieval and safety equipment • Follow all requirements of the HASP and confined space entry procedures	Field Staff	

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Name/Company	Sign	Date

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Presenter signature: _____ Date/time: _____

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Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Decontamination of Sampling Equipment and Personnel (PPE Level D)

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Decontamination of sampling equipment and personnel (PPE Level D)				
Key equipment:	Alconox/Liquinox, brushes, potable water				
Task-specific training:	Decontamination/Site Control; Quality Control/Sampling Plan				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Decontamination of sampling equipment (including pumps, bailers, tubing, etc.)	• Contaminant exposure • Pinch points • Slip/trip/hit/fall hazards • Lifting hazards • Back injury • Manual material handling	• Set up decon station to capture any spills to avoid cross-contamination and manage wastes • Wear appropriate PPE • Scrub equipment clean then rinse and verify it is clean and free of contamination • Avoid putting hands in or near pinch points • Maintain good housekeeping and be aware of surroundings • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical means, such as a dolly, cart, or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Refer to the HASP for additional lifting techniques	Field Staff	
2	Decontamination of personnel	• Contaminant exposure • Slip/trip/hit/fall hazards	• Refer to the HASP for specific procedures but in general start with most contaminated article and remove until inner gloves are the last item left • Dispose of used PPE in accordance with site requirements • Wash hands and face before eating, drinking, or using tobacco products • Take care when removing PPE (boots, gloves, etc.); sit down to remove/change boots as necessary	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Management of waste derived from decontamination activities	• Contaminant exposure • Lifting hazards • Back injury • Manual material handling	• Containerize decon waste (e.g., water, used PPE) as required • Properly dispose of decon fluids (e.g., sediments) • Refer to step 1 and the HASP for additional lifting information	Field Staff	

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Location of mustering point: _____ Wind direction (current): _____

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Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Excavation Oversight

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Excavation oversight				
Key equipment:	Excavator; Excavation Safety Checklist;				
Task-specific training:	40-Hour and 8-Hour HAZWOPER; PPE; Mobile Equipment Operations; Excavation Safety Training; Excavation Competent Person; Confined Space Entry				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Perform the STAR process; discuss SWA; verify Permit to Excavate and Utility Clearance Form is completed (overhead and underground); verify excavation layout	• Underground utility strike • Overhead utilities	• QSF 019 and Permit to Excavate Forms completed and signed off • Utility Locate Ticket number on file within 10 days of excavation startup? • Mark work area and safe distances for overhead lines; use spotter as necessary	Senior Field Team Leader	
2	Set up necessary work area and traffic controls	• Fall-in • Caught-between • Struck-by • Lifting hazards • Manual material handling • Back injury	• Demarcate site and work areas to ensure that personnel and truck/equipment traffic is maintained safely and smoothly • Stockpile and laydown area are set up properly • Perform a pre start meeting, inform subcontractor of safe lifting practices • Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves when setting up barricades • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one handed carrying if possible; maintain awareness of footing	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Hand digging and potholing activities (where/if necessary based on utility locates)	• Underground utility strike	• Use preventive techniques • Maintain proper utility clearances with heavy equipment and use hand digging/potholing when necessary • Refer to step 2 and the HASP for additional lifting information	Field Staff	
4	Heavy equipment operations to excavate and handle soils and waste materials	• Caught-between and struck-by hazards • Underground/overhead utilities	• Stay out of swing radius • Use spotters to verify clear route of travel and work area • Maintain eye contact with operator and/or signal operator • Keep soil 2 feet from edges • Inspect heavy equipment and document inspection • Ensure the above utility clearances and safe work protocols are followed	Field Staff	
5	Excavating activities	• Soil cave-in • Noise hazard • Struck-by/against hazards • Potential contact with chemical waste material, organic vapors, and particulate	• Keep proper distances from edge of excavation • Limit equipment operations in trench area • Keep work area free of trip hazards • Perform necessary soil classification • Use hearing protection as necessary • Wear designated PPE and conduct air monitoring	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
6	Excavation entry activities (if required)	• Soil cave-in • Struck-by/against hazards • Hazardous atmospheres • Slip/trip/fall hazards • Emergency egress	• Keep proper distances from edge of excavation • Limit equipment operations in trench area • Keep work area free of trip hazards • Perform necessary soil classification • Use daily inspection form to document/meet competent person inspection requirements • Inspect trench after any change in conditions (e.g., rain, equipment vibrations) • Provide fall protection measures • Utilize shoring equipment properly – ensure that tabulated data sheet is on site • Use 4 gas monitor and PID to screen excavation air prior to and during entry • Ladder safety and proper slope of ladder • Use harness and lifeline when entering trenches over 5 feet deep	Field Staff	

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Presenter signature: _____ Date/time: _____

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Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Sediment Sampling Within Stormwater Ditch/Pond

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Sediment sampling within Ditch or Stormwater Pond				
Key equipment:	Hand auger/split spoon sampler, bucket, PPE, sample containers; Hip waders				
Task-specific training:	GHD Field Method Training Sampling Procedures, SMART Procedures				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☒ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Use SWA to stop any work that is unsafe • Discuss PPE requirements • Work gloves required at all times • No fixed open blade knives (FOBKs) allowed	Senior Field Team Leader	
2	Inspect and calibrate sampling and monitoring equipment	• Lost time from improperly functioning equipment • Incorrect sampling procedures/ collection due to malfunctioning equipment	• Ensure all equipment is functioning properly; complete Quality Control documents	Field Staff	
3	Establish Access/Egress Routes into ditch/pond by placing rope and/or ladders on side slopes	• Hand Injury • Pinch points • Back strains • Property damage • Gravity hazards • Biological hazards	• Wear work gloves at all times • Be aware of hand placement • When placing ladder, do not overextend the load away from body. • Check tie off point to ensure integrity. Tie rope and/or ladder off to a rigid object • To extent possible, place ladder feet on bottom of pond/slope. Tie off ladder to prevent further movement/slippage • Be aware of bees, wasps, etc. Use bug spray as needed	Field Staff	
4	Entering Ditch/Pond	• Injury • Slips/Trips/Falls • Limited access/egress • Biological hazards	• Wear required PPE including hard hat • Wear work gloves and be aware of hand placement at all times • Utilize pathway which is free of slip/trip hazards to the extent possible. Communicate any encountered potential slip/trip hazards to other field	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
			team members • Maintain 3 points of contact at all times • Ensure ladder or rope to aid entry is secure • Ensure access/egress routes have been established prior to entering pond • Be aware of surroundings and assess presence of other potential biological hazards		
5	Lowering Equipment down slope into ditch/pond	• Injury • Gravity hazards and impact injury • Back strain • Damaged Equipment	• Position one person at the top of the slope and one near the bottom. The person at the bottom of the slope should be positioned out of the pathway should equipment fall to prevent impact injury • Wear work gloves at all times • Lower equipment slowly in controlled manner using a rope or by hand • Do not overextend when lowering equipment • Avoid dropping equipment, lower carefully and in controlled manner • Verbally communicate with team members when equipment is being lowered	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
6	Walking in Ditch/Pond to Sample Location	• Slips/trips/hit/fall hazards • Heat stress • Biological hazards • Wildlife encounters • Potential adverse weather conditions	• Use buddy system while in ditch/pond • Spot check to identify hazards, establish pathways which is most free of slip and trip hazards, beware of trip hazards, keep work areas free of clutter, communicate hazards to on-site personnel • Be aware of surroundings • Ensure stable footing is present before proceeding • Heightened awareness of wasps, ants, bees, ticks, spiders, other animals and poison plants and use bug spray as necessary • Perform a thorough self-examination for ticks at the end of the day • Monitor for heat stress, establish work/rest regimes, wear heat stress PPE, and have liquids available • Be aware of any rapidly changing environmental conditions and respond accordingly	Field Staff	
7	Advancing hand auger or post-hole digger	• Overhead and underground utilities • Lifting hazards • Back injury • Manual material handling • Improper hand auger operation • Dust/flying debris/contaminants	• Inspect route to be traveled • Use precaution when advancing hand auger/post-hole tool • Assess the potential for underground structures (i.e., utilities) at the sign of unusual resistance • Do not work under overhead utilities • Know the length of the hand auger/post-hole tool and how close it could come to utilities • Use proper bending/lifting techniques by bending and lifting with legs and not with back • Do not twist at waist when turning the auger • Dust particles may become airborne; if dust becomes excessive, use a dust mask • When pulling the hand auger/post-hole out of the boring, materials can become airborne	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
			• Pull up slowly using your legs • Do not jerk the hand auger/post-hole out of the hole • Get assistance if you cannot maintain proper posture by yourself • Wear nitrile gloves under high-visibility work gloves when advancing the hand auger/post-hole tool to avoid dermal contact with potential contaminants		
8	Sample collection	• Contaminant exposure • Cuts from container breakage • Sample misidentification • Pinch Points • Lost time due to incorrect sample selection	• Wear nitrile gloves when handling sample containers and replace between soil samples • Inspect glass bottles for breaks/cracks • Do not attempt to use any suspect containers • Close glass sample containers carefully to avoid breakage • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid) • Confirm selected samples are correct based on work plan selection criteria, PID readings, and soil boring logs • Check sample labels for accuracy prior to placing in cooler	Field Staff	
9	Removing Equipment from ditch/pond	• Injury • Gravity hazards and impact injury • Back strain • Damaged Equipment	• Position one person at the top of the slope and one near the bottom. The person at the bottom of the slope should be positioned out of the pathway should equipment fall to prevent impact injury • Wear work gloves at all times • Raise equipment slowly in controlled manner using a rope or by hand • Do not overextend when raising equipment • Avoid dropping equipment, raise carefully and in controlled manner • Verbally communicate with team members when equipment is being lowered	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
10	Exiting Ditch/Pond	• Injury • Slips/Trips/Falls • Sloped sidewalls • Limited access/egress • Biological hazards	• Wear required PPE including hard hat • Wear work gloves and be aware of hand placement at all times • Utilize pathway which is free of slip/trip hazards to the extent possible. Communicate any encountered potential slip/trip hazards to other field team members • Maintain 3 points of contact at all times • Ensure ladder or rope to aid exit is secure • Ensure all tools have been removed from ditch/pond so that personnel are not carrying equipment while navigating the slope or ladder (See Step 9)	Field Staff	
11	Packing samples in cooler(s)	• Bottle breakage • Contaminant exposure • Cuts • Pinch points • Back strain • Lost time due to incorrect sample packaging or hold time exceedances	• Wear nitrile gloves when handling sample containers • Pack glass containers in bubble wrap • Check COC against sample labels and SSOW for accuracy before shipping • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid) • Refer to steps 3 and 4 and the HASP for additional lifting techniques • Ensure equipment and supplies are loaded correctly and do not shift during transport	Field Staff	

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(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Initial Site Recon and Walkthrough

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Site walkthrough to assess and inventory hazards posed by site work activities				
Key equipment:	Basic PPE, hand/power tools based on site condition, site inspection checklist or notebook, JSA forms, pens; Insect repellant, flashlight. Coveralls may be necessary based on type of brush/plants/insects in work area(s) being inspected. Protective gloves if overgrown vegetation or rundown buildings.				
Task-specific training:	SMART Safety training (STAR), JSA development, Poison Plant Identification				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☒ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Use SWA to stop any work that is unsafe	All persons on project team	
2	Check weather	• Unexpected storm, fog; rain; snow; lightening, thunder • Heat/cold stress	• Check local weather forecast • Discuss weather issues and precautions to take while driving and on site during the pre-job safety meeting • If weather conditions (e.g., fog, rain, snow) impair the ability/vision of the driver, exit at nearest safe location and assess the situation • While on site, at first sign of lightning/thunder utilize SWA and assess weather conditions • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	Senior Field Team Leader	
3	Sign in	• Site Manager and Operator not aware of GHD staff presence in facility or on grounds	• Sign in at front desk • Ask to speak to Site Manager or alternate designate	Field Staff	
4	Don necessary GHD and client required PPE	• Contact with recyclable material or equipment	• Wear all required PPE (hard hat, vest, boots, and glasses) at all times while in the facility	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
5	Unload equipment from vehicle	• Lifting hazards • Back injury • Manual material handling • Cuts • Pinch points • Hand/foot injury • Forgotten equipment • Damaged equipment	• Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing • Wear leather/cotton gloves and avoid placing hands/fingers in pinch point locations • Wear steel-toed boots • Verify requested equipment against warehouse form • Load equipment in an organized manner to prevent shifting during transport or use cargo netting	Field Staff	
6	Complete site inspection and walkover of the property and work areas – Note any hazards that will impact site personnel and/or their operations	• Slip/trip/fall hazards • Insects/reptiles • Pedestrian injury • Poison plants	• Check in with site personnel and sign appropriate visitor or safety log (may require watching safety video [i.e., plant]) • Check with site contact to determine safely accessible areas and areas where PPE are required • Wear PPE as directed by site personnel or dependent upon your evaluation of conditions • If building(s) looks dilapidated or in poor condition, do not enter • Watch for vehicles or other mobile equipment moving around • Make sure areas are well lit and you are accompanied by a site representative (if applicable) • Watch where you step on pavement (potholes, dips, or obstructions) and in	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
			vegetated/wooded areas (dips, holes, branches, vines, etc.) • Do not take photographs while walking • Do not talk on cell phone while walking • If in vegetated or wooded areas, watch for beehives, wear insect repellent (if area and season dictate) as needed, be mindful of gopher holes/tunnels, small animal dens, snakes, stray dogs/cats, transient/homeless individuals, poison ivy/oak/sumac, etc.		
7	Sign out	• Site Manager and Operator not aware that GHD staff have left facility	• Sign out at front desk • Ask to speak to Site Manager or alternate designate	Field Staff	
8	Demobilization	• Collision • Injury or death to vehicle occupants or other parties	• Perform perimeter vehicle check • Maintain awareness of pedestrian/vehicular traffic when exiting the site • Utilize defensive driving techniques • Complete post-departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency	Field Staff	

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(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
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Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Soil Sampling from an Excavator Bucket

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Soil sampling using an excavator bucket to collect the soil sample				
Key equipment:	Air monitoring equipment, PPE, Excavation equipment; Tyvek if Level C initiated; gloves dependent on the task and chemical contamination present or suspected present				
Task-specific training:	GHD Field Method Training on Soil Sampling Procedures; Mobile Equipment or Heavy Equipment Safety				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☐ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☒ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA.	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Use SWA to stop any work that is unsafe	Senior Field Team Leader	
2	Inspect and calibrate sampling and monitoring equipment.	• Lost time from improperly functioning equipment • Incorrect sampling procedures/collection due to malfunctioning equipment	• Ensure all equipment is functioning properly • Complete Quality Control documents	Field Staff	
3	Prepare to collect soil samples: Technician will choose the location of the sample and communicate sample location to the operator.	• Back strain • Pinch points • Cuts • Punctures • Sample misidentification	• Use proper lifting techniques and buddy system if needed • Avoid placing hands/fingers in pinch point locations • Use proper tools when opening container packaging • Do not use fixed open blade knives when opening boxes or containers • Ensure the sample id label matches sample location with site plan/GHD site supervisor/subcontractor • Setup a safe area for technician to obtain sample from bucket	Field Staff	
4	Obtaining the soil sample from the excavation via remote means – use the hydraulic excavator: Operator will place bucket on ground in a safe location after obtaining the sample from the agreed location.	• Excavation collapse • Contaminant exposure • Heavy equipment operation	• Stay clear of the edge of the excavation; demarcate areas that were undermined • Wear nitrile gloves and follow air monitoring program as per HASP • Follow JSAs specific for excavation and heavy equipment activities; maintain excavation safety • Be aware of swing radius of heavy equipment	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
5	Sample collection from excavator bucket: Operator will place heavy equipment in a zero energy state via lockout (interlocks) and placing bucket on ground. If not equipped with interlocks or equivalent safety devices then operator will shut off engine with bucket on ground. Technician will collect soil sample from the bucket once heavy equipment is in a zero energy state and leave the area.	• Contaminant exposure • Cuts from container breakage • Sample misidentification • Struck-by/crushing injuries	• Wear nitrile gloves and replace between soil samples • Inspect glass bottles for breaks/cracks • Do not attempt to use any suspect containers • Communicate to all present not to distract the excavator operator • Establish eye/hand contact with excavator operator and approach when safe • Have operator activate hydraulic system kill switch if equipped and maintain two thumbs up visible to technician • If excavator is not equipped with a hydraulic system kill switch, then the operator must leave the cab prior to sample collection • Do not stand in front of or behind the bucket; stand to either side to collect sample • Close glass sample containers carefully to avoid breakage • Signal operator with thumps up when clear of swing radius • Check sample labels for accuracy prior to placing in cooler	Field Staff	
6	Sample selection	• Bottle breakage • Contaminant exposure • Pinch points • Lost time due to incorrect sample selection	• Wear nitrile gloves when handling sample containers • Confirm selected samples are correct based on work plan selection criteria, PID readings, and soil boring logs • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid)	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
7	Packing samples in cooler(s)	• Bottle breakage • Contaminant exposure • Cuts • Pinch points • Back strain • Lost time due to incorrect sample packaging or hold time exceedances	• Wear nitrile gloves when handling sample containers • Pack glass containers in bubble wrap • Check COC against sample labels and SSOW for accuracy before shipping • Avoid placing hands/fingers in pinch point locations (e.g., between cooler and lid) • Use proper lifting techniques and buddy system if needed • Ensure equipment and supplies are loaded correctly and do not shift during transport	Field Staff	
8	Investigation derived waste (IDW) management	• Contaminant exposure • Heavy lifting • Pinch points • Slips/trips/fall hazards • Mislabeled waste	• Wear nitrile gloves when handling IDW • Use proper lifting techniques to transport/dispose of IDW into drums and use buddy system if needed • Avoid placing hands/fingers in pinch point locations • Maintain awareness of walking surfaces • Label IDW with generator, a contact number, identification of contents, and site location • Specify IDW as either hazardous or non-hazardous material	Field Staff	

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(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
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Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Job Safety Analysis (JSA)

Tank Sampling

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project Number:	002428	**Created By**	K. Galanti	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project Address:	3875 River Road, Tonawanda, NY				
Specific Task	Tank Sampling				
Key equipment:	Non-sparking tools, poly-coated Tyvek coverall may be worn dependent on field conditions				
Task-specific training:	40-Hour and 8-Hour HAZWOPER, CSE, PPE				

Hard Hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (Top Impact)	☒ Chemical Protective (i.e. Nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full Face Mask	☒ Class II	☐ Coveralls
☐ Type II (Side Impact)	☒ Level 1 Light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half Face Mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 Light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-Static	☐ High viz clothing
☐ Class G	☐ Level 3 Medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 Heavy duty			☐ N95	☐ PFD	☐ Long sleeve shirts
Foot Protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.Cat 2	☐ P95		☐ Polyethyene tyvek
☒ Rubber boots (industrial grade)		☐ Required	☐ Haz Cat 4	☐ R95		☒Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project Development Team		Modified by	Reviewed by	Date
Name	**Signature**			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Eliminate all potential sources of ignition	• Explosion and/or fire	• Inform all Site personnel that smoking is prohibited on Site • Shut down all open flame and sparking equipment within vapor hazard • Use only explosion-proof equipment within the hazard area • Ground all heavy equipment that will or may touch the tank	Senior Field Team Leader and Field Staff	
2	Open access portal to tank	• Explosion and/or fire • Product Spill • Chemical Exposure	• Use non-sparking tools • Have spill absorption material/kit available on Site • Place containment materials (bucket, sorbent pads/booms) under points where tank wall is being breached • Use proper PPE in accordance with the HASP	Field Staff	
3	Purge tank vapors	• Explosion and/or fire • Inhalation exposure to vapors (both to workers and public)	• Frequently test % of Lower Explosion Limit (ILEL) in tank at varying elevations (floor, breathing zone)	Field Staff	
4	Tank Entry		See JSA for Confined Space Entry	Field Staff	
5	Collect samples in accordance with sampling plan	• Falling debris • Contaminant exposure • Lifting hazards • Back injury • Manual material handling • Dust/flying debris/contaminants • Slip or fall due to uneven terrain	• Beware of overhead hazards • Wear nitrile gloves when handling sample containers and replace between samples • Use proper bending/lifting techniques by bending and lifting with legs and not with back • Dust particles may become airborne; if dust becomes excessive, use a dust mask • Keep footing secure	Field Staff	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor Signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Wading Through a River

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	23 February 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Wading through a river				
Key equipment:	Waterproof waders, life jacket, bug spray; first aid kit				
Task-specific training:	Reference HASP for additional site/client safety training requirements				

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☒ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☒ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☒ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☒ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☐ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☐ Industrial grade safety boot	☐ Other*	☒ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒Other *
☒ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		*see key equipment

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Check weather	• Unexpected storm • Fog; rain; snow; lightening/thunder • Heat/cold stress	• Check local and destination weather forecast • Discuss weather issues and precautions to take while driving to the destination • If weather conditions (e.g., fog, rain, snow) impair the ability/vision reschedule site visit • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection	Field Team Leader	
2	Prepare to enter river	• Boat traffic • Proper PPE • Prepare to carry equipment in river • River current • River Depth • River water temperature • Slip/trip/fall hazards	• Maintain awareness river traffic • Make sure PPE is properly secured. This includes water proof waders and life jacket • Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing • Refer to the HASP for additional lifting information • Maintain resistance to river current. If	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
			current is too swift do not enter the river. • If river water is greater than three feet deep, do not enter the river. Utilize a boat for field activities and follow proper boat protocol. • Test river water temperature to not induce hypothermia. If river water is extremely cold, do not enter the river. • Practice STAR		
3	River Wading	• Slips/trips/hit/fall hazards • Heat stress • Cold stress • Biological hazards • Wildlife encounters • Potential adverse weather conditions	• Project team to consist of 3 persons minimum: 2 person sampling team and 3rd person shore attendant • Use buddy system while walking through the river • Spot check to identify underwater hazards, establish pathways which is most free of slip and trip hazards, beware of trip hazards, communicate hazards to on-site personnel • Heightened awareness of wasps, ants, bees, snakes, turtles, alligators and use bug spray as necessary • Monitor for heat stress, establish work/rest regimes, wear heat stress PPE, and have liquids available • Monitor for cold stress, wear warm clothing, have access to fluids and high energy food and schedule a work and rest regime • Be aware of any rapidly changing environmental conditions and respond accordingly	Field Staff	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Working Around Water

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS Yes/No**	**SSE on site? Yes/No**
Project address:	3875 River Road, Tonawanda, NY				
Specific task	Construction activities on water or around the water				
Key equipment:	CSA approved Life Jacket or PFD that fits the operator and occupants; Sunglasses; sunscreen				
Task-specific training:	Towing and Trailering, Boating Safety				

Hard hat	**Gloves (ANSI/EN 388)**	**Eye protections**	**Fall protection**	**APR**	**Vest**	**PPE clothing**
☐ Type I (top impact)	☒ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☐ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☐ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☒ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☒ Other *
☒ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	Signature			
K. Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Set up of work site	• Inclement weather • Lifting hazards • Manual material handling • Back injury • Pinch points • Slip/trip/fall hazards • Fuel spill	• Monitor weather forecasts • Make sure grip is adequate; wear leather/cotton gloves • Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and keep lower back in a neutral position • Avoid one-handed carrying if possible; maintain awareness of footing • Refuel in appropriate location, no sparks or static buildup • Practice STAR	Field Staff	
2	Sampling activity near water	• Slippery banks • Drowning • Overgrowth • Differing elevations to water's edge • Recovery of a person in the water	• Practice STAR • Make sure area is clear of tripping hazards • Position retrieval and rescue equipment as appropriate for the work • Use tie off points and travel restraint if appropriate • Review JSA's for all tasks to be preformed • Wear appropriate PFD vest	Field Staff	

(1) Each Job or Task consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the potential (associated) hazards.

(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
I have participated in the review and discussion of the Job Safety Analysis (JSA) listed on this document and understand the duties I am responsible to fulfill. As part of my work, I know I have the responsibility and obligation to STOP work with a **Stop Work Authority (SWA)** if conditions change and/or potential hazards have been identified.

Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Job **Safety Analysis (JSA)**

Mobilization/Demobilization

Field staff must review job-specific work plan and coordinate with project manager to verify that all up-front logistics are completed prior to starting work including, but not limited to, permitting, access agreements, and notification to required contacts (e.g., site managers, inspectors, clients, subcontractors, etc.). Additionally, a tailgate safety meeting must be performed and documented at the beginning of each workday. **Stop, Think, Act, Review (STAR)** must be used prior to any activity. All personnel must possess the appropriate training prior to initiating scheduled tasks. Also consider weather conditions. GHD personnel have the authority and responsibility to use **Stop Work Authority (SWA).**

Date issued/revised:	June 9, 2016	**Client:**	Hodgson Russ LLP – Tonawanda Coke Corp Site		
Project number:	002428	**Created by**	K. Galanti	**Sim OPS** Yes/No	**SSE on site?** Yes/No
Project address:	3875 River Road, Tonawanda, NY				
Specific task					
Key equipment:	360-degree topper				
Task-specific training:					

Hard hat	Gloves (ANSI/EN 388)	Eye protections	Fall protection	APR	Vest	PPE clothing
☐ Type I (top impact)	☐ Chemical protective (i.e. nitrile)	☐ ANSI/CSA safety glasses	☐ Harness	☐ Full face mask	☐ Class II	☐ Coveralls
☐ Type II (side impact)	☒ Level 1 light duty	☐ Goggles/spoggles	☐ Shock absorb lanyard	☐ Half face mask	☐ Class III	☐ Fire retardant clothing (FRC)
☐ Class E (standard)	☐ Level 2 light duty with protection	☐ Face shield	☐ Lifeline		☐ Anti-static	☐ High viz clothing
☐ Class G	☐ Level 3 medium duty	☐ Other*		**Cartridges**	☐ FRC	☒ Long pants
	☐ Level 4 heavy duty			☐ N95		☐ Long sleeve shirts
Foot protection	☐ High viz	**Hearing protection**	**Arc flash**	☐ P100		☐ Paper tyvek
☒ Industrial grade safety boot	☐ Other*	☐ NOT Required	☐ Haz.cat 2	☐ P95		☐ Polyethyene tyvek
☐ Rubber boots (industrial grade)		☐ Required	☐ Haz cat 4	☐ R95		☐Other *
☐ Hip waders				☐ Organic vapor		
	*see key equipment			☐ Specialty/other*		

Project development team		Modified by	Reviewed by	Date
Name	**Signature**			
Katherine Galanti				

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
1	Discuss STAR and SWA	• Site personnel not aware of STAR and SWA	• Project team (GHD) discusses importance of and documentation procedures for SWA during pre-job safety meeting • Use SWA to stop any work that is unsafe	Senior Field Team Leader	
2	Check weather	• Unexpected storm • Fog, rain, snow; lightening/thunder • Heat/cold stress	• Check local weather forecast • If adverse weather conditions are likely, prepare a contingency plan for lodging, etc. with project manager • Discuss weather issues and precautions to take while driving and on site during the pre-job safety meeting • If weather conditions (e.g., fog, rain, snow, etc.) impair the ability/vision of the driver, exit at nearest safe location and assess the situation • While on site, at first sign of lightening/thunder utilize SWA and assess weather conditions • In extreme temperatures, ensure all personnel have proper clothing, hydration, and heat/cold protection (e.g., canopy, fan, glove warmers)	Driver	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
3	Load equipment into vehicle	• Lifting hazards • Manual material handling • Back injury • Cuts • Pinch points • Hand/foot injury • Forgotten or damaged equipment • Materials or equipment leaving the vehicle bed during travel create hazards for other drivers	• Reduce travel distance when there is a need to carry/lift materials • Make sure grip is adequate; wear leather/cotton gloves • Size up the load; if the object is too large or odd shaped OR is in excess of 50 pounds (23 kg) then assistance (mechanical or a buddy lift) will be required • Maintain neutral back posture - Lift with the legs (bend at the knees and use the leg muscles) to protect the lower back and make sure to shift with the feet rather than twisting at the back • Maintain neutral wrist posture when lifting, carrying, pushing or pulling. The wrist is the strongest and most stable when it is straight. • Avoid one-handed carrying if possible; maintain awareness of footing • Avoid placing hands/fingers in pinch point locations • Wear safety-toed boots • Verify requested equipment against warehouse form • Load equipment in an organized manner to prevent shifting during transport or use cargo netting • Secure materials or equipment with cargo netting. Ensure netting does not loosen during travel by securing the straps with plastic wire ties or equivalent measures.	Field Staff	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
4	Complete GHD Daily Operator Vehicle Checklist	• Damaged vehicle lights, tires, windows, mirrors, horn • Inadequate vehicle documents and/or safety items	• Check for fluid leaks under vehicle • Test operation of headlights, front/rear turn signals, backup lights, brake lights, and emergency flashers • Visually check the pressure/wear of tires • Ensure the vehicle has a spare tire • Assure windshield and window glass is clean and free from obstructions • Test the windshield wipers and horn • Verify vehicle registration, insurance card, and inspection sticker is present and valid • Ensure the vehicle contains a first aid kit, fire extinguisher, and road hazard kit • Check immediate vehicle perimeter and initial path of travel for obstructions	Driver	
5	Check and adjust seat, steering wheel, headrest, and mirrors	• Back/body strain • Blind spot • Impaired vision	• Adjust seat, headrest, and steering wheel height so body is fully supported/comfortable and pedals are within easy reach • Ensure mirrors are properly adjusted	Driver	
6	Fasten seat belt(s) and ensure passenger(s) seat belts are fastened	• Serious injury, ejection, or death from collision and/or traffic citation	• Verify driver and passenger(s) seat belts are in good condition and properly latched	Driver	
7	Ensure vehicle doors are locked	• Serious injury, ejection, or death from collision • Unwanted intrusion • Lost equipment	• Manually lock all doors to vehicle	Driver	
8	Start engine and check gauges and warning lights	• Vehicle breakdown	• Verify sufficient fuel and other hazard lamps (e.g., battery, oil, and temperature) are not lit	Driver	
9	Mobilize to site	• Arriving late • Collision • Injury or death to occupants or other parties	• Do not use cell phones or perform other distracting activities while vehicle is in motion • Constantly scan intersections, move eyes, check mirrors, and assess traffic lights (fresh vs. stale) • Maintain safety cushion around vehicle (front, sides, and rear) and 4-second following distance • Utilize all driving defensive techniques	Driver	

Job steps[1]	Task activity	Potential hazard(s)[2] Include energy sources from hazard wheel -	Corrective measure(s)[3]	Person responsible (Print first and last names)	Verified by (Print first and last names)
10	Arrive at site	• Pedestrian injury • Collision	• Maintain awareness of pedestrian/vehicular traffic when entering site and traveling to work zone	Driver	
11	Park vehicle	• Pedestrian injury • Collision • Property damage	• Maintain awareness of pedestrian/vehicular traffic • Park vehicle in pull-through parking space or facing the exit • Parking in a parking space that is not a designated parking space will require the placement of the 360-degree topper on the hood of the vehicle • Use caution and mirrors/spotter when backing vehicle • Set parking brake	Driver	
12	Demobilization	• Collision • Injury or death to occupants or other parties	• Check immediate vehicle perimeter and initial path of travel for obstructions • Maintain awareness of pedestrian/vehicular traffic when exiting site • Utilize defensive driving techniques • Complete post-departure checklist and report vehicle problems to company vehicle maintenance manager or rental car agency	Driver	

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(2) A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - victim is struck by or strikes an object; **Caught** - victim is caught on, caught in or caught between objects; **Fall** - victim falls to ground or lower level (includes slips and trips); **Exertion** - excessive strain or stress/ergonomics/lifting techniques; **Exposure** - inhalation/skin hazards. Specify the hazards and do not limit the description to a single word such as "Caught".

(3) Aligning with the Job Steps, Task Activity Description, and Potential Hazard columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective, observable, and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

Site personnel participating in JSA review:
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Name/Company	Sign	Date

SSE(s) on job: _____ **Assigned mentor:** _____

Presenter signature: _____ Date/time: _____

My signature below indicates that all conditions and requirements listed above have been verified, met, and reviewed with all affected personnel prior to start of work.

Supervisor signature: _____ Date/time: _____

Location of mustering point: _____ Wind direction (current): _____

GHD emergency contact (Name and verified phone number): GHD Incident Hotline 1-866-529-4886

Supervisor signature documenting daily debrief has been completed: _____

Attachment B
Project Safety Forms

Unsafe Act / Unsafe Condition / Stop Work Authority (SWA) Report

Reported by:		Employee's office:	
RSHM:		Date:	Time:
Employee's supervisor:		Employee's principal:	
Project related:	☐ No ☐ Yes	If yes, name of client:	
Client contact (if applicable):		Project no (if applicable):	

Re: (check all that apply) ☐ **Unsafe act** ☐ **Unsafe condition** ☐ **Stop work authority (SWA)**

Location: (check one) ☐ Driving ☐ Field ☐ Office

Date reported to supervisor/PM:		Date corrected:	
Time reported to supervisor/PM:		Time corrected:	

Describe the unsafe act, unsafe condition or SWA situation

List corrective action(s) implemented

Did the corrective action(s) mitigate the unsafe act/unsafe condition?

For SMART administrators use only:

Category:

- ☐ **PPE** Personal Protective Equipment
- ☐ **BP** Body Positioning
- ☐ **WE** Work Environment
- ☐ **OP** Operating Procedures
- ☐ **TE** Tools and Equipment
- ☐ **CU** Computer Usage
- ☐ **PD** Pre-Driving
- ☐ **OPP** Operating Procedures – Parking

Chevron category:

- ☐ **A** Person or People
- ☐ **B** Equipment
- ☐ **C** Environmental
- ☐ **D** Procedures/ Processes/
  - ☐ JSA-review/revise
- ☐ **E** Visitors

Causative factor:

- ☐ **1** Insufficient training for task
- ☐ **2** Hurrying to complete the task
- ☐ **3** Easier if proper process not followed
- ☐ **4** Took shortcuts without prior incident
- ☐ **5** Incomplete or no procedures
- ☐ **6** Procedures not known or enforced
- ☐ **7** Improper PPE
- ☐ **8** Improper tools
- ☐ **9** Improper workplace layout
- ☐ **10** Exposure to conditions

Energy source:

- ☐ **G** Gravity
- ☐ **M** Motion
- ☐ **ME** Mechanical
- ☐ **E** Electrical
- ☐ **P** Pressure
- ☐ **T** Temperature
- ☐ **B** Biological
- ☐ **C** Chemical
- ☐ **R** Radiation
- ☐ **S** Sound

Are additional actions required? ☐ No ☐ Yes If yes, what?

Field Safe Task Evaluation Process (F-STEP)

Report status:					
(insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Observer's name:	Date:	Time:
Client:	Project name :	
Observer's office:	Site location:	
Observer's supervisor:	Project no. (if applicable):	
Subcontractor: ☐ Yes ☐ No	Subcontractor company name:	

Feedback conducted by:	Date:
Observee's supervisor:	Time:

Check task being observed (if not listed here, go to columns at right)		If checking this column, write in the specific task	
☐ Air knifing	☐ Mob/demob	☐ Agricultural services	
☐ Clearing	☐ Project oversight	☐ Construction	
☐ Demolition	☐ Soil sampling	☐ Landfill	
☐ Drilling	☐ Stack testing	☐ Office operations	
☐ Electrical work	☐ Surveys & audits	☐ O&M	
☐ Excavation	☐ Traffic control	☐ Pipeline	
☐ General site cleaning	☐ UST removal	☐ Refinery	
☐ Heavy equipment operations	☐ Water sampling	☐ Treatment plants	
☐ IH sampling	☐ Well management	☐ Other	
☐ Manual lifting			

Background information (Give a brief description of task being performed and your surroundings)

Observer's positive comments

1.

2.

3.

Feedback session conclusion:
If no questionable Items: brief recap of positive actions/comments
If questionable Items: brief recap of positive actions/comments and why did the questionable item(s) occur?

Personal protective equipment	Meets work standards	???	N/A	Evaluation comments
1. Hearing protection (e.g., ear plugs)			☐	
2. Head protection (e.g., hard hat)			☐	
3. Eye protection (e.g., safety glasses/goggles)			☐	
4. Hand protection (e.g., gloves)			☐	
5. Foot protection (e.g., steel-toe boots)			☐	
6. Respiratory protection			☐	
7. Fall protection (e.g., lanyard/harness)			☐	
8. High visibility clothing (e.g., work vest)			☐	
9. First aid kit/fire extinguisher			☐	
10. Other (be specific)			☐	
Body position	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
11. Proper body positioning when exerting force (lifting/pushing/pulling)			☐	
12. Pinch points/moving equipment - hands/body placement			☐	
13. 3-points of contact			☐	
14. Other (be specific)			☐	
Work environment	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
15. Work/walk surface clear (free and clear pathway)			☐	
16. Housekeeping/equipment storage			☐	
17. Controlled work zone (e.g., warning devices, barricades, cones, flags)			☐	
18. Emergency stop/safety switches			☐	
19. Materials labeled correctly			☐	
20. Storage/disposal of waste			☐	
21. Other (be specific)			☐	
Operating procedures	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
22. Star performed/job planning			☐	
23. Stop work authority process – understood and considered			☐	
24. JSA/JLA/risk assessment reviewed and followed			☐	
25. Daily site inspection			☐	
26. High risk task specific (hot work, confined space, LOTO, excavation/ trenching)			☐	
27. Inspect work zone for hazards			☐	
28. Coordinate/communicate with site rep and/or others on site			☐	
29. Spotters used appropriately			☐	
30. Underground/overhead utilities identified			☐	
31. Other (be specific)			☐	
Tools/equipment	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
32. Hand/power tool - selection, condition, and use			☐	
33. Field/test equipment - selection, condition, and use			☐	
34. Heavy equipment - selection, condition, and use			☐	
35. Other (be specific)			☐	
Observation total occurrences			☐	
% observations to meet work standards			☐	
Item specific to work task	**Meets works standards**	**???**	**N/A**	**Evaluation comments**
Insert task/JSA/SOP Step			☐	
Insert task/JSA/SOP Step			☐	
Insert task/JSA/SOP Step			☐	

Causative factors and corrective actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	**CF**	**Corrective actions (Must match Causative Factor)**	**Responsible party**	**Date due**	**Date completed**	**Verified by/ Validated by**	**Date**	**Details**
						Verified by: **Validated by:**		
						Verified by: **Validated by :**		
						Verified by: **Validated by:**		
						Verified by: **Validated by:**		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

Driving Safe Task Evaluation Process (D-STEP)

Report status:					
(insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Observer's name:	Date:	Time:
Client:	Project name:	
Observer's office:	Site location:	
Observer's supervisor:	Project no. (if applicable):	
Subcontractor: ☐ Yes ☐ No	Subcontractor company name:	

Feedback conducted by:	Date:
Observee's supervisor:	Time:

Driving conditions			
☐ Freeway/interstate	☐ Wet	☐ Day	☐ Raining
☐ Surfaced street	☐ Dry	☐ Night	☐ Windy
☐ Dirt road	☐ Snow/ice		☐ Snowing
	☐ Mud		☐ Fog

Vehicle condition			
☐ Car	☐ Truck	☐ Van	☐ Pulling trailer
☐ Company owned	☐ Rental	☐ Personal	

Background information (Give a brief description of where you are driving from and to and your surroundings)

Observer's positive comments

1.

2.

3.

Feedback session conclusion:
If no questionable Items: brief recap of positive actions/comments
If questionable Items: brief recap of positive actions/comments and why did the questionable item(s) occur?

Pre-driving	Meets work standards	???	N/A	Evaluation comments
1. JMP/JSA/Risk Assessment developed and/or reviewed			☐	
2. STAR performed/job planning			☐	
3. Stop Work Authority – understood and considered			☐	
4. Registration/insurance/last maintenance report			☐	
5. Tire inflation and tread			☐	
6. Wipers and washer fluid/clean windows/mirrors			☐	
7. Horn/lights operation/instrument panel			☐	
8. Body damage/overall vehicle appearance			☐	
9. Under-vehicle check for leaks/obstructions			☐	
10. Secure loose items			☐	
11. Check fluid levels			☐	
12. Fire extinguisher/triangles/first aid kit/jack/spare			☐	
13. Verifies area is clear before moving vehicle			☐	
Body positioning	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
14. Adjust seat			☐	
15. Adjust head rest			☐	
16. Adjust mirrors to minimize blind spots			☐	
17. Seat belts (driver/passengers)			☐	
18. Locks doors			☐	
Operating procedures	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
19. Yields right-of-way and allows other vehicles to merge, change lanes, turn			☐	
20. Respects pedestrians, cyclists, other drivers			☐	
21. Is courteous/tolerant of others' poor driving			☐	
22. Two hands on wheel no higher than 9 and 3			☐	
23. Skill in handling distractions			☐	
24. Adjusts to traffic conditions (speed / traffic)			☐	
25. Uses turn signals (for turns and lane changes)			☐	
26. Following distance is appropriate (4-second rule)			☐	
27. Avoids sudden acceleration and deceleration			☐	
28. Before backing up, looks behind vehicle/checks for traffic, pedestrians, parked vehicles, uses spotter			☐	
29. Scans the road ahead (15-second eye lead or 2-3 blocks-1/4 mile) and anticipates actions of others to avoid sudden swerves, stops, lane changes			☐	
30. Checks mirrors every 5-8 seconds			☐	
31. Checks for hazards on the road (e.g., animals, debris, road conditions)			☐	
32. Reads and obeys traffic signals			☐	
33. Makes complete stops at signals, at a safe distance			☐	
34. Scans intersection left and right/anticipates intent of other vehicles before reaching "point of no return"			☐	
35. Covers brakes safely and adjusts speed			☐	
36. Does not use cell phone during operation of vehicle			☐	
37. Other (be specific)			☐	
Operating procedures - Parking	**Meets work standards**	**???**	**N/A**	**Evaluation comments**
38. Looks for pull through parking before backing in			☐	
39. Uses signals, leaves adequate space before pulling back into lane			☐	
40. Obeys signs and uses signals in parking lot			☐	
41. Maintains proper speed inside the lot			☐	
42. Ensures vehicle is legally/properly parked			☐	
43. Sets parking brake and secures vehicle			☐	
44. Other (be specific)			☐	
Observation total occurrences			☐	
% Observations to meet work standards			☐	
Item specific to work task				
Insert Task/JSA/SOP Step			☐	
Insert Task/JSA/SOP Step			☐	

Causative factors and corrective actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	**CF**	**Corrective actions (Must match Causative Factor)**	**Responsible party**	**Date due**	**Date completed**	**Verified by/ Validated by**	**Date**	**Details**
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by:		
						Verified by:		
						Validated by:		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

Near Miss Reporting Form

Note: A Significant Near Miss must be called into the Incident Reporting Hotline: 1-866-529-4886

Instructions:
1) Employee completes the Near Miss Report and submits to Supervisor.
2) Supervisor reviews and makes other comments.
3) Employee discusses Near Miss with Project Manager.
4) Submit to applicable SMART Reporting submission address

Report status:					
(insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Section 1

A. Employee Identification ☐ **GHD Employee** ☐ **Temporary Employee** ☐ **Subcontractor**			
Employee No.	Last Name	First Name	Employee's Company - if Subcontractor
Date of Hire	Position/Title	Supervisor	Home Office Location - if GHD Employee

B. General Information	
Where did the Near Miss occur? ☐ Office ☐ Project Site ☐ Other _____ ☐ Canada ☐ United States ☐ UK	Type of Near Miss (Check all that apply) ☐ Employee Injury/Illness ☐ Vehicle Accident ☐ Property Damage ☐ Environmental
Address of Near Miss (City, State/Province/County, Postal/Zip Code)	Specific Location of Near Miss (e.g., where on site)

Date and Hour of Near Miss		Date and Hour Reported to GHD		Time Employee Began Work
Month Day Year	a.m. p.m.	Month Day Year	a.m. p.m.	a.m. p.m.
Witnesses? ☐ Yes ☐ No	Witness Name and Telephone Number			

C. Project Information (Project Related Near Miss Only): Project Related: ( ) Yes ( ) No				
Project #	Project Name	GHD Project Manager	Client	Client Contact
Was the Client Advised of the Near Miss? ☐ Yes ☐ No ☐ N/A	Name:	Date and Time Month Day Year Time		

Section 2

A Details of the Near Miss
1. What job/task was being performed when the Near Miss occurred? (Example: collecting groundwater samples).
2. Provide a detailed description of the employee's specific activities at the time of the Near Miss. Include details of equipment/materials being used, including the size and weights of objects being handled, and weather conditions at time of the Near Loss. If necessary, attach additional pages to the report.

Section 2 (continued)

B. Near Miss Investigation	
Conduct a 5-Why Root Cause Analysis Investigation. In addition, if there was the potential for a significant injury or loss, report the Near Miss to the Incident Hot Line (this will determine if a Tap Root Cause Analysis is necessary).	
HASP prepared? ☐ Yes ☐ No ☐ N/A Submit a PDF of HASP to Investigation Team. If yes, was the HASP on site? ☐ Yes ☐ No	Did the safety plan identify and provide safety procedures for the specific tasks being performed when the Near Miss occurred? ☐ Yes ☐ No If no, why not? (Explain) _____ Did the employee utilize the STAR process before initiating the task? ☐ Yes ☐ No If no, why not? (Explain) _____

5-Why Root Cause:	Additional information: Attach photos, witness statement(s), affected employee statement, as applicable, to the end of this document.
1. Why did "above" happen?	
2. Why did "1" happen?	
3. Why did "2" happen?	
4. Why did "3" happen?	
5. Why did "4" happen?	See Section 3 Below: Corrective Actions/ Verification and Validation
6. Why did "5" happen?	

C. Accountability		
Initial Report Date Month Day Year	Initial Report Prepared by: (please print)	Initial Report Prepared by: (signature)
Investigation Team	Company	Position/Title
Final Report Date Month Day Year	Final Report Prepared by: (please print)	Final Report Prepared by: (signature)

D. Stewardship		
Will a Near Miss Summary be Prepared? ☐ Yes ☐ No If yes, by:		
Quality Review By:	Date:	Findings:

Section 3 (continued)

Corrective Action					Validation & Verification		
CF	**Corrective Actions (Must match Causative Factor)**	**Responsible Party**	**Due Date**	**Date Completed**	**Verified By/ Validated By**	**Date**	**Details**
					Verified By		
					Validated By		
					Verified By		
					Validated By		
					Verified By		
					Validated By		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

Incident Reporting Form

Note: Incidents must be called into the Incident Reporting Hotline: 1-866-529-4886

Instructions: *1) For Personal Injuries, Occupational Illnesses, and Property Damage, complete Sections 1 and 2*
2) For Motor Vehicle Accidents, complete Sections 1, 2, and 4.
3) ***Initial report must be submitted within 24 hours.***

Report status:					
(insert date)	Initial report	Updated report	Final report	Verification/validation	Report input to SMART database

Section 1

A. Employee Identification ☐ **GHD Employee** ☐ **Temporary Employee** ☐ **Subcontractor**				
Employee No.	Last Name	First Name	Middle Name/Initial	☐ Male ☐ Female
Area Code ( ) Telephone Number	Employee Home Address (Street, City, State/Province/County, Postal/Zip Code)			
Date of Hire Month Day Year	Position/Title	Supervisor	Employee's Company/Home Office Location	

B. General Information	
Where did the Incident occur and which country? ☐ Office ☐ Project Site ☐ Other _____ ☐ Canada ☐ United States	Type of incident (Check all that apply) ☐ Employee Injury/Illness ☐ Vehicle Accident ☐ Property Damage Only
Address of Incident (City, State/Providence/County, Postal/Zip Code)	Specific Location of incident (e.g., where on site)

Date and Hour of Incident		Date and Hour Reported to Employer		Date and Hour Last Worked		Time Employee Began Work
Month Day Year	a.m. p.m.	Month Day Year	a.m. p.m.	Month Day Year	a.m. p.m.	a.m. p.m.

Normal Work Hours	Witnesses?	Witness Name and Telephone Number
From: To:	☐ Yes ☐ No	

C. Project Information (Project Related Incident Only) Project Related? ☐ Yes ☐ No				
Project #	Project Name	Project Manager	Site Telephone Number ( )	Project Manager Cell Number ( )
Client Name		Was the Client Advised of the Incident? ☐ Yes ☐ No	Name of Person Contacted	Date and Time Contacted

Section 2

A. Details of the Incident
1. What job/task was being performed when the incident occurred? (Example: collecting groundwater samples).
2. Provide a detailed description of the employee's specific activities at the time of the incident. Include details of equipment/materials being used, including the size and weight of objects being handled, and weather conditions at time of the incident. If necessary, attach additional pages to the report.
3. For injuries, identify the specific part of body injured, and specify left or right side. For illnesses, identify and describe the affected area/body part.
4. Identify the object or substance that directly injured the employee and how. Include size, weight, and shape of object, quantity of substance, etc.
5. Identify property damaged and how it was damaged (include owner of property, nature and source of damage, and model and serial number, if appropriate).

B. Health Care/Medical Treatment	
Employee received health care? ☐ Yes ☐ No	Identify the type of health care provided and where it was performed. **(Check all that apply).** ☐ First Aid ☐ Medical treatment other than first aid (sutures, etc.) ☐ Hospitalized ☐ Clinic ☐ Hospital emergency room ☐ On location by self or GHD employee ☐ On site by EMT
Name of Health Care Provider, Physician Name, Phone Number, Address (Street, City, Province/State/County, and Postal/Zip Code)	

Section 2 (continued)

C. Incident Investigation

☐ **5 Why Root Cause Analysis Investigation [Non-OSHA Recordable, <$5,000/£3,000 damage]**

☐ **Tap Root Cause Analysis [OSHA Recordable, and/or >$5,000/£3,000 damages]**

HASP prepared? ☐ Yes ☐ No ☐ N/A Submit a PDF of HASP and relevant JSA(s)/Risk Assessment to Investigation Team. If yes, was the HASP on site? ☐ Yes ☐ No	Did the safety plan identify and provide safety procedures for the specific tasks the employee was conducting when injured? ☐ Yes ☐ No If no, why not? (Explain) _____ Did the employee utilize the STAR process before initiating the task? ☐ Yes ☐ No If no, why not? (Explain) _____ Was the employee drug & alcohol tested post incident? ☐ Yes ☐ No

5-Why Root Cause: Incident Statement	Additional information: Attach photos, witness statement(s), affected employee statement, accident diagrams, as applicable, to the end of this document.
1. Why did "above" happen?	
2. Why did "1" happen?	
3. Why did "2" happen?	
4. Why did "3" happen?	
	See *Corrective Actions/Verification and Validation* Section (Page 4)
5. Why did "4" happen?	
6. Why did "5" happen?	

D. Accountability

Initial Report Date Month Day Year	Initial Report Prepared by: (please print)	Initial Report Prepared by: (signature)
Investigation Team	Company	Position/Title
Final Report Date Month Day Year	Final Report Prepared by: (please print)	Final Report Prepared by: (signature)

E. Stewardship

Will an Incident Summary be Prepared? ☐ Yes ☐ No By:		
Quality Review By:	Date:	Findings:

Section 3

A. Agency Reporting and Recording Information (To be completed by an HSE Team Member)			
CANADA			
Provincial Regulatory Agency Reporting Required? ☐ Yes ☐ Not required	Employee Injury Information (Injury met the following criteria): ☐ First Aid ☐ Medical Treatment ☐ Critical Injury ☐ Modified Duty ☐ Lost Time Injury If medical treatment, what?		
Joint Safety and Health Committee Notified? ☐ Yes ☐ No	Total days of modified duty If exceeds 7 days, report to WSIB	Total days of lost time (if any)	Date employee returned to work Month Day Year
UNITED STATES			
OSHA Recordable Injury? ☐ Yes ☐ No OSHA Recordable.pdf	Employee Injury Information (Injury met the following OSHA 300 Log criteria) ☐ First Aid ☐ Medical Treatment ☐ Restricted Duty ☐Lost Time Injury If medical treatment, what?		
Total days of restricted duty:	Total days of lost time (if any)		Date employee returned to work Month Day Year

Section 4

A. Vehicle GHD Employee was Operating ☐ Personal ☐ GHD-Owned ☐ Rental - Rental Company:

License Plate No.	State/Province/County	Police Department City	State/Province/County
Vehicle Year/Make/Model	Odometer Reading at Time of Accident	Police Report Number	Weather Conditions

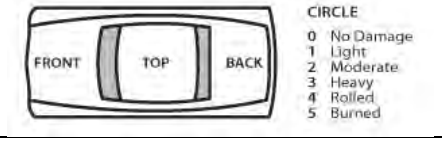
Name of Person Operating Vehicle

Address

City State/Province/County Postal/Zip Code

Telephone: Area Code ( )

"X" IN AREA OF VEHICLE DAMAGE



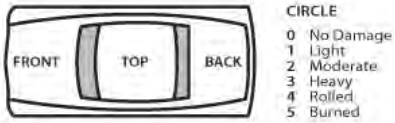
Description of Vehicle Damage:

B. Other Vehicles Involved

Name of Owner	Address	City/State/Prov./County/Postal/Zip	Area Code and Telephone Number ( )
Operator's Name (if different from above)	Address	City/State/Prov./County/Postal/Zip	Area Code and Telephone Number ( )

Year/Make/Model	Description of Property Damage:
Insurance Co. Name & Telephone	
License Plate No./State/Province	

"x" IN AREA OF VEHICLE DAMAGE



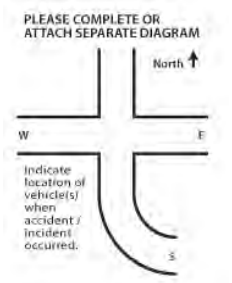
C. Injured Persons

Name	Address Street, City, State/Prov./County/Postal/Zip Code	Phone Number	Nature of Injury	Indicate if Injured was a Vehicle Driver/ Passenger, GHD Employee, Other, or Pedestrian
1.				
2.				
3.				

D. Witnesses

Name	Address Street, City, State/Prov./County/Postal/Zip Code	Area Code and Telephone Number
1.		( )
2.		( )

E. Description of Accident



Was Ticket Issued? Reason:

☐ Other Operator

☐ GHD Operator

Report Date Month Day Year	Report Prepared by: (please print)	Report Prepared by: (signature)

Note: If Additional Space is Required to Complete this Report, Use Separate Sheet of Paper and Attach.

Causative factors and corrective actions						Verification (Did we do what we said we would do?) and Validation (Is it working?)		
Item No.	**CF**	**Corrective actions (Must match Causative Factor)**	**Responsible party**	**Date due**	**Date completed**	**Verified by/ Validated by**	**Date**	**Details**
						Verified by: **Validated by:**		
						Verified by: **Validated by:**		
						Verified by: **Validated by:**		
						Verified by: **Validated by:**		

Causative factors

Personal factors		Company factors		External factors	
1	Insufficient training for task	5	Incomplete or no procedures	10	Exposure to conditions
2	Hurrying to complete the task	6	Procedures not known or enforced		
3	Easier if proper process not followed	7	Improper PPE		
4	Took shortcuts without prior incident	8	Improper tools		
		9	Improper workplace layout		

HASP Acknowledgment Sheet

Project Name:_____ Project Number: _____

This is to certify that I have received a pre-entry briefing regarding this HASP, and I understand its contents. My failure to follow and comply with the requirements contained in this plan may result in disciplinary action and/or termination.

Print Name	Signature	Date

Tailgate Safety Meeting Form
Large Group Format - Single Day

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Site personnel in attendance:

Print Name	Signature	Company

Tailgate Safety Meeting Form
Small Group Format - Multiple Days

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Print Name	Signature	Company

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Print Name	Signature	Company

Date:		Time:		Project No.:	
Presenter:		Project Name:			

Safety topics/items discussed:

Print Name	Signature	Company

Health and Safety Plan Amendment Form

This document is to be completed for ANY changes that occur within the Site Health and Safety Plan (HASP). This document is to be sent to the Regional Safety & Health Manager (RSHM) for review, verification and sign off of the HASP.

Amendment #	
Site Name/Project ID	
Date	
Client Contact (same/change)	
Reason for Amendment (SOW change, JSA addition, Chemical, etc.)	
Alternate or Additional Safeguard Procedures	
Required changes in PPE	
Additional Comments:	

Project Manager Notified	☐
RSHM Notified	☐
Client PM Notified (if necessary)	☐

Site HSE Officer (sign above)	Date

The Project Manager is ultimately responsible for the accuracy of the information on this amendment and ensuring any changes to the original HASP is discussed with all affected site personnel prior to commencing work

This original form must be placed in the project file and a copy needs to be attached to the Site Health and Safety Plan (HASP).

Permit-Required Confined Space Inventory

No	Type	Location	Existing or Potential Hazards	Other Comments

Confined Space Entry Permit

Permit Date:		Entry Class (MN only) ☐ IA ☐ IB ☐ II ☐ III
Facility/Location:		
Permit Number:		

Section 1: Confined Space Characteristics	
Purpose of Entry:	*(specify)*
Location and Configuration of Confined Space:	*(specify)*

Section 2: Chemical and Physical Hazards				
Materials present or previously stored in space (specify):*				
Material State:	☐ Solid	☐ Liquid	☐ Gas	☐ Sludge
Physical Hazards:	☐ Physical Exertion	☐ Heat Stress	☐ Cold Stress	☐ Heavy Equipment
	☐ Fire Hazards	☐ Lifting Hazards	☐ Slip, Trips, Fall	☐ High Noise
	☐ Overhead Hazard	☐ Underground Hazard	☐ Fall Protection	☐ Electrical
	☐ Hand/Power Tools	☐ Welding/Cutting	☐ Sparks	☐ Grinding
	☐ Explosive	☐ Visibility	☐ Respiratory (dust)	☐ Splash
	☐ Flying Debris	☐ Pinch, Grab, Roll	☐ Internal Obstruction	☐ Oxygen Deficient
		☐ Engulfment	☐ Other (specify):	_____
*Note: The health effects of the contaminant(s) need to be discussed with the team prior to entry. Smoking is prohibited.				

Section 3: Lock-Out/Tag-Out/Isolation					
Pipes/Valves	☐ Yes	☐ No	☐ N/A	Pipes/valves closed, multiple locked and tagged.	Initials:
	☐ Yes	☐ No	☐ N/A	Pipes blanked	Initials:
	☐ Yes	☐ No	☐ N/A	Vents/drains blocked	Initials:
Electrical	☐ Yes	☐ No	☐ N/A	Switches/lines off, multiple locked and tagged.	Initials:
Mechanical	☐ Yes	☐ No	☐ N/A	Pumps, motors and other mechanical devices off. Multiple locked and tagged.	Initials:
Other:					

Section 4: Personal Protective/Safety Equipment Assessment			
☐ Faceshield	☐ Alarm/Air Horn	☐ Airline/5 minute escape	☐ Tripod escape unit/hoist
☐ Hard hat	☐ Signage, barricades, etc.	☐ Coveralls, other: _____	☐ Fire Extinguisher
☐ Hearing protection	☐ Gloves, other:	☐ Spark Resistant Tools	☐ Fall Protection Device
☐ Steel-toed shoes	☐ Tyvek suit	☐ Radios, telephone, etc.	☐ Intrinsic lighting & tools
☐ Rubber boots	☐ PVC/Splash suit	☐ First Aid Kit	☐ Other:
☐ Portable eyewash	☐ Air-purifying respirator	☐ Escape harness/lifeline	☐ Other:

Section 5: Air Monitoring

Test(s) Required	**Instrument/Model and Serial Number**	**Permissible Entry Level**	**Date: Time:**	**Date: Time:**	**Date: Time:**	**Date: Time:**	**Date: Time:**
% O_2		≥19.5% and <22.0%					
% LEL		<10%					
ppm CO		<35 PPM					
ppm H_2S		<5 PPM					
ppm VOC		See HASP					
Other							
Other							
Equipment will be calibrated in accordance with manufacturers' guidelines.			Tester's Name:				

Section 6: Authorized Entrants/Attendants within Permit Space

I understand that I have reviewed this permit and know my job function and procedures necessary to accomplish this task safely.

Entrant	Signature	Time In	Time Out	Time In	Time Out	Time In	Time Out
Authorized Attendant	**Signature**	**Time In**	**Time Out**	**Time In**	**Time Out**	**Time In**	**Time Out**

Section 7: Confined Space Certifications

Based on the hazard assessment, the following entry procedure will be followed:

☐ Non-Permit Entry	☐ Alternate Entry	☐ Permit-Required Entry

I certify that all required precautions have been taken and necessary equipment and emergency response is provided for safety entry and work in this confined space.

Signature of Entry Supervisor Authorizing Entry:	*Date/Time:*

DURATION: This permit is approved for _____ hours on this day. Only the entry supervisor can extend this permit to a maximum of 12 hours.

Section 8: Emergency Response Support for Permit-Required Spaces

IDLH Conditions are Present or Possible (Note: If Yes, then responders must be on site during entry.)	☐ Yes	☐ No

Name and Phone Number of Emergency Responders:			
Called Responders to Brief and Confirm Availability:	☐ Yes	☐ No	☐ Not Applicable

Section 9: Task Completion and Permit Close-Out

Verification of System Line Restoration (Removal of locks, tags, blanks, blocks, etc.):	☐ Yes	☐ No	☐ Not Applicable

I certify that this permit is finalized and closed out. _____ *Entry Supervisor (Print and Sign Name)*	_____ *Date/Time*

Upon completion, this permit must be sent to an HSE Team Manager or designee for review and be kept on file for a period of 1 year.

(Enter Name of competent person who completed the hazard assessment)
Signature: _____ Date: _____

Review Date	Time	Reason for Review	Initials

Evaluation Form for Emergency Rescue Services on Permit-Required Confined Spaces

Directions: This evaluation must be completed initially and then annually for sites and/or facilities which rely on community/local rescue services to provide emergency rescue services to their permit-required confined spaces. The rescue service should visit each site and/or facility to view all permit-required confined spaces and review their potential hazard(s). All questions must be answered satisfactorily in order to be able to list 911 on the CS permit and rely on the rescue service. It is acceptable to work with and assist rescue services in achieving a satisfactory evaluation.

Name of Service:		Contact's Name:	
Emergency Phone No.:		Business Phone No.:	

Item No.	Description		Yes	No
1.	Does the rescue service have the ability, in terms of proficiency, with rescue-related tasks and equipment?		☐	☐
2.	Will the rescue service stand by (on site) at the permit space for IDLH or potential ILDH atmospheres? The cost for providing this service is $_____.		☐	☐
3.	Can the rescue service respond in a 10- to 15-minute timeframe for non-IDLH situations (i.e., mechanical hazards that may cause broken bones, abrasions, etc.)? The availability of the rescue service is (i.e., 24 hours a day or are there times when key personnel would not be available)? _____		☐	☐
4.	Does the rescue service:			
	A.	Provide all required PPE and equipment that may be needed at the site and/or facility? If no, GHD will provide.	☐	☐
	B.	Train rescue personnel annually in accordance with the standard?	☐	☐
5.	Will the rescue service commit to providing rescue services to the site and/or facility?		☐	☐
6.	Is there an adequate method of communication between the attendant and rescue service to summon help?		☐	☐
7.	Has the rescue service practiced rescues or successfully performed a permit space rescue within the last 12 months?		☐	☐

Evaluation Completed By:

Name (Print)	Signature	Date

Confined Space Entry Coordination Document

Each company involved in confined space entry and related work has responsibilities. If more than one Company is involved in entering a confined space, one representative will be designated as the "lead employer". The lead employer must complete the coordination document below. This document explains the duties of each employer involved in the confined space work. This will ensure that the same standard is being applied to all contractors and that one plan is followed when entering the confined space.

(***Insert Company name***) will act as lead employer for the Confined Space Activities listed on permit (attach permit). As lead employer for this portion of the project, (***company name***) reserves the right to stop work at any time should any of the entry requirements not be adhered to.

(List company names and authorizing signatures)

Company Name	Print Name	Authorizing Signature

Check applicable boxes only:

☐	Each contractor listed above needs to provide general confined space training to their workers.
☐	The lead employer is responsible for training all of the contractors on the confined space plan before the work begins.
☐	The contractor (name) shall act as lead employer for the duration of the CSE.
☐	Permit attached.

Underground Utilities Checklist

(QSF-019)

Pre-Drilling/Excavation Checklist and Utility Clearance Log

Project number:	**Project name:**
Date:	**Project location:**
Public utility locator:	**Public utility locator phone number:**
Date of public utility locator request:	**Public locator call reference number:**
Private utility locator (If applicable):	**Private utility locator phone number:**

Utilities (indicate that location/utility presence was checked)

Borehole/ Excavation location	Date (mm/dd/yyyy)	Telephone	Water	Storm sewer	Sanitary sewer	Process sewer	Gas	Electrical	Cable	Overhead utilities	Other	Comments/Warnings
Utility owner												

Instructions: This checklist is to be completed by GHD personnel prior to initiation of field activities as a safety measure, to ensure that all underground utility lines, other underground structures, and above-ground power lines are clearly marked in the area selected for boring or excavation.

Notes: _____

Client: _____ **Client representative:** _____ **Phone number:** _____

Client or property owner acknowledgement of utility clearance: _____ **(Client, property owner, or authorized agent signature)**

Subcontractor acknowledgement of utility clearance: _____ **(Subcontractor or subcontractor representative signature)**

GHD field representative name: _____ **Signature:** _____

GHD project manager's review/confirmation of locate completion: _____

In the event that client or property owner acknowledgement cannot be obtained, it is strongly encouraged that all boreholes be hydro vacuumed and the costs passed on to the client.
Attach any clearance documentation from utility owner/operator to this document.

Underground Utilities Checklist for GHD Personnel

Pre-Drilling/Excavation Checklist and Utility Clearance Log

Drilling or excavation work may not proceed if any of the questions answered below are answered "No." Implement stop work authority and contact the GHD project manager to discuss and resolve any concerns or issues. Document the reason for a "No" answer in the comments section below.

Yes	No	N/A	Pre-Mobilization
☐	☐	☐	1. Has a utility locator request been completed within the last 30 days (verify time limit with state or provincial law)? If no, stop work and comment below.
☐	☐	☐	2. Is a scaled site plan, map or drawing showing the proposed borehole locations attached to this form?
☐	☐	☐	3. Does each borehole and excavation location allow for clear entry and exit, adequate workspace, and a clear path for raising the mast (or boom) and operating the drill rig and all support equipment? Ensure that the minimum OSHA/state/provincial utility clearance requirements between the mast or boom and the power line(s) are met. For instance, OSHA requires a minimum approach distance of 10 feet for systems below 50 kV and an increase of 4" for every 10 kV over 50 kV. Confirm if additional permits are required if the boom or mast will be working 5 meters (15 feet) or less from the electrical lines.
☐	☐	☐	4. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface or above-ground utilities shown on client's building plans? Check here ☐ if plans not provided by client (therefore not applicable to this job.
☐	☐	☐	5. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface or above-ground utilities shown on public right-of-way street improvement or other public property plan or site map?
☐	☐	☐	6. Has the site representative, familiar with the site, indicated no knowledge of any subsurface or above-ground utilities within 3 metres (10 feet) of the proposed borehole and excavation locations? (Review locations with site representative)
☐	☐	☐	7. Are all of the proposed borehole and excavation locations at least 1.0 meters (3 feet) from any subsurface utilities identified during a geophysical survey? Check here ☐ if no geophysical survey has been completed (therefore not applicable to this job).
☐	☐	☐	8. Have all utility locating service providers, notified by the public line locator, marked out their facilities in the vicinity of the borehole and excavation locations or otherwise notified us that they do not have any facilities near the proposed locations? (Attached confirmation and utility locate sheets from public locator)
☐	☐	☐	9. Are all proposed borehole and excavation locations at least 1.5 meters (5 feet) from a visual line connecting two similar looking manhole covers?
☐	☐	☐	10. Are all proposed borehole and excavation locations at least 1.5 meters (5 feet) from a visual line perpendicular to the street from the water, gas, and electrical meters?
☐	☐	☐	11. Are all proposed boring and excavation locations clear of pavement joints, curbs, crash posts, or other engineered structures?
☐	☐	☐	12. Does the ground surface/pavement lack signs of previous excavation (e.g., no pavement subsidence, no differences in pavement texture or relief, no pavement patching)?
			Pre-Drilling and Excavation
☐	☐	☐	13. Has it been verified that the proposed drilling or excavation work will not affect any work currently in progress?
☐	☐	☐	14. Has the drill rig or heavy equipment been inspected prior to use and documented? (See Drill Rig Inspection Checklist or Mobile Equipment Safety Inspection Checklist)
			15. Have barricades been erected to prevent unauthorized access, where applicable?
☐	☐	☐	16. Have all known live electrical or product lines within 3 meters (10 feet) of the dig path been visually verified? If no, comment below.
			17. For boreholes that have not been cleared or are within 3 meters of a utility:
☐	☐	☐	a. Before drilling have you cleared a hole to 2.4 meters (8 feet) below grade using an air-knife, or equivalent, before drilling and is the diameter of this hole greater than the final outside diameter of the boring? If not required comment below.
☐	☐	☐	b. Does the soil you encountered in the hand-dug hole appear to be native material (i.e., free of clean gravel, clean sand, aggregate base [gravelly sand ~ 10% fines] or other non-native looking material)? If not required comment below.

Have the above concerns been discussed with the GHD project manager?	☐ Yes	☐ No	☐ Not Applicable
Has the start of subsurface work been communicated to the GHD project manager?	☐ Yes	☐ No	☐ Not Applicable
Have the above concerns been discussed with the client?	☐ Yes	☐ No	☐ Not Applicable
Has the scope of work been approved by the client?	☐ Yes	☐ No	☐ Not Applicable

Comments: _____

_____

_____

_____

_____

GHD field representative name: _____ **Date:** _____

Attachment C
Community Air Monitoring Plan (CAMP)

Attachment C Community Air Monitoring Plan

This Community Air Monitoring Plan (CAMP) has been developed for the Tonawanda Coke Corporation (Site), NYSDEC Site #915055, located in Tonawanda, New York. The CAMP has been developed in accordance with the New York State Department of Health's (NYSDOH's) Generic Community Air Monitoring Plan.

Overview

This site-specific CAMP requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of intrusive work activities. The action levels specified herein require increased monitoring and corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP will help to confirm that work activities do not spread contamination off site through the air.

Designated air monitoring station locations will be established around the perimeter of the site for use as monitoring locations. The site-specific CAMP presented below will be implemented during ground intrusive activities at the site. Each day that this activity is in progress upwind and downwind air monitoring stations will be set up to collect data. The instruments that will be used to collect the air monitoring data will have data logging capabilities. The data will be downloaded periodically, stored electronically and will be available to agency personnel for their review.

Reliance on this CAMP should not preclude simple, common sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Real-time air monitoring for VOCs and particulate levels at the perimeter of the site will be necessary, as described below.

Continuous monitoring will be required during all ground intrusive activities at the Site. Ground intrusive activities include the installation of soil borings, monitoring wells, and test trenches.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil sample and groundwater samples. Periodic monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while sample collection and then taking a reading prior to leaving a sample location.

VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the site on a continuous basis. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The specific type of air monitoring equipment that will be used at the site for VOC monitoring will be a MiniRae 3000, or equivalent. The equipment will be calibrated in accordance with the manufacturer's guidelines. The equipment will be

capable of calculating 15 minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of VOCs at the downwind perimeter of the site exceeds 5 parts per million (ppm) above background for the 15 minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the site persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the designated work area or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15 minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the Site, activities must be shut down.
4. All 15 minute readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate/Fugitive Dust Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at upwind and downwind monitoring stations on the site perimeter. 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 particulate monitor that will be used will be a TSI 8520 DustTrak, or equivalent. The equipment will be equipped with an audible and/or visible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM 10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15 minute period or if airborne dust is observed leaving the designated work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM 10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the designated work area.
2. If, after implementation of dust suppression techniques, downwind PM 10 particulate levels are greater than 150 mcg/m^3 above the upwind level, 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 mcg/m^3 of the upwind level and in preventing visible dust migration.
3. All readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review.

The following fugitive dust suppression and corrective procedures will be employed at the site.

1. Reasonable fugitive dust suppression techniques will be employed during all remedial activities, which may generate fugitive dust.

2. The following techniques are generally effective for the controlling of the generation and migration of dust during construction activities and may be employed as necessary:

    a. Applying water on haul roads.

    b. Wetting equipment and excavation faces.

    c. Spraying water on buckets during excavation and dumping.

    d. Hauling materials in properly tarped or watertight containers.

    e. Restricting vehicle speeds to 10 mph.

    f. Covering excavated areas and material after excavation activity ceases.

    g. Reducing the excavation size and/or number of excavations.

When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

Appendix B
Quality Assurance Project Plan

Appendix B
Quality Assurance Project Plan

Confirmation Investigation
Tonawanda Coke Corporation
3875 River Road
Tonawanda, New York 14150

GHD | 2055 Niagara Falls Boulevard Niagara Falls New York 14304 USA

002428| 05| 12 | Report No 21 | July 25, 2016

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Quality Assurance Project Plan
Signature Page

Site Name:	Tonawanda Coke Corporation
Location address:	3875 River Road, Tonawanda, New York

Ref. No.	002428	GHD Office:	Niagara Falls, New York
Anticipated Start Date:	July 2016	Anticipated Project Duration:	1 week
Prepared By:	Paul McMahon	Date:	July 25, 2016
Project Manager:	Jim Kay	Date:	July 25, 2016
Quality Assurance Officer:	Paul McMahon	Date:	July 25, 2016

This signature page must be completed and be available on Site for review. This page does not, however, replace the QSF-016 requirements.

Acronyms and Short Forms

DER-10	DER-10 Technical Guidance for Site Investigation and Remediation", December 2010
DQOs	Data Quality Objectives
EDDs	Electronic Data Deliverables
ELAP	NYSDOH Environmental Laboratory Accreditation Program
FSP	Field Sampling Plan
GC/MS	Gas Chromatography/Mass Spectrometry
GHD	GHD Services Inc.
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management System
MDL	Method Detection Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PARCCS	Precision, Accuracy, Representativeness, Comparability, Completeness, Sensitivity
%R	Percent Recovery
PPE	Personal Protective Equipment
O&M	Operations and Maintenance
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
Site	Tonawanda Coke Corporation, Tonawanda, New york
SOPs	Standard Operating Procedures
SVOCs	Semi-volatile Organic Compounds
SW-846	"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd Edition with Updates 1 through V, 2014
TCL	Target Compound List
USEPA	United States Environmental Protection Agency

1. Introduction

The New York State Department of Environmental Conservation (NYSDEC) - Division of Remediation (DER) "DER-10 Technical Guidance for Site Investigation and Remediation", December 2010, (DER-10) provides the guidelines for anyone seeking to complete an investigation and/or remediate a potentially contaminated site in New York State. A component of DER-10 is the development of a Quality Assurance Project Plan (QAPP). The QAPP is a planning document that provides a "blueprint" for obtaining the type and quantity of data needed to support environmental decision making. The QAPP integrates all technical and quality aspects of a project and documents all quality assurance (QA), quality control (QC), and technical activities and procedures associated with planning, implementing, and assessing environmental data collection operations.

GHD Services Inc. (GHD) has been retained to prepare this QAPP in accordance with the DER-10 guidelines, and the United States Environmental Protection Agency (USEPA) QAPP guidance documents "EPA Requirements for Quality Assurance Project Plans", EPA QA/R-5, reissue May 2006, and "EPA Guidance for Quality Assurance Project Plans", EPA QA/G-5, reissue December 2002.

In accordance with these documents, there are four basic groups of elements that must be included in a QAPP.

These four groups and associated elements follow:

- Group A - Project Management. The elements in this group include all aspects of project management, project objectives, and project history.
- Group B – Data Generation and Acquisition. The elements in this group include descriptions of the design and implementation of all measurement systems that will be used during the project.
- Group C – Assessment/Oversight. The elements in this group encompass the procedures used to ensure proper implementation of the QAPP.
- Group D – Data Validation and Usability. The elements in this group cover the QA activities that occur after the data collection phase of the project is completed.

The elements associated with the project management, data generation and acquisition, assessment/oversight, and data validation and usability for the supplemental investigation are presented in this QAPP.

2. Project Organization

The responsibilities of management, QA personnel, field personnel, and laboratory personnel are provided in the following subsections. Additionally, any special training/certification requirements for the project are identified and an organization chart that identifies the lines of communication among the participants in the investigation activities is presented herein.

2.1 Management Responsibilities

GHD has been selected as technical consultant for the supplemental investigation activities at the Site. GHD has technical responsibility for the data collection activities at the Site. GHD's Project Manager is ultimately responsible for ensuring that the project objectives are achieved. GHD's Project Manager has selected a project team consisting of GHD's technical personnel (engineering, geology/hydrogeology, chemistry, and data management), QA personnel, and the analytical laboratory. GHD's Project Manager for the investigation activities and his specific responsibilities are summarized by the following.

Jim Kay - Project Manager - GHD

- Technical representation on behalf of the client
- Advising on corrective actions
- Overview of field activities
- Ensuring all GHD resources are available on an as-required basis
- Preparing and reviewing reports
- Coordinating GHD's technical group

The analytical laboratory for this project is TestAmerica Laboratories, Inc. (TestAmerica). Additional laboratories may be required for any specialty environmental analyses that are required in the future. The laboratory Project Manager is responsible for ensuring the project objectives are achieved by the laboratories. The TestAmerica Project Manager and her specific responsibilities are summarized by the following.

Melissa Deyo - TestAmerica

- Ensures all resources of the laboratory are available on an as-required basis
- Review of final analytical reports
- Approve final reports prior to submission to GHD

2.2 Quality Assurance Responsibilities

Project team members with QA responsibilities include GHD's QA Officer, GHD's Field QA Officer, and the laboratory QA Officer. These individuals and their specific responsibilities are summarized by the following.

Paul McMahon - Quality Assurance Officer - GHD

- Review laboratory quality assurance/quality control (QA/QC)
- Coordinate and review data validation and assessment
- Advise on laboratory corrective action procedures
- Prepare and review QA reports
- QA/QC representation of project activities

Robert Adams - Remedial Investigation Coordinator/Field QA Officer - GHD

- Overview and review field QA/QC
- Management of field activities and field QA/QC
- Field data assessment
- Internal field technical system audits
- Technical representation of field activities
- Preparation of standard operating procedures (SOPs) for field activities
- Implement and document field corrective actions, if necessary

Brad Prinzi - TestAmerica

- Coordinate and overview of laboratory systems audits
- Overview of QA/QC documentation
- Conduct detailed data review
- Implement and document laboratory corrective actions, if required
- Technical representation of laboratory QA procedures
- Oversee preparation of laboratory SOPs

2.3 Field Responsibilities

GHD will conduct all field sampling and obtain field measurements related to sampling during the investigation. The specific procedures for field sample collection and field measurements will adhere to the GHD SOPs for field work and as described in any applicable work plan. GHD's field team leader will be responsible for documenting any field-related non-conformances and implementing and documenting subsequent corrective actions. The field team leader or any field team member can identify and report non-conformances.

2.4 Laboratory Responsibilities

2.4.1 TestAmerica Laboratories, Inc.

TestAmerica is expected to perform the analyses for the investigation. Specific information concerning the sampling and analysis requirements for the investigation are provided in Section 2.7 of this QAPP.

The shipping address and contact information for the laboratory follows:

TestAmerica Laboratories, Inc.
10 Hazelwood Drive Suite 106
Amherst, New York 14228
(716) 691-2600
Laboratory Certification ID NY10026

The specific responsibilities of laboratory personnel involved in the project are summarized by the following:

Melissa Deyo - TestAmerica

- Coordinate laboratory analyses.
- Supervise in-house chain of custody.
- Sub-contract sample analyses as needed.
- Schedule sample analyses.
- Oversee data review.
- Oversee preparation of analytical reports.

Sample Custodian – TestAmerica

- Receive and inspect incoming sample containers.
- Record the condition of incoming sample containers.
- Sign appropriate documents.
- Verify correctness of chain of custody documentation.
- Notify project manager of any nonconformances identified during sample receipt and inspection.
- Assign a unique identification number to each sample, and enter the client identification number and sample identification numbers into the sample receiving log.
- Initiate transfer of the samples to appropriate laboratory sections.
- Control and monitor access/storage of samples and extracts.

2.5 Project Organization

The organization and lines of communication among the project participants identified in the preceding subsections are presented on Figure B2.1.

2.6 Problem Definition/Background Information

The problem definition and background information is detailed in the work plan.

This QAPP has been prepared by GHD on behalf of the client, and focuses on specific QA/QC activities designed to achieve the objectives of a supplemental investigation at the site.

This QAPP is a dynamic document, and it will be updated with specific addenda, if necessary, to reflect new phases of work as they are implemented. Any necessary modifications will be made by GHD's QA Officer and will be reviewed by GHD's Project Manager. This QAPP will be reviewed on an annual basis by GHD's QA Officer to ensure it accurately reflects any work being conducted at the Site. It is anticipated that this QAPP will be utilized throughout the investigative process.

2.7 Project/Task Description

An overview of the sampling and analysis program is provided in Table 1.1. Target analytes and targeted reporting limits are presented in Table 2.1.

2.7.1 Project Schedule

The program schedules will be presented in any applicable work plans and will be dependent on some critical items such as regulatory reviews and approvals and weather. These items may impact the ultimate implementation and completion of scheduled activities. Forthcoming work plans will provide schedules for any future sampling and analysis programs.

2.8 Quality Objectives and Criteria for Measurement Data

The quality objectives and measurement performance criteria for data obtained for the investigation are presented in the following subsections.

2.8.1 Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements derived from the outputs of each step of the DQO process. The DQO process is a series of planning steps based on the scientific method that is designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application.

There are seven steps in the DQO process that include:

- Stating the problem
- Identifying the goal of the study
- Identifying information inputs
- Defining the boundaries of the study
- Developing the analytical approach
- Specifying performance or acceptance criteria
- Developing the plan for obtaining data

The resulting statements and DQOs are summarized in the following:

1	Problem	Determine the impact of Site-related releases.
2	Goal	Determine if constituents of concern are detected in soil, sediment, tar, and tank solids/liquids.
3	Inputs	Data from the sampling locations detailed in the work plan.
4	Boundaries	Site boundaries as provided by historical documentation.
5	Analytical Approach	If Site-related constituents exceed NYSDEC criteria, additional activities may be necessary to address the findings.
6	Acceptance Criteria	Ability to detect constituents at laboratory method detection limits (MDLs) and quantitate constituents at laboratory targeted reporting limits (refer to QAPP Section 5.0 and Table 2.1).
7	Plan	Scheduled the sampling event, with subsequent data analysis and reporting.

2.8.2 Measurement Performance Criteria

The measurement performance criteria for precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) are provided in the following subsections.

2.8.2.1 Field Precision Criteria

Precision of the field sample collection procedures will be assessed by the analysis of field duplicate samples. Field duplicate samples will be collected at a frequency of 1 per 20 or fewer investigative samples or at a minimum frequency of 1 per sampling event. The samples will be labeled such that the field duplicate sample is "blind" to the laboratory. A relative percent difference (RPD) of 100 percent will be used for analytes detected in both the investigative and field duplicate samples at concentrations greater than or equal to five times their quantitation limits.

2.8.2.2 Laboratory Precision Criteria

Laboratory precision will be assessed through the calculation of RPDs for laboratory duplicate sample analyses. These will be matrix spike/matrix spike duplicate (MS/MSD) and/or duplicate laboratory control samples (LCS/LCSD) samples. The equation to be used to determine precision is presented in Section 5.3.1 of this QAPP. Laboratory precision acceptance criteria will be generated by the laboratory and included in the laboratory reports.

2.8.2.3 Field Accuracy Criteria

The criteria for accuracy of the field sample collection procedures will be to ensure that samples are not affected by sources external to the sample, such as inadequate equipment decontamination procedures or sample contamination by ambient conditions or sample cross-contamination. Field sampling accuracy will be assessed using the data from equipment blank samples.

Field equipment blank samples will be collected at a frequency of one per ten or fewer sampling equipment decontamination procedures with a minimum frequency of one per sampling event during which equipment decontamination occurs. Field equipment blank samples (also referred to herein as equipment blank samples) will be collected by routing laboratory-provided deionized water through decontaminated sampling equipment for the same parameters being analyzed for the

investigation collection activities. The samples will be labeled such that the field blank sample is "blind" to the laboratory. Equipment blank samples will be analyzed to check for procedural contamination or ambient conditions that may cause sample contamination.

Equipment blank samples should not contain target analytes. The equipment sample data will be evaluated using the procedures specified in Section 5.3.2 of this QAPP. Accuracy also will be ensured by adhering to all sample handling procedures, sample preservation requirements, and holding time periods.

2.8.2.4 Laboratory Accuracy Criteria

Laboratory accuracy will be assessed by determining percent recoveries from LCS analyses. An LCS will be analyzed at a frequency of 1 per laboratory batch of 20 or fewer samples of the same matrix. Accuracy relative to the sample matrix will be assessed by determining percent recoveries from the analysis of MS samples. The equation to be used to determine accuracy for this project is presented in Section 5.3.2 of this QAPP. Laboratory accuracy acceptance criteria will be generated by the laboratory and included in the laboratory reports.

The accuracy of all organic analyses also will be monitored through the analysis of surrogate compounds. Surrogate compounds are added to each sample, standard, blank, and QC sample prior to sample preparation and analysis. Surrogate compounds are not expected to be found occurring naturally in the samples, but behave analytically similar to the compounds of interest. Consequently, surrogate compound percent recovery data will provide information on the effect that the sample matrix exhibits on the accuracy of the analyses. Surrogate compound percent recovery acceptance criteria will be generated by the laboratory and included in the laboratory reports.

2.8.2.5 Field Representativeness Criteria

Representativeness is dependent upon the proper design of the sampling program. The representativeness criteria for field sampling will be to ensure that the correct locations are sampled and that the proper sampling procedures are followed. The sampling program was designed to provide data representative of conditions at the Site. During development of the sampling program, consideration was given to existing analytical data and physical setting.

2.8.2.6 Laboratory Representativeness Criteria

The representativeness criteria for laboratory data will be to ensure that the proper analytical procedures are used for sample preparation, sample analysis, and that sample holding times are met. Additionally, the accuracy and precision of the laboratory data affect representativeness. The laboratory representativeness criteria will include achieving the accuracy and precision criteria for the sample analyses.

2.8.2.7 Field Comparability Criteria

The criteria for field comparability will be to ensure and document that the proper sampling procedures are followed.

2.8.2.8 Laboratory Comparability Criteria

The criteria for laboratory data comparability will be to ensure that the analytical methods used for the investigation are comparable to the methods used for previous sampling events, as applicable. The methods identified in Section 3.3.2 of this QAPP are the same or comparable to the methods used to generate previous data.

2.8.2.9 Field Completeness Criteria

No field analyses are currently scheduled for this investigation.

2.8.2.10 Laboratory Completeness Criteria

The criteria for laboratory completeness will be 90 percent or more of the laboratory data are determined to be usable for the intended purpose. The procedure for determining laboratory data usability is provided in Section 3.9.2 of this QAPP. The equation for calculating completeness is presented in Section 5.3.4 of this QAPP.

2.8.2.11 Field Sensitivity Criteria

No field analyses are currently scheduled for this investigation.

2.8.2.12 Laboratory Sensitivity Criteria

The sensitivity criteria for the laboratory analyses are the targeted reporting limits provided in Table 2.1 of this QAPP.

It should be noted that high concentration of target and non-target analytes and matrix interferences may prevent the targeted quantitation limits from being achieved for all samples. The methods selected for analyzing the samples are USEPA methods routinely used to support environmental investigations and data gathering activities.

2.9 Special Training/Certification Requirements

GHD field sampling team members are required to have successfully completed relevant field training protocols. They are also required to have received the 40-hour Hazardous Waste Operations and Emergency Response (known as HAZWOPER) safety training and annual 8-hour refresher courses required by 29 CFR Parts 1910 and 1926. Employee training documentation is maintained within GHD.

Laboratory personnel training records are maintained by the laboratory. The laboratory is required to be accredited by the National Environmental Laboratory Accreditation Program (NELAP) to demonstrate compliance with USEPA's requirement that the laboratory have a documented quality system that complies with ANSI/ASQC E4-94 ("Specifications and Guidelines for Quality System for Environmental Data Collection and Environmental Technology Programs", January 1995), and EPA QA/R-2 ("EPA Requirements for Quality Management Plans", March 2001). The laboratory is accredited by NELAP for the analyses identified in this QAPP.

2.10 Documentation and Records

The documents, records, and reports generated during the investigation activities are identified in the following subsections. The GHD Project Manager will ensure the most current version of the QAPP is available prior to each sampling event.

2.10.1 Field and Laboratory Records

Documents and records generated during the project include sample collection records, QC sample records, laboratory records, and data handling records. A brief description of these documents and records are provided below. Detailed information on these records is provided in subsequent sections of this QAPP.

Sample collection records that will be used during the program's sampling activities include field logbooks and/or project standard field forms, stratigraphic logs, chain of custody records, field narratives, and shipping papers.

QC sample records that will be used during the project to document the generation of QC samples include field logbooks and/or project standard field forms recording field blank samples, and field duplicate samples. The laboratory will maintain quality records for deionized water sent for field blank samples and sample integrity information. Records of sample preservation will be maintained in field logbooks and/or on project standard field forms and by the laboratories.

Laboratory records that will be maintained for the project include sample receipt documentation, laboratory narratives, field and laboratory chain of custody documentation, sample container cleanliness certifications, reagent and standard reference material certifications, sample preparation records, sample analysis records (i.e., run logs), instrument/raw data, QC data, calibration data, corrective action reports, and final reports.

Data handling records that will be maintained include verification of computer programs used to manipulate or reduce raw data into final results and data validation reports. The laboratory will maintain documentation of data verification and reduction procedures as necessary for the analyses used during the investigation. GHD will maintain checklists, notes, and reports generated during the external data validation process.

2.10.2 Data Reporting Format

Field data will be recorded in field logbooks and/or on project standard field forms. The details for recording field data are provided in Section 3.2.2.1 of this QAPP. Field data will be generated primarily from observations. This information will be included in project reports or submittals.

Level II laboratory reports will be provided. MDL studies and method performance and validation studies will be maintained by the laboratory.

2.10.3 Data Archiving and Retrieval

All records will be maintained consistent with the laboratory's and GHD's record retention policies.

3. Data Generation and Acquisition

The design and implementation of the measurement systems that will be used during the investigation activities, including sampling procedures, analytical procedures, and data handling and documentation, are detailed in the following subsections.

3.1 Sampling Process Design

The rationale for the sampling program is described in the Work Plan.

3.1.1 Sampling Methods

Sample collection methods are provided in the Work Plan.

3.1.2 Field Equipment and Sample Container Cleaning Procedures

Equipment cleaning/decontamination procedures are provided in the Work Plan. Sample containers will be provided by the laboratories. All containers will be pre-cleaned in accordance with the USEPA guidance document entitled "Specifications and Guidance for Contaminant-Free Sample Containers", EPA 540/R-93/051. Certificates of analysis for each lot of containers will be maintained by the laboratory or be available from the vendor upon request.

3.1.3 Field Equipment Maintenance, Testing, and Inspection Requirements

Field equipment will be inspected and tested prior to use in the field. Maintenance logs for all field equipment are kept in field equipment files located at each GHD office. Prior to use in the field, the equipment is checked again, and the performance information is recorded in the field logbook and/or on a standard field equipment form. All equipment returned from the field is inspected and tested. Any required maintenance is performed and documented prior to the equipment being returned to service.

Critical spare parts for field equipment and replacement field equipment are available and can be delivered to the field when the need is identified. Alternately, field equipment vendors can provide replacement equipment if needed. The replacement equipment can be shipped for overnight delivery as necessary.

3.1.4 Inspection and Acceptance Requirements for Supplies and Sample Containers

The field supplies for the investigation consist of detergent (Alconox) for equipment cleaning, distilled water for sample collection equipment rinsing, deionized water for final sample collection equipment rinsing and for collecting equipment rinsate blank samples, and sample containers to collect the samples.

Alconox, a standard laboratory-grade detergent, and distilled water will be purchased as needed from a variety of vendors.

Deionized water and sample containers will be provided by the laboratory. The laboratory will maintain documentation of the purity/cleanliness for these materials. The laboratory QA Officer is ultimately responsible for ensuring these materials are acceptable for the project. The acceptability of these materials for use will be evaluated by reviewing lot analysis certificates (deionized water and containers). Water and containers that do not meet the laboratory's acceptability requirements will not be shipped to the field.

3.2 Sample Handling and Custody Requirements

The procedures for sample handling, labeling, shipping, and chain of custody documentation are provided in the subsections that follow.

3.2.1 Sample Handling

The procedures used to collect the samples are provided in the Work Plan. Table 3.2 identifies the requirements for the number of containers, container volume, container type, preservation, holding time periods, and shipping for the analyses. The sample identification procedure is as follows:

Example: S-002428-062016-DJT-XXX

Where: S - Designates sample matrix (S - Soil)

002428 GHD project number

062016 date of collection (mm,dd,yy)

DJT sampler initials

xxx unique sample number

Samples will be placed in shipping coolers containing bagged, cubed ice immediately following collection. The samples will be grouped in the shipping cooler by the order in which the samples are collected, and then shipped to the laboratory via laboratory courier, hand delivery by GHD, or by an overnight courier service, generally on the day they are collected. The only exceptions to this procedure will be for samples collected after the courier service has picked up the shipment for the day and when samples are collected on a Sunday or holiday. In these instances, the samples will be shipped on the next business day.

3.2.2 Sample Custody

Chain of custody is the sequence of possession of an item. An item (such as a sample or final evidence file) is considered to be in custody if the item is in actual possession of a person, the item is in the view of the person after being in his/her actual possession, or the item was in a person's physical possession but was placed in a secure area by that person. Field, laboratory, and final evidence files custody procedures are described in the subsections that follow.

3.2.2.1 Field Custody Procedures

Logbooks and/or project standard field forms will be used to record field data collection activities. Entries will be described in as much detail as possible to ensure that a particular situation could be

reconstructed solely from these entries. Field logbooks are bound field survey books or notebooks with consecutively numbered pages. Logbooks will be assigned by project and will be stored at GHD's office when not in use. Each logbook will be identified by a project-specific document number.

The title page of each logbook will contain the following information:

- Project name
- Project number
- Project start date
- End date

Entries into the logbook will contain a variety of information. At the beginning of each day's logbook entry, the date, start time, weather, names of all sampling team members present, and the signature of the person making the entry will be entered. The names of individuals visiting the Site or field sampling team and the purpose of their visit will also be recorded in the field logbook.

All sample collection information will be recorded in a logbook and/or on a project standard field form. Project standard field forms are specifically prepared for each project sampling location. These forms are used to record all field information obtained and samples collected for each location. All entries will be made in ink, signed, and dated with no erasures. If an incorrect entry is made, the incorrect information will be crossed out with a single strike mark. The correct information will be entered adjacent to the original entry.

Whenever a sample is collected, an identification and a detailed description (if necessary) of the location will be recorded in the logbook and/or on a project standard field form. Photographs taken at a location, if any, will be noted in the logbook.

Samples will be collected according to the sampling procedures documented in the work plan. The equipment used to collect samples, time of sample collection, sample description, volume and number of containers, preservatives added (if applicable) will be recorded in the field logbook and/or on a project standard field form. A deviation from the work plan, QAPP, or other project-appropriate planning document sampling procedures will be documented in the field logbook and/or on a project standard field form. Each sample will be uniquely identified using the sample identification system provided in Section 3.2.1.

Figure B3.1 illustrates an example chain of custody form. The sample packaging and shipping procedures summarized below will ensure that the samples arrive at the laboratory with the chain of custody intact:

1. The field sampler is personally responsible for the care and custody of the samples until they are transferred to another person or the laboratory. As few people as possible will handle the samples.
2. All sample containers will be identified by using sample labels that include the sampler's initials, sample name, date and time of collection, and analyses to be performed. Sample labels will be completed for each sample using waterproof ink, and will be placed on the sample container.

3. Samples will be accompanied by a properly completed chain of custody form. The sample identification numbers and required analyses will be listed on the chain of custody form. When transferring the possession of samples, the individuals relinquishing and receiving the samples will sign and record the date and time on the form. The chain of custody form documents sample custody transfers from the sampler to another person, to the laboratory, or to/from a secure storage area.
4. Samples will be properly packaged for shipment using bubble wrap or foam sleeves and dispatched to the laboratory for analysis with a separate signed chain of custody form enclosed in and secured to the inside top of each shipping cooler. Shipping coolers will be secured with custody seals for shipment to the laboratory. The custody seal is then covered with clear plastic tape to prevent accidental damage to the custody seal.
5. If samples are split with a government agency or other entity, it is the responsibility of that entity to prepare its own chain of custody form for the samples. Information regarding the identity of the entity and the sample(s) that are being split will be recorded in the field logbook.
6. All sample shipments will be accompanied by the chain of custody form identifying its contents. The chain of custody form is a four part carbonless-copy form. The form is completed by the sampling team which, after signing and relinquishing custody to the shipper, retains the bottom (goldenrod) copy. The shipper, if different than the sampling team members, retains the pink copy after relinquishing custody to the laboratory. The yellow copy is retained by the laboratory, and the fully executed white copy is returned as part of the data deliverables package.
7. If the samples are sent by common carrier, a bill of lading (i.e., FedEx air bill) will be used and copies will be retained as permanent documentation. Commercial carriers are not required to sign the chain of custody form provided the form is sealed inside the sample cooler with the custody tape intact.

3.2.2.2 Laboratory Custody Procedures

Laboratory sample custody begins when the samples are received at the laboratory. The laboratory sample custodian will assign a unique laboratory sample identification number to each incoming sample. The field sample identification numbers, laboratory sample identification numbers, date and time of sample collection, date and time of sample receipt, and requested analyses will be entered into the sample receiving log. The laboratory's sample log-in, custody, and document control procedures will be consistent with its standard operating procedure.

Following log-in, all samples will be stored within an access-controlled location and will be maintained properly preserved (as defined in Table 3.2) until completion of all laboratory analyses. Unused sample aliquots and sample extracts will be maintained properly preserved for a minimum of 30 days following receipt of the final report by GHD. The laboratory will be responsible for the disposal of unused sample aliquots, sample containers, and sample extracts in accordance with all applicable local, state, and federal regulations.

The laboratory will be responsible for maintaining analytical logbooks and laboratory data.

3.2.2.3 Final Evidence Files Custody Procedures

The final evidence file for the project will be maintained by GHD and will consist of the following:

1. Project plans
2. Project logbooks
3. Field data records
4. Sample identification documents
5. Chain of custody records
6. Correspondence
7. References, literature
8. Final data packages
9. Miscellaneous - photos, maps, drawings, etc.
10. Reports

The final evidence file materials will be the responsibility of the evidentiary file custodian with respect to maintenance and document removal.

3.3 Analytical Method Requirements

The field and laboratory analytical methods that will be used during the investigation are detailed in the following subsections.

3.3.1 Field Analytical Methods

No field analyses are currently scheduled for this investigation.

3.3.2 Laboratory Analytical Methods

The analytical methods that will be used are presented in Table 3.3. The frequency and types of QC samples to be collected are included in Table 1.1.

The turnaround time required for the analyses required for each batch of samples will be noted on the chain of custody documents submitted with the samples and will be communicated to the laboratory prior to the sampling event, as necessary.

3.4 Quality Control Requirements

The field and laboratory QC requirements for the investigation are discussed in the following subsections. Specific QC checks and acceptance criteria are provided in the referenced analytical methods.

3.4.1 Field Sampling Quality Control

Field QC samples for this project include equipment blank samples to determine the existence and magnitude of sample contamination resulting from ambient conditions or sampling procedures and field duplicate samples to assess the overall precision of the sampling and analysis event. The frequency of collection of these field QC samples is summarized in Table 1.1 of this QAPP. The evaluation of field QC data is provided in Section 3.9.2 of this QAPP.

3.4.2 Analytical Quality Control

The laboratory QC requirements for the analyses include analyzing method blanks, instrument performance checks, initial calibration standards, calibration verification standards, internal standards, surrogate compound spikes, and LCS. The acceptance criteria for LCS and surrogate compounds will be generated by the laboratory and included in the laboratory reports. The analysis frequency and acceptance criteria for the remaining QC checks will be consistent with the referenced methods in Table 3.3.

3.5 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

The procedures used to verify that instruments and equipment are functional and properly maintained are described in the following subsections.

3.5.1 Field Instrument Maintenance

No field analyses are currently scheduled for this investigation.

3.5.2 Laboratory Instrument Maintenance

As part of its QA/QC program, the laboratory conducts routine preventive maintenance to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees will regularly perform routine scheduled maintenance and repair of (or coordinate with the instrument manufacturer for the repair of) all instruments. All maintenance that is performed will be documented in the laboratory's maintenance logbooks. All laboratory instruments are maintained in accordance with manufacturer's specifications. Table 3.1 provides examples of the frequency at which components of key analytical instruments or equipment will be serviced.

3.6 Calibration Procedures and Frequency

The procedures for maintaining the accuracy for all the instruments and measuring equipment that will be used for conducting field sampling and laboratory analyses are described in the following subsections. These instruments and equipment will be calibrated prior to each use or according to a periodic schedule.

3.6.1 Field Instruments/Equipment

No field analyses are currently scheduled for this investigation.

3.6.2 Laboratory Instruments

Calibration of laboratory equipment will be based on approved written procedures. Records of calibration, repairs, or replacement will be filed and maintained by the designated laboratory personnel performing these quality control activities. These records generally will be filed at the location where the work is performed and will be subject to a QA audit. The laboratory will have trained staff and in-house spare parts available for instrument repair or will maintain service contracts with vendors. Specific calibration procedures and frequencies are detailed in the referenced method.

3.7 Inspection/Acceptance Criteria for Supplies and Consumables

The procedures that will be used to ensure that supplies and consumables used in the field and laboratory will be available as needed and free of contaminants are detailed in the following subsections.

3.7.1 Field Supplies and Consumables

Supplies and consumables for field sampling will be obtained from various vendors and include sample containers, detergent and water for equipment decontamination, and field blank water. The vendors and inspection and acceptance criteria for these field supplies were presented in Section 3.1.4 of this QAPP. Additional field supplies and consumables may include pump tubing and personal protective equipment. Pump tubing will be constructed of pre-cleaned high density polyethylene (or equivalent acceptable tubing). These materials will not introduce contaminants into the samples or interfere with the analyses. All field supplies will be consumed or replaced with sufficient frequency to prevent deterioration or degradation that may interfere with the analyses.

3.7.2 Laboratory Supplies and Consumables

The laboratory's vendors for general lab ware and reagents include VWR Scientific Products and Fisher Scientific. Vendors for chromatography supplies and organic standards may include Ultra Scientific, Supelco, Accustandard, Restek, ChemService, Cambridge Isotopes, and Aldrich Chemical. The lot numbers of reagents and standards will be recorded and dates of receipt, first use, and expiration will be documented by the laboratory. Certificates of analysis will be maintained on file to document reagent/standard purity.

The referenced methods provide details on identifying contaminants in reagents and standards, determining deterioration of reagents and standards, and the corrective actions required if contaminants or deterioration are identified. The laboratory QA Officer is ultimately responsible for the ensuring the acceptability of supplies and consumables.

3.8 Data Acquisition Requirements (Non-Direct Measurements)

Data generated during the investigation are verified and validated. These data then will be submitted in the required reports to the NYSDEC. Data from other sources are not required for this investigation.

3.9 Data Management

The procedures for managing data from generation to final use and storage are detailed in subsections that follow.

3.9.1 Data Recording

Field information will be recorded in field logbooks and/or on project standard field forms. Field staff is responsible for recording field data and the Field QA Officer is responsible for identifying and correcting recording errors.

Laboratory data are recorded in a variety of formats. Data from instruments are recorded on magnetic media, strip charts, or bench sheets. The referenced methods provide the data recording requirement for each preparation and analysis method.

3.9.2 Data Validation

Validation of field data for this project will primarily consist of checking for transcription errors and reviewing information recorded in field logbooks. Data transcribed from the field logbook into summary tables for reporting purposes will be verified for correctness by the Field QA Officer or her designee. Any limitations on the use of field data will be identified in the required reports to the NYSDEC.

Validation of the analytical data will be performed by GHD's QA Officer or his designee based on the relevant and applicable evaluation criteria outlined in "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review", EPA 540-R-08-01, June 2008 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review", EPA-540-R-10-011, January 2010. The evaluation and action criteria specified in these documents (referred to hereafter as the National Functional Guidelines) will be used for validating the data. Qualifiers assigned to the data will be consistent with the data qualifiers specified in the National Functional Guidelines.

The following QC data deliverables will be evaluated on 100 percent of the data:

1. Technical Holding Times
2. Method Blanks
3. Surrogate Spikes
4. LCS Samples
5. Matrix Spikes
6. Field Duplicates
7. Equipment Blank Samples

3.9.3 Data Transformation/Data Reduction

No field analyses are currently scheduled for this investigation.

3.9.4 Data Transmittal/Transfer

The laboratories will provide data in electronic format as electronic data deliverables (EDDs) that are compatible with EarthSoft's EQuIS database product, which is GHD's database for chemistry and geographical data. EDDs are generated directly from the laboratory information management system (LIMS), thereby eliminating the possibility of manual transcription errors. Laboratory EDDs are imported into the EQuIS database, and the data are maintained in the database for manipulation and presentation.

GHD's QA Officer is responsible for verifying the correctness of the analytical database after the laboratory data for each event have been imported. This is accomplished by comparing the data from the database to the hard copy analytical reports for a minimum of 10 percent of the sample results. If discrepancies between the database and analytical reports are detected, a complete verification of the database will be performed or a new EDD will be submitted, imported, and verified as described previously.

3.9.5 Data Analysis

Soil, sediment, tar, and tank liquids/solids data will be analyzed to determine contours and concentration gradients. It is anticipated that commercially-available GIS software or GHD's Electronic Database Access Tool (e:DAT) may be used to facilitate the evaluation/visualization of the data. The actual software used and input parameters/assumptions will be identified in project reports, as necessary. There are no extreme or unique computer hardware required to use these software.

3.9.6 Data Assessment

Assessment of laboratory data will be performed using the procedures detailed in the analytical methods. These assessments included determining the mean, standard deviation, relative standard deviation, percent difference, RPD, and percent recovery for certain QC elements.

Assessment of QC data for data validation purposes will include determining the percent recovery, RPD, and percent completeness. The statistical equations to determine these parameters are provided in Section 5.3 of this QAPP.

3.9.7 Data Tracking

The laboratory's LIMS will provide the means for tracking data in the laboratory. The Laboratory Director is ultimately responsible for data tracking in the laboratory.

Tracking of analytical data in GHD's database includes recording the laboratory generating the data, the date when the EDD was received and imported, the date when qualifiers were applied to the results, the level of data review performed, and the data review guidance used to evaluate the data. GHD's Project Manager is ultimately responsible for tracking data from entry to reporting.

3.9.8 Data Storage and Retrieval

Laboratory data will be stored in hard copy and/or electronic format for a minimum period of 5 years. Electronic instrument data will be maintained for this same time period. All laboratory

records for this project will be maintained consistent with the storage requirements stated in Section 2.10.3 of this QAPP.

GHD's Project Manager is responsible for project data storage and retrieval. Final evidence files, which will include a copy of all laboratory data, will be maintained by GHD in secure on-Site or off-Site storage.

3.9.9 Data Security

Laboratory data security is the responsibility of the Laboratory Director. Archived data cannot be accessed without authorization, and the name and purpose of personnel accessing archived data are recorded. The laboratory's LIMS is password protected and access rights are restricted by job function. GHD's data security procedures include limiting project database access to database managers and analysts, in addition to general building security procedures.

4. Assessment/Oversight

The following subsections describe the procedures used to ensure proper implementation of this QAPP and the activities for assessing the effectiveness of the implementation of the project and associated QA/QC activities.

4.1 Assessments and Response Actions

Assessments consisting of internal and external audits may be performed during the project. Internal technical system audits of both field and laboratory procedures will be conducted to verify that sampling and analysis are being performed in accordance with the procedures established in the work plan and QAPP.

An internal field technical system audit of field activities will be conducted by the GHD Field QA Officer or their designee at the beginning of the field sampling activities to identify deficiencies in the field sampling and documentation procedures. The field technical system audit will include examining field sampling records and chain of custody documentation. In addition, sample collection, handling, and packaging in compliance with the established procedures will be reviewed during the field audit. Any deficiencies identified will be documented and corrective actions will be taken to rectify the deficiencies.

Corrective action resulting from internal field technical system audits will be implemented immediately if data may be adversely affected from the use of unapproved methods or the improper use of approved methods. GHD's Field QA Officer will identify deficiencies, if any, and recommend corrective action to GHD's Project Manager. Implementation of corrective actions will be performed by the GHD Field QA Officer and field team. Corrective action will be documented in the field logbook and/or the project file. Follow-up audits will be performed as necessary to verify that deficiencies have been corrected and that the QA/QC procedures described in this QAPP and the work plan are maintained throughout the project.

An internal laboratory technical system audit will be conducted by the laboratory's QA Officer or designee. The laboratory technical system audit typically is conducted on a biannual basis and

includes examining laboratory documentation regarding sample receiving, sample log-in, storage and tracking, chain of custody procedures, sample preparation and analysis, instrument operating records, data handling and management, data tracking and control, and data reduction and verification. The laboratory's QA Officer will evaluate the results of the audit and provide a report to section managers and the Laboratory Director that includes any deficiencies and/or noteworthy observations.

Corrective action resulting from deficiencies identified during the internal laboratory technical system audit will be implemented immediately. The Laboratory Director or section leaders, in consultation with the laboratory supervisor and staff, will approve the required corrective action to be implemented by the laboratory staff. The laboratory QA/QC Officer will ensure implementation and documentation of the corrective action. All problems requiring corrective action and the corrective action taken will be reported to the laboratory Project Manager. Follow-up audits will be performed as necessary to verify that deficiencies have been corrected.

External laboratory audits, if conducted, may include, but not be limited to, reviewing laboratory analytical procedures, laboratory on-Site audits, and/or submitting performance evaluation (PE) samples to the laboratory for analysis.

4.2 Reports to Management

Quality assurance information will be summarized following completion of the investigation activities. This information will consist of the results of external performance evaluations, results of periodic data quality validation and assessment, data use limitations, and any significant QA problems identified and corrective actions taken.

GHD's QA Officer will be responsible within the organizational structure for compiling this information.

5. Data Verification/Validation and Usability

The QA activities that will be performed to ensure that the data are scientifically defensible, properly documented, of known quality, and meet the project objectives are described in the following sections.

5.1 Data Review, Verification, and Validation Requirements

All field and laboratory data will be reviewed, verified, and validated. These terms are defined as follows:

- Data review is the in-house examination to ensure that the data have been recorded, transmitted, and processed correctly.
- Data verification is the process for evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual specifications.

- Data validation is an analyte and sample-specific process that extends the evaluation of data beyond method, procedure, or contractual compliance (i.e., data verification) to determine the quality of a specific data set relative to the end use.

The procedures and criteria used to verify and validate field and laboratory data are presented in Section 5.2. Field data and logbooks will be reviewed to ensure that the requirements of the sampling program, including the number of samples and locations, sampling, and sample handling procedures, were fulfilled.

Laboratory data review consists of raw data being reduced to results and checked by the responsible analyst. A second review of the data reduction procedure is conducted by another analyst or senior chemist. After the data are verified (see Section 5.2), a draft report is reviewed by the laboratory Project Manager. Final reports are generated, signed, and transmitted after approval of the draft by the Project Manager.

5.2 Verification and Validation Methods

Field data will be verified by reviewing field documentation and chain of custody records.

Verification of sample collection procedures consists of reviewing sample collection documentation for compliance with the requirements of the work plan and QAPP. If alternate sampling procedures were used, the acceptability of the procedure will be evaluated to determine the effect on the usability of the data. Data usability will not be affected if the procedure used is determined to be an acceptable alternative that fulfills the measurement performance criteria in Section 2.8.2 of this QAPP.

The laboratory will internally verify its data by reviewing and documenting sample receipt, sample preparation, sample analysis (including internal QC checks), and data reduction and reporting. Any deviations from the acceptance criteria, corrective actions taken, and data determined to be of limited usability (i.e., laboratory-qualified data) will be noted in the laboratory reports.

Verification of laboratory data conducted by GHD will consist of reviewing the final reports to ensure that the methods used to analyze the samples were consistent with the requirements of this QAPP. Sample handling records will also be reviewed to ensure that sample integrity remained intact from collection to laboratory receipt and that samples were properly preserved. Chain of custody documentation and sample condition upon laboratory receipt will be reviewed. Laboratory results, holding time periods, and QC data will be reviewed to determine compliance with the measurement performance criteria in Section 2.8.2 of this QAPP and the analytical methods.

Data validation will be conducted by GHD consistent with the procedure identified in Section 3.9.2 of this QAPP. The results of the data validation procedure will identify data that do not meet the measurement performance criteria in Section 2.8.2 of this QAPP. Data validation will determine whether the data are acceptable, of limited usability (qualified as estimated), or rejected. Data qualified as estimated will be reviewed and a discussion of the usability of estimated data will be included in the data validation report. The results of data verification/validation will be summarized in data validation report provided to GHD's Project Manager for use in interpreting the results and for use in project reports.

Data determined to be unusable may require corrective action to be taken. Potential types of corrective action may include resampling by the field team or reanalysis of samples by the laboratory. The corrective actions taken are dependent upon the ability to mobilize the field team and whether or not the data are critical for project DQOs to be achieved. GHD's Project Manager will be responsible for approving the implementation of any corrective action deemed to be necessary during data verification/validation.

5.3 Usability/Reconciliation with Data Quality Objectives

The overall usability of the data for the investigation will be assessed by evaluating the PARCCS of the data set to the measurement performance criteria in Section 2.8.2 of this QAPP using basic statistical quantities, as applicable. The procedures and statistical formulas to be used for these evaluations are presented in the following subsections.

5.3.1 Precision

Precision of field sampling procedures will be evaluated by assessing the RPD data from field duplicate samples. Analytical precision will be evaluated by assessing the RPD data from either duplicate spiked sample analyses or duplicate LCS analyses. The RPD between two measurements is calculated using the following simplified formula:

$$RPD = \frac{|R_1 - R_2|}{R_1 + R_2} X\ 200$$

Where:

R_1 = value of first result

R_2 = value of second result

RPD data will provide the means to evaluate the overall variability attributable to the sampling procedure, sample matrix, and laboratory procedures. It should be noted that the RPD of two measurements can be very high when the concentrations approach the quantitation limit of an analysis.

5.3.2 Accuracy/Bias

The data from method blank samples, surrogate compound spikes, LCS, and matrix spikes will be used to determine accuracy and potential bias of the sample data.

The data from method blank samples provide an indication of laboratory contamination that may result in bias of sample data. Sample data associated with method blank contamination will have been identified during the data validation process. Sample data associated with method blank contamination are evaluated during the data validation procedure to determine if analytes detected in samples associated with contaminated method blanks are "real", or are impacted by laboratory contamination. The procedure for this evaluation involves comparing the concentration of the analyte in the sample to the concentration in the method blank sample taking into account adjustments for sample preparation and dilution factors. In general, the sample data are qualified as non-detect "U" if both the sample and blank concentrations are less than the reporting limit or less

than 2x the reporting limit for common laboratory contaminants (phthalates). The "U" qualifier indicates that the result is a laboratory artifact based on the method blank contamination.

The data from equipment samples provide an indication of field conditions that may result in bias of sample data. Sample data associated with contaminated equipment blank samples will have been identified during the data validation process. The evaluation procedure and qualification of sample data associated with equipment contamination are performed in a similar manner as the evaluation procedure for method blank sample contamination.

MS sample data provide information regarding the accuracy/bias of the analytical methods relative to the sample matrix. MS samples are field samples that have been fortified with target analytes prior to sample preparation and analysis. The percent recovery data provide an indication of the effect that the sample matrix may have on the preparation and analysis procedure. Sample data exhibiting matrix effects will have been identified during the data verification/validation process.

Surrogate spike recoveries provide information regarding the accuracy/bias of organic analyses on an individual sample basis. Surrogate compounds are not expected to be found in the samples and are added to every sample prior to sample preparation. The percent recovery data provide an indication of the effect that the sample matrix may have on the preparation and analysis procedure. Sample data exhibiting matrix effects will have been identified during the data validation process.

Analytical accuracy/bias will be determined by evaluating the percent recovery data of LCS. LCS are artificial samples prepared in the laboratory using a blank matrix fortified with analytes from a standard reference material that is independent of the calibration standards. LCS are prepared and analyzed in the same manner as the field samples. The percent recovery data from LCS analyses will provide an indication of the accuracy and bias of the analytical method for each analyte or analyte group.

Percent recovery is calculated using the following formula:

$$\%R = \frac{SSR - SR}{SA} X\ 100$$

Where:

SSR = Spiked Sample Result

SR = Sample Result or Background

SA = Spike Added

The percent recovery for surrogate compounds and LCS are determined by dividing the measured value by the true value and multiplying by 100.

Accuracy/bias will be determined by comparing the percent recovery data to the measurement performance criteria in Section 2.8.2 of this QAPP.

5.3.3 Sample Representativeness

Representativeness of the samples will be assessed by reviewing sample holding times, the results of field audits, if conducted, and the data from field duplicate samples. Sample representativeness will be considered acceptable if holding time periods are met, the results of field audits indicate that the approved sampling methods or alternate acceptable sampling methods were used to collect the samples, and the field duplicate RPD data are acceptable.

5.3.4 Completeness

Completeness will be assessed by comparing the number of valid (usable) sample results to the total possible number of results within a specific sample matrix and/or analysis. Percent completeness will be calculated using the following formula:

$$\% \text{ Completeness} = \frac{\text{Number of Valid (usable) measurements}}{\text{Number of Measurements Planned}} \quad X\ 100$$

Completeness will be considered acceptable if 90 percent of the data are determined to be valid. However, valid sample data will not be rendered unusable if this completeness goal is not met. Formal corrective actions and additional sampling/analysis may be required when data quality results in a percentage less than the completeness goal. This will be addressed on a per event basis, in conjunction with the client and GHD.

5.3.5 Comparability

The comparability of data sets will be evaluated by reviewing the sampling and analysis methods used to generate the data for each data set. Comparability will be determined to be acceptable if the sampling and analysis methods specified in this QAPP and any approved QAPP revisions or amendments are used for generating the data.

Comparability of data from split samples (samples that are collected at the same time from the same location and split equally between two parties using sample containers from the same source or vendor), if collected, will be evaluated by determining the RPD of detected analytes in both samples following data validation. Analytes that are detected in only one of the two samples will be assessed by reviewing the data validation reports for both data sets and determining the cause of the discrepancy, if possible. Comparability of split sample data will be considered acceptable if the RPD for detected analytes with concentrations greater than or equal to five times their respective quantitation limits does not exceed RPD acceptance criteria for field duplicate samples.

5.3.6 Sensitivity and Quantitation Limits

Laboratory reports will include method reporting limits. These limits will be reviewed for the samples to ensure that the sensitivity of the analyses was sufficient to achieve the program requirements, per the NYSDEC criteria. All relevant QC data will be reviewed to assess compliance with the measurement performance criteria specified in Section 2.8.2 of this QAPP.

It should be noted that quantitation limits may be elevated as a result of high concentrations of target compounds, non-target compounds, and matrix interferences (collectively known as sample

matrix effects). In these cases, the sensitivity of the analyses will be evaluated on an individual sample basis relative to the applicable evaluation criteria.

5.3.7 Data Limitations and Actions

Data use limitations will be identified in data validation reports. Data that do not meet the measurement performance criteria specified in this QAPP will be identified and the impact on the project quality objectives will be assessed and discussed in these reports and project reports. Field information will be reviewed to ensure that all sampling procedures were conducted in accordance with the requirements of this QAPP. Data from samples collected using procedures inconsistent with the requirements of this QAPP will be evaluated using the procedures in Section 5.1 of this QAPP. Specific actions for laboratory data that do not meet the measurement performance criteria depend on the use of the data, and may require that additional samples are collected or the use of the data be restricted.

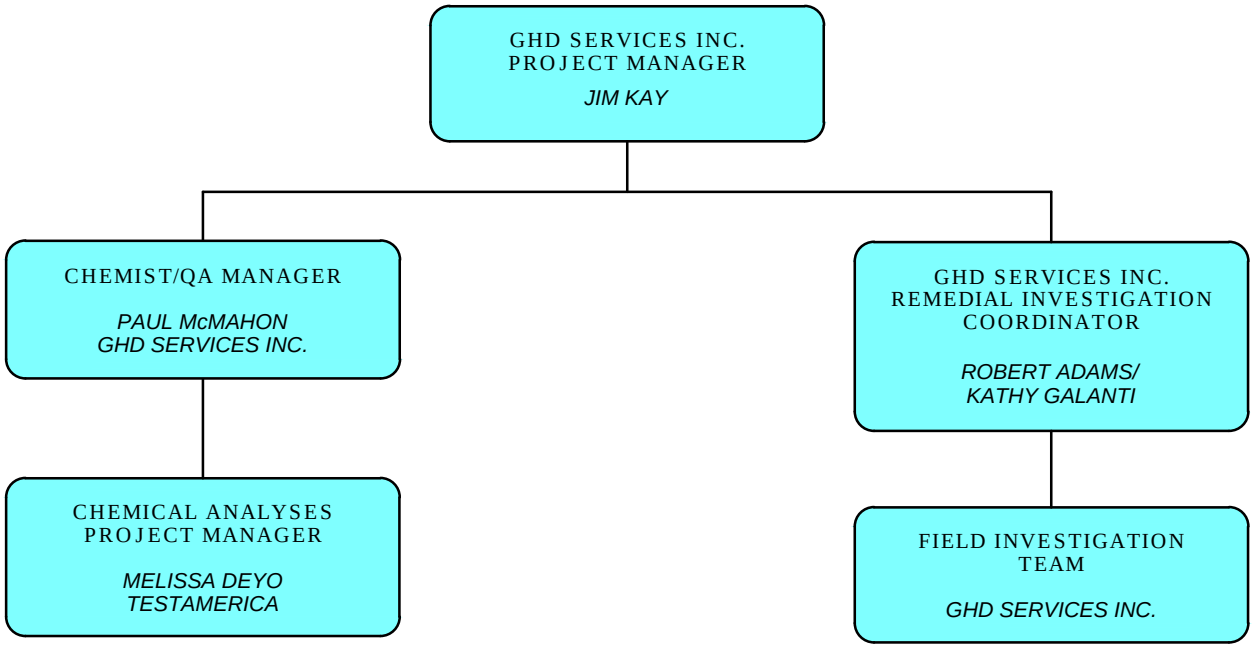

figure B2.1

PROJECT QA ORGANIZATION
CONFIRMATION INVESTIGATION
TONAWANDA COKE CORPORATION
Tonawanda, New York

CHAIN OF CUSTODY RECORD

Address: _____

Phone: _____ Fax: _____

COC NO.: _____

PAGE ___ OF ___

(See Reverse Side for Instructions)

Project No/ Phase/Task Code:	Laboratory Name:	Lab Location:	SSOW ID:
Project Name:	Lab Contact:		Cooler No:
Project Location:	SAMPLE TYPE / ANALYSIS REQUESTED (See Back of COC for Definitions)		Carrier:
GHD Chemistry Contact:			Airbill No:
Sampler(s):			Total # of Containers:

Item	SAMPLE IDENTIFICATION (Containers for each sample may be combined on one line)	DATE (mm/dd/yy)	TIME (hh:mm)	Matrix Code (see back of COC)	Grab (G) or Comp (C)	Filtered (Y/N)	Total Containers/sample	MS/MSD Request	COMMENTS/ SPECIAL INSTRUCTIONS:
	PRESERVATION - (SEE BACK OF COC FOR ABBREVIATIONS)								
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

TAT Required in business days (use separate COCs for different TATs):

☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 1 Week ☐ 2 Week ☐ Other:

Notes/ Special Requirements:

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
1.				1.			
2.				2.			
3.				3.			

THE CHAIN OF CUSTODY IS A LEGAL DOCUMENT – ALL FIELDS MUST BE COMPLETED ACCURATELY

GHD Form: COC-10B (20110804)

figure B3.1

CHAIN OF CUSTODY FORM
QUALITY ASSURANCE PROJECT PLAN
TONAWANDA COKE CORPORATION
Tonawanda, New York

Table 1.1

Summary of Sampling and Analysis Program
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda New York

Description	Sample Matrix	Laboratory Parameters [1]	~ No. of Samples Per	QC Samples		
				Equipment Blanks [2]	Duplicates	MS/MSD [3]
Tank Farm	Soil	TCL SVOCs	16	1	1	1
Subsurface	Soil	TCL SVOCs, TAL Metals	17	1	1	1
Subsurface	Soil	TCL/TAL[4]	2			
Surface	Soil	TCL/TAL[4] ,TOC	2	1	1	1
Surface	Soil	TCL SVOCs, TAL Metals, TOC	13	0	0	0
Embayment	Sediment	TCL/TAL[4] ,TOC	3	1	1	1
Embayment	Sediment	TCL SVOCs, TAL Metals, TOC	21	1	1	1
Ditch	Sediment	TCL/TAL[4] ,TOC	2	0	0	0
Ditch	Sediment	TCL SVOCs, TAL Metals, TOC	14	1	1	1
Tank	Tar	TCL SVOCs	11	1	1	0
Tank	Liquids	TCL SVOCs	3	1	1	0
Tank	Solids	TCL SVOCs	3	1	1	0

Notes:

1 Refer to Table 2.1 for specific analytes and quantitation limits.
2 No equipment blank collection is necessary if dedicated sampling equipment is used.
3 Double the normal sample volume is collected for soil/sediment.
4 Consists of TCL VOCs/SVOCs/Pesticides/PCBs, TAL metals and cyanide.
TCL Target Compound List
TAL Target Analyte List
VOCs Volatile Organic Compounds.
SVOCs Semivolatile Organic Compounds.
PCBs Polychlorinated Biphenyls
TOC Total Organic Carbon

Analyte List and Quantitation Limits
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda, New York

Analyte	Targeted [1] Quantitation Limits: Tank Liquid (µg/L)	Targeted [1] Quantitation Limits: Soil/Sediments/ Tar/Tank Solids (µg/kg)
TCL VOCs		
1,1,2,2-Tetrachloroethane	-	10
1,1,2-Trichloroethane	-	10
1,1-Dichloroethane	-	10
1,1-Dichloroethylene	-	10
1,2-Dibromo-3-chloropropane	-	10
1,2-Dibromoethane	-	10
1,2-Dichloroethane	-	10
1,2-Dichloropropane	-	10
Bromodichloromethane	-	10
Bromoform	-	10
Carbon tetrachloride	-	10
Chlorobenzene	-	10
Chloroethane	-	10
Chloroform	-	10
cis-1,3-Dichloropropene	-	10
Dibromochloromethane	-	10
Dichlorodifluoromethane	-	10
m-Dichlorobenzene	-	10
Bromomethane	-	10
Chloromethane	-	10
Methylene chloride	-	10
o-Dichlorobenzene	-	10
p-Dichlorobenzene	-	10
Tetrachloroethylene	-	10
trans-1,2-Dichloroethylene	-	10
trans-1,3-Dichloropropene	-	10
Trichloroethylene	-	10
Trichlorofluoromethane	-	10
Vinyl chloride	-	10
4-Methyl-2-pentanone	-	10
2-Butanone	-	10
Benzene	-	10
Ethylbenzene	-	10
Styrene	-	10
Toluene	-	10
Xylene(total)	-	10
1,1,1-Trichloroethane	-	10
2-Hexanone	-	10
Acetone	-	10
Carbon disulfide	-	10
1,1,2-Trichloro-1,2,2-trifluoroethane	-	10
Methyl Acetate	-	10
Methyl tert-Butyl Ether	-	10
cis-1,2-Dichloroethene	-	10
Cyclohexane	-	10
Methylcyclohexane	-	10
Isopropylbenzene	-	10
1,2,4-Trichlorobenzene	-	10

Analyte List and Quantitation Limits
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda, New York

	Targeted [1] Quantitation Limits	
	Tank Liquid (µg/L)	Soil/Sediments/ Tar/Tank Solids (µg/kg)
TCL SVOCs		
Acenaphthene	10	330
Acenaphthylene	10	330
Acetophenone	10	330
Anthracene	10	330
Atrazine	10	330
Benzaldehyde	10	330
Benzo(a)anthracene	10	330
Benzo(a)pyrene	10	330
Benzo(b)fluoranthene	10	330
Benzo(g,h,i)perylene	10	330
Benzo(k)fluoranthene	10	330
1,1'-Biphenyl	10	330
4-Bromophenylphenyl ether	10	330
Butylbenzylphthalate	10	330
di-n-Butyphthalate	10	330
Caprolactam	10	330
Carbazole	10	330
4-Chloroaniline	10	330
bis(2-Chloroethoxy)methane	10	330
bis(2-Chloroethyl)ether	10	330
bis(2-Chloroisopropyl)ether	10	330
4-Chloro-3-methylphenol	10	330
2-Chloronaphthalene	10	330
2-Chlorophenol	10	330
4-Chlorophenyl phenyl ether	10	330
Chrysene	10	330
Dibenz(a,h)anthracene	10	330
Dibenzofuran	10	330
3,3'-Dichlorobenzidine	10	330
2,4-Dichorophenol	10	330
Diethylphthalate	10	330
2,4-Dimethylphenol	10	330
Dimethylphthalate	10	330
4,6-Dinitro-2-methylphenol	25	330
2,4-Dinitrophenol	25	330
2,4-Dinitrotoluene	10	330
2,6-Dinitrotoluene	10	330
1,4-Dioxane	10	330
bis(2-Ethylhexyl)phthalate	10	330
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	10	330
Hexachlorobutadiene	10	330
Hexachlorocyclopentadiene	10	330
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	10	330
Isophorone	10	330
2-Methylnaphthalene	10	330
2-Methylphenol	10	330
4-Methylphenol	10	330
Naphthalene	10	330
2-Nitroaniline	25	330

Analyte List and Quantitation Limits
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda, New York

	Targeted [1] Quantitation Limits	
	Tank Liquid (µg/L)	Soil/Sediments/ Tar/Tank Solids (µg/kg)
TCL SVOCs (continued)		
3-Nitroaniline	25	330
4-Nitroaniline	25	330
Nitrobenzene	10	330
2-Nitrophenol	25	330
4-Nitrophenol	25	330
N-Nitroso-di-n-propylamine	10	330
N-Nitrosodiphenylamine (diphenylamine)	10	330
di-n-Octylphthalate	10	330
Pentachlorophenol	25	330
Phenanthrene	10	330
Phenol	10	330
Pyrene	10	330
2,4,5-Trichlorophenol	25	330
2,4,6-Trichlorophenol	10	330
TCL Pesticides/PCBs		
alpha-BHC	-	1.7
beta-BHC	-	1.7
delta-BHC	-	1.7
gamma-BHC (Lindane)	-	1.7
Heptachlor	-	1.7
Aldrin	-	1.7
Heptachlor epoxide	-	1.7
Endosulfan I	-	1.7
Dieldrin	-	3.3
4,4'-DDE	-	3.3
Endrin	-	3.3
Endosulfan II	-	3.3
4,4'-DDD	-	3.3
Endosulfan sulfate	-	3.3
4,4'-DDT	-	3.3
Methoxychlor	-	17
Endrin ketone	-	3.3
Endrin aldehyde	-	3.3
alpha-Chlordane	-	1.7
gamma-Chlordane	-	1.7
Toxaphene	-	170
Aroclor-1016	-	33
Aroclor-1221	-	67
Aroclor-1232	-	33
Aroclor-1242	-	33
Aroclor-1248	-	33
Aroclor-1254	-	33
Aroclor-1260	-	33

Analyte List and Quantitation Limits
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda, New York

	Targeted [1] Quantitation Limits	
	Tank Liquid (µg/L)	**Soil/Sediments/ Tar/Tank Solids (mg/kg)**
TAL Inorganics		
Aluminum	-	20
Antimony	-	6
Arsenic	-	1
Barium	-	20
Beryllium	-	1
Cadmium	-	1
Calcium	-	500
Chromium	-	1
Cobalt	-	5
Copper	-	3
Iron	-	10
Lead	-	1
Magnesium	-	500
Manganese	-	2
Mercury	-	0
Nickel	-	4
Potassium	-	500
Selenium	-	1
Silver	-	1
Sodium	-	500
Thallium	-	1
Vanadium	-	5
Zinc	-	2
Cyanide	-	1
General Chemistry		
TOC	-	1000

Notes:

1	Please note that these are targeted quantitation limits and are presented for guidance only. Actual quantitation limits are highly matrix dependent and may be elevated due to matrix effects, QA/QC problems and high concentrations of target and non-target analytes.
-	Not applicable.
TCL	Target Compound List
TAL	Target Analyte List
VOCs	Volatile Organic Compounds.
SVOCs	Semivolatile Organic Compounds.
PCBs	Polychlorinated Biphenyls
TOC	Total Organic Carbon

Table 3.1

Routine Preventive Maintenance Procedures and Schedules
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda, New York

Gas Chromatograph/Mass Spectrometer (GC/MS)	1. Replace pump oil as needed. 2. Change septa weekly or as often as needed. 3. Change gas line dryers as needed. 4. Replace electron multiplier as often as needed. 5. Replace gas jet splitter as needed. 6. Replace GC injector glass liner weekly or as often as needed. 7. Replace GC column as needed. 8. Check daily to ensure that gas supply is sufficient for the day's activity, and the delivery pressures are set as described in the SOP. 9. Check daily to ensure the pressure on the primary regulator is sufficient. 10. Clean source as needed.	1. Syringes 2. Septa 3. Various electronic components 4. Glass jet splitter 5. GC column 6. Glass liners
Gas Chromatograph	1. Change septa weekly or as often as needed. 2. Change gas line dryers as needed. 3. Replace GC injector glass liner weekly or as often as needed. 4. Replace GC column as needed. 5. Clean/replace GC detector as needed. 6. Check daily to ensure that gas supply is sufficient for the day's activity, and the delivery pressures are set as described in the SOP. 7. Check daily to ensure the pressure on the primary regulator is sufficient.	1. Syringes 2. Septa 3. Detectors 4. Glass liner 5. GC column
Purge and Trap Sample Concentrator	1. Replace trap as needed. 2. Decontaminate the system after running high concentration samples or as required by blank analysis. 3. Leak check system daily and as often as needed 4. Check daily to ensure the gas supply is sufficient for the day's activity, and the delivery pressures are set as described in the SOP. 5. Check daily to ensure the pressure on the primary regulator is sufficient.	1. Spare traps 2. Spare sparger vessels 3. Various electronic components/ circuits 4. Plumbing supplies - tubing, fittings
Mercury Analyzer	1. Clean tubing and quartz cell weekly or as often as needed. 2. Clean aspirator after each batch samples or as necessary. 3. Check daily to ensure the gas supply is sufficient for the day's activity, and the deliver pressures are set as described in the SOP.	1. Quartz cells 2 Aspirator

Table 3.1

Routine Preventive Maintenance Procedures and Schedules
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda, New York

Inductively Coupled Plasma Spectrometer (ICP)	1. Clean torch assembly and mixing chamber when discolored or after eight hours of running high dissolved solid samples 2. Clean nebulizer as needed. 3. Check daily to ensure the gas supply is sufficient for the day's activity pressures are set as described in the SOP.	1. Spare torch and mixing chambe 2. Spare nebulizer 3. Spare capillary tubing
Total Organic Carbon Analyzer	1. Inspect pump tubes after each 8-hour run; replace if discolored or distorted 2. Check the UV lamp daily 3. Replace chemical reagents as needed.	1. Pump tubing 2. UV lamps
Refrigerators	1. Monitor temperature twice daily.	
Ovens	1. Monitor temperature twice daily.	

Table 3.2

Container, Preservation, and Shipping Requirements
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda, New York

	Analysis	Sample Containers [1]	Preservation	Maximum Holding Times	Shipping Means	Comments
Soil/Sediment/ Tar/Tank Solids	TCL VOCs	Low level TerraCore kits or Equivalent	Cool to 0° to 6°C	48 hours from collection to extraction 14 days from collection to analysis	Courier or Federal Express	Fill completely
	TCL SVOCs	One 4-ounce glass jar with teflon-lined lid	Cool to 0° to 6°C	14 days from collection to extraction 40 days from extraction to analysis	Courier or Federal Express (Priority 1)	Fill completely
	TCL Pesticides/PCBs	One 4-ounce glass jar with teflon-lined lid	Cool to 0° to 6°C	14 days from collection to extraction 40 days from extraction to analysis	Courier or Federal Express (Priority 1)	Fill completely
	TAL Metals	One 4-ounce glass jar with teflon-lined lid	Cool to 0° to 6°C	6 months from collection to analysis (mercury 28 days from collection)	Courier or Federal Express (Priority 1)	Fill completely
	Cyanide	One 4-ounce glass jar	Cool to 0° to 6°C	14 days from collection to analysis	Courier or Federal Express	Fill completely
	TOC	One 4-ounce glass jar with teflon-lined lid	Cool to 0° to 6°C	14 days from collection to analysis	Courier or Federal Express (Priority 1)	Fill completely
Liquid	TCL SVOCs	2-1 L amber glass	Cool to 0° to 6°C	7 days from collection to extraction 40 days from extraction to analysis	Courier or Federal Express (Priority 1)	Fill completely

Notes:

1 The laboratory may choose to combine analyses in the same bottles, at their discretion.
TCL Target Compound List
TAL Target Analyte List
VOCs Volatile Organic Compounds.
SVOCs Semivolatile Organic Compounds
PCBs Polychlorinated Biphenyls
TOC Total Organic Carbon

Table 3.3

Summary of Analytical Methods
Confirmation Investigation
Tonawanda Coke Corporation
Tonawanda, New York

Parameter	Analysis Method	Laboratory	Location
TCL VOCs	SW-846 8260C [1]	TestAmerica Laboratories, Inc.	Amherst, NY
TCL SVOCs	SW-846 8270D [1]	TestAmerica Laboratories, Inc.	Amherst, NY
TCL Pesticides	SW-846 8081B [1]	TestAmerica Laboratories, Inc.	Amherst, NY
TCL PCBs	SW-846 8082A [1]	TestAmerica Laboratories, Inc.	Amherst, NY
TAL Metals	SW-846 6010C [1]	TestAmerica Laboratories, Inc.	Amherst, NY
Mercury	SW-846 7471B [1]	TestAmerica Laboratories, Inc.	Amherst, NY
Cyanide	SW-846 9012B [1]	TestAmerica Laboratories, Inc.	Amherst, NY
TOC	Lloyd Kahn[2]	TestAmerica Laboratories, Inc.	South Burlington, VT

Notes:

1 - SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd Edition with Updates I through IVB

2 "Determination of Total Organic Carbon in Sediment", Lloyd Kahn, USEPA Region II Memorandum, July 27, 1988.

TCL Target Compound List

TAL Target Analyte List

VOCs Volatile Organic Compounds.

SVOCs Semivolatile Organic Compounds

PCBs Polychlorinated Biphenyls

TOC Total Organic Carbon

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