FINAL
FIELD ACTIVITIES PLAN
REMEDIAL INVESTIGATION
SARANAC LAKE GAS COMPANY SITE
SARANAC LAKE, NEW YORK

SITE NUMBER 516008

WORK ASSIGNMENT NO. D007619-23

Prepared for:

New York State Department of Environmental Conservation

Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

Project Number: 3612132271

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

Figure

LIST OF TABLES

Table

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ASP	Analytical Services Protocol
bgs	below ground surface
COC	contaminant of concern
CSM	Conceptual Site Model
DNAPL	dense non-aqueous phase liquid
°F	degrees Fahrenheit
FAP	Field Activities Plan
FDR	field data record
FWIA	fish and wildlife impact analysis
FS	Feasibility Study
GPR	ground penetrating radar
HASP	Health and Safety Plan
IDW	investigation derived waste
IRM	Interim Remedial Measure
LNAPL	light non-aqueous phase liquid
MACTEC	MACTEC Engineering and Consulting, P.C.
MGP	manufactured gasification plant
msl	mean sea level
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

NYSDOH	New York State Department of Health
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyls
PVOC	petroleum volatile organic compound
QAPjP	Quality Assurance Project Plan
QAPP	Quality Assurance Program Plan
RI	Remedial Investigation
ROW	right of way
SC	site characterization
SCGs	standards, criteria and guidance
SCO	Soil Cleanup Objective
Site	Saranac Lake Gas Company
SVOC	semivolatile organic compound
TAL	target analyte list
TOC	total organic carbon
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WA	Work Assignment

1.0 INTRODUCTION

This Field Activities Plan (FAP) has been prepared by MACTEC Engineering and Consulting, P.C. (MACTEC) in response to Work Assignment (WA) No. D007619-23 dated May 24, 2013 from the New York State Department of Environmental Conservation (NYSDEC) for the Saranac Lake Gas Company Site (Site) in the Town of North Elba, in Essex County, New York (Figure 1.1) and in accordance with the April 2011 Superfund Standby Contract between MACTEC and the NYSDEC.

The Site (Site Number 516008) is currently listed as a Class 2 site (i.e., significant threat to the public health or environment) by the NYSDEC. The classification of the Site is based on the results of a previous Site Characterization (SC) conducted at the Site by the NYSDEC which identified manufactured gas plant (MGP) related contamination in groundwater, sediment, and soil. WA D007619-23 was issued to conduct a Remedial Investigation (RI) and Feasibility Study (FS) for the Site.

This FAP presents a technical scope of work for the RI activities and data collection. Results of the investigation will be used to prepare RI and FS Reports.

The purpose of the RI is to further evaluate the horizontal and vertical extent of MGP waste that has been released to the environment as a result of past activities and to evaluate whether contaminant concentrations exist at levels exceeding NYSDEC standards, criteria and guidance (SCGs). To evaluate the impact of contaminants on the environment a Fish and Wildlife Impact Analysis (FWIA) will be conducted. The need to investigate soil vapor intrusion will be evaluated based on soil and groundwater data collected during the RI.

This FAP is organized into seven sections as follows:

- *Section 1.0* – Introduction.
- *Section 2.0* –Site Physical Setting – Describes the physical and geologic and hydrogeologic setting of the Site.
- *Section 3.0* – Conceptual Site Model (CSM) – Presents a working conceptual model to describe how contaminants may have been released into the environment, how they might migrate and who they might affect.
- *Section 4.0* – Scope of Work - Describes the sampling and analysis that will be performed to assess contaminant distribution in groundwater, soil, sediment, and surface water.

- *Section 5.0* –Data Evaluation and Remedial Investigation Report- Describes the data evaluation and reporting process
- *Section 6.0* Feasibility Study Describes the Feasibility Study process and reporting.
- *Section 7*.0 References

The FAP is supplemented by the following attached documents:

- *Appendix A* – Site Specific Quality Assurance Project Plan (QAPjP)
- *Appendix B* – MACTEC Short Form Site-Specific Health and Safety Plan (HASP)
- *Appendix C* – Fish and Wildlife Impact Assessment Process
- *Appendix D* – Soil Grid and Sediment Tracking logs

1.1 WORK ASSIGNMENT OBJECTIVES

The Site has been separated into three distinct operable units (OU). An OU represents a portion of a site where technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate site related contamination. The OUs identified for this Site are: OU 01- onsite (the former gasification plant property); OU 02- Brandy Brook (from the Site to Pontiac Bay in Lake Flower); and OU 03- Lake Flower.

Based on a review of the Site Characterization Report (MACTEC, 2007), the WA Issuance and discussions with the NYSDEC Project Manager, the objectives of the RI/FS are to:

- evaluate the nature and extent and of MGP -related contamination of soil and groundwater at the Site (former gasification plant OU 01); the extent of surface water and sediment contamination in Brandy Brook (OU 02); and the extent of surface water and sediment contamination in Pontiac Bay of Lake Flower (OU 03);
- map the extent of soil contamination above the soil cleanup objectives (SCOs) for unrestricted use in the vicinity of the OU 01;
- map the extent of groundwater contamination above New York State (NYS) Class GA groundwater standards (Title 6 of the New York Codes, Rules, and Regulations Part 703.5 Water Quality Standards);
- map the extent of sediment contamination in Brandy Brook and Lake Flower above NYS Technical Guidance for Screening Contaminated Sediments (NYSDEC, 1993);
- determine groundwater flow direction and rate;
- evaluate fish and wildlife resources that occur on and in the vicinity of the Site via a FWIA; and

- evaluate the need for and feasibility of an interim remedial measure (IRM).
- produce a report of the investigation findings

1.2 SITE BACKGROUND

The Site background is discussed in the following sub-sections. Background information was primarily based on the WA Issuance/notice to proceed (NYSDEC, 2013) and the 2007 SC Report (MACTEC, 2007).

1.2.1 Site Description

The former Saranac Lake Gas Company Site is zoned as commercial; however, it is located in a residential setting on 24 Payeville Road in the Village of Saranac Lake, Essex County, New York (Figure 1.1). The Site is located east of, and adjacent to the Adirondack Scenic Rail Road. Residential properties border the Site to the north and east and recreational facilities and soccer playing fields border the south. The Site property consists of approximately 4.5 acres. Currently the Site is unoccupied and consists of a fenced storage yard that was recently used to stage and store propane gas cylinders, tanks and miscellaneous equipment. A figure showing the historical Site-related features is provided as Figure 1.2.

1.2.2 Site History

Based on information provided by NYSDEC (NYSDEC, 2013) and information gathered while conducting the SC investigation, the Saranac Lake Gas Company manufactured lighting gas (coal gasification) for the Village of Saranac Lake from the late 1800s to approximately the 1940s. Historically, operations at the Site included two above ground (or partially above ground) gas holders, a building housing purifier and retort operations, as well as additional areas for coal storage and offices. The Site owner is listed on the 1931 Sanborn map as The Mountain Gas Company. Based on hand-written sketches on the 1931 map obtained, it appears there was a pre-1931 Sanborn map; however it was not obtained during the Site visit. The 1937 or 1945 Sanborn map (actual date unknown) documents the Site as vacant and dilapidated, and one of the two gas holders has been removed. In a 1962 Sanborn map, the Site owner is listed as the Adirondack Bottled Gas Corp. and

shows only the purifier and offices remaining. An aerial photo taken in the early 1970s indicates little change from the 1962 Sanborn map.

Original structures from the MGP are not currently present on the Site, with the possible exception of a raised concrete storage pad and concrete foundation for one of the two gas holders.

1.2.3 Previous Investigations

Several investigations have been conducted at or in the vicinity of the Site, and were documented in the following reports:

- A 1989 NYSDEC Spill Report (NYSDEC, 1989) indicated stratified layers and pockets of coal tar-like material was observed at depths of 6 to 8 feet during the excavation of a house sewer located adjacent to Brandy Brook, just upstream of the intersection of River Road and Slater Avenue.
- Sampling and analysis documented as part of a 2001 Hazardous Substance Waste Disposal Site Nomination Form in which samples taken downstream from the Site in 1992 and 1993 from Brandy Brook and Pontiac Bay of Lake Flower indicated the presence of MGP related wastes.
- A SC Report documented investigation activities performed at the Site in 2007. MGP-related wastes were documented as being present at concentrations above NYS SCGs in soil and groundwater at the Site, in the sediments of Brandy Brook, and the sediments of Pontiac Bay of Lake Flower.

2.0 SITE PHYSICAL SETTING

The sections below describe the topography, climate, surface water and groundwater hydrology, and geology in the area surrounding the Site.

2.1 TOPOGRAPHY

The Site is located in the Town of North Elba, Essex County at approximately 1560 feet above mean sea level (msl). The topography in the immediate vicinity of the Site is characterized by a relatively flat grade. Brandy Brook flows adjacent to the northern edge of the Site and eventually discharges to Pontiac Bay of Lake Flower which is located approximately 0.75 miles northeast of the Site.

2.2 CLIMATE

The climate of the area is characterized by moderately warm summers and cold winters. Mean monthly temperatures range from around 14 degrees Fahrenheit (°F) in January to 65°F in July. Average annual precipitation is about 40 inches (National Climatic Data Center, 1999).

2.3 SURFACE WATER HYDROLOGY

Surface drainage at the Site is presumed to discharge to a storm drain located at the entrance of the driveway leading into the Site and Brandy Brook located adjacent to and alongside the northern portion of the property. Brandy Brook drains to Lake Flower at Pontiac Bay.

2.4 GROUNDWATER HYDROLOGY

Based on microwell survey results and site topography observed during the 2007 SC investigation there may be a groundwater divide across the site. The ground surface at the site slopes to the north towards Brandy Brook and to the south towards the soccer field. Water level elevation from monitoring wells at the site are needed to fully define groundwater flow direction. It is likely that surface water features (i.e., Brandy Brook to the north and drainage ditches located south of the site) may influence shallow groundwater flow from the site.

2.5 GEOLOGY

Based on the 2007 SC investigation, the surficial geology at the Site is predominately lacustrine sands and kame deposits (MACTEC, 2007). Overburden observed at the Site appears to be more consistent with lacustrine sands. Bedrock geology at the site is noted as gneiss of igneous or uncertain origin, and varied in composition (New York, 1970). Bedrock was not encountered during the 2007 SC and depth to bedrock at the Site is not known.

3.0 CONCEPTUAL SITE MODEL

This CSM is based on information that is currently available and it is considered a dynamic model. The CSM presented below will be used to focus, explain and modify data gathering activities as well as subsequent report writing activities. This CSM is intended to be modified as more data become available and to be referenced while collecting and/or analyzing data. Field staff collecting samples will evaluate conditions encountered to determine if what is observed in the field is consistent with the CSM. If findings in the field do not support the CSM, then the project team will re-evaluate the sampling approach to ensure that the samples collected meet the project objectives. The CSM will be modified when information gleaned from field and/or laboratory demonstrates the need for its modification.

3.1 SITE BACKGROUND

The Saranac Lake Gas Company manufactured lighting gas, through the coal gasification process for the Village of Saranac Lake. According to Sanborn insurance maps and photos obtained from the town library, the MGP likely operated until the 1930s or 1940s and included two above ground (or partially above ground) gas holders, a building housing the purifier and retort (heating) operations, as well as additional areas for coal storage and offices.

Based on the operational age of this MGP site, the most likely method of gas manufacturing was via the Carbureted Water Gas process. In general, this method involved:

- Coal heated in closed retorts in which the coal was prevented from combusting by limiting the oxygen.
- During the heating process steam was injected into the retort and a chemical reaction occurred that produced a flammable gas mixture.
- Liquid petroleum hydrocarbons were sprayed into the hot gas mixture creating addition methane.
- The gas was collected, cooled, and purified before being used.
- Condensed tar (coal tar) was produced as a by-product.

SC activities conducted at the Site in 2007 revealed the presence of MGP-related waste in soil, groundwater and sediment.

3.2 CONTAMINANTS OF CONCERN (COC)

The by-products resulting from the manufacture of coal gas contain a number of different chemical constituents that are a cause for concern when left untreated in the environment. The COCs resulting from the MGP process include:

- Coal Tar which includes polynuclear aromatic hydrocarbons (PAHs);
- Light oil which was a secondary by-product of the gasification process which contains volatile organic compounds (VOCs) including: benzene, toluene, ethylbenzene, and xylenes, naphthalene and trimethylbenzenes, collectively referred to as petroleum volatile organic compounds (PVOCs);
- Phenols;
- Purifier box waste which contains complexed-cyanide compounds as well as sulfur (which may cause changes in pH) ; and
- Metals, resulting from the coal ash and purifier waste which may include: aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc. Metals that have been previously detected at elevated concentrations in soil or groundwater at the Site during field activities conducted in 2007 are underlined.

The tar and associated light oil can exist as a Dense Non-Aqueous Phase Liquid (DNAPL), or a Light Aqueous Phase Liquid (LNAPL). The VOCs and phenols would tend to dissolve in groundwater, or volatilize in the soil (vadose zone). Metals and cyanide may be mobilized from the purifier waste and coal ash, depending on pH (perhaps affected by the presence of sulfur); the metals may be insoluble or soluble.

MGP-related contaminants detected during the 2007 SC in site soil, groundwater, and sediment are presented in Figure 3.1, Figure 3.2, and Figure 3.3, respectively.

3.3 SOURCE AREAS

The following features and areas onsite represent potential source areas for MGP waste:

- Gas Holders – within and around the footprint of the former gas holders – previous test pitting in these areas verified the presence of MGP-related waste;
- Former purifier and retort building;
- Former coal storage area;

- Potential waste landfill areas where coal tar and purifier waste may have been disposed.

3.4 POINTS OF ENTRY (FOR THE COCS)

Waste from the MGP process may have been released to the environment through a variety of processes. Onsite gas holders, condensers and/or tar separators may have leaked, and/or product could have been spilled and/or wastes may have been disposed onsite releasing tar and light oil into the soil. Both tar and light oil would tend to sink in the vadose zone. However, once the water table is encountered, the tar would continue to sink but the light oil would float. The VOCs associated with the light-oil would migrate in groundwater in a dissolved phase.

Wastes from the purifier box and ash from the retort may have been disposed onsite (e.g., landfill area). The associated COCs would be released via precipitation whereby cyanide and metals would be mobilized into the soil. The presence of sulfur in the box waste may result in a reduction of pH which could reduce metals to a soluble state. When these COCs (including metals) come in contact with the water table, migration would occur in a dissolved state coincident with the groundwater flow direction.

The distribution of MGP-related waste in sediment samples previously collected along Brandy Brook and Pontiac Bay suggests that tar waste may have been directly discharged to Brandy Brook, either via a drainage swale or a discharge pipe.

3.5 HYDROGEOLOGY AND CONTAMINANT DISTRIBUTION

The underlying soil encountered during the 2007 SC consisted of lacustrine sand. Borings went to a depth of 11 feet; however, bedrock was not encountered. The ground surface at the site slopes in a southern direction, toward the soccer field, and in a northern direction toward Brandy Brook. Although no conclusive data has been gathered to discern groundwater flow direction, it is likely that there is a groundwater divide at the site. A small pond south of the soccer field may be a discharge point for groundwater under the southern portion of the site, and Brandy Brook is likely a point of discharge for groundwater under the northern portion of the site.

VOCs, PAHs and metals associated with MGP-waste have been detected in groundwater onsite. Dissolved aromatic hydrocarbons and PVOCs generally bio-degrade relatively quickly and therefore

are not likely to migrate in groundwater great distances. Additionally, PAHs have a high Koc (partitioning coefficient) and therefore tend to "stick" to readily available natural carbon within the aquifer matrix, thus even limited migration of PAHs in groundwater is not expected.

The presence of coal tar in the stream and lake suggests that tar was discharged into Brandy Brook either from a surface source and overland flow, or pipe discharge. Given the fine grain nature of the lacustrine sand and the high Koc of the coal-tar, it is not likely that coal tar migrated to the stream from groundwater discharge. In areas of likely coal-tar discharge on site (e.g., near the gas holders), it is likely that the dense phase of the coal-tar would have sunk in the aquifer. Its migration within the aquifer would be controlled by gravity (i.e., slope) of the underlying confining surfaces, such as clay layers or perhaps the bedrock surface. In contrast, migration of lighter phase oils that are associated with the coal-tar would tend to follow the hydraulic gradient once the water table was encountered.

3.6 MIGRATION PATHWAYS

Based on results obtained during the 2007 SC, MGP-related waste appears to have been discharged either via a drainage swale or a discharge pipe to the Brandy Brook located to the northeast of the Site and the contamination appears to have migrated from Brandy Brook to Pontiac Bay of Lake Flower. There is also a potential for migration of MGP-related contaminants from Site soil to groundwater, however the current extent of groundwater contamination at the site and the groundwater flow from the site have not been clearly defined.

3.7 EXPOSURE ROUTES AND POINTS

MGP-related contamination above SCGs were documented in groundwater and soil at the Site (OU 01) and in sediment from Brandy Brook (OU 02) and Pontiac Bay/Lake Flower (OU 03) based on the 2007 SC. Exposure to OU 01 soils and groundwater is prevented by a locked chain link fence surrounding the portion of the property that historically housed the former MGP operations. Public water is available in the vicinity of the Site; therefore, it is unlikely that groundwater near the Site is being used for drinking purposes. Brandy Brook (OU 02) extends from the northern portion of the Site and discharges into Pontiac Bay of Lake Flower approximately 2,000 feet downgradient from the Site. Pontiac Bay/Lake Flower (OU 03), a Class A water body, serves as a recreational area as well as an

alternate water supply for the Village of Saranac Lake. Direct contact with sediment and ingestion of surface water are potential exposure pathways to humans and the environment.

3.8 DATA GAPS

Based on the CSM, data gaps have been identified, including:

- The extent of soil contamination in excess of the SCOs on the Site has not been defined;
- The extent of the overburden groundwater contamination above NYS Class GA groundwater standards in the vicinity of the Site has not been defined;
- Groundwater flow direction and rate has not been defined;
- Groundwater use (private well for drinking or other purposes) in the area of the site;
- Potential impacts to surface water in Brandy Brook, Pontiac Bay, and Lake Flower has not been evaluated;
- Potential ecological receptors have not been identified and/or evaluated; The extent of MGP-related sediment contamination in Brandy Brook in excess of the NYS Technical Guidance for screening contaminated sediments has not been defined; and,
- The extent of MGP-related sediment contamination in Pontiac Bay and Lake Flower in excess of the NYS Technical Guidance for screening contaminated sediments has not been defined.

4.0 SCOPE OF WORK

This FAP has been developed for the purpose of addressing WA objectives (Section 1.1) and current identified data gaps (Section 3.8); data collected will be used to prepare an RI Report, evaluate the potential for IRMs, and prepare a FS Report.

The following subsections describe the activities planned for the RI field investigation. The field investigation will be conducted in accordance with the specifications presented in the Quality Assurance Program Plan (QAPP) (MACTEC, 2011a) and the Site specific QAPjP, included as Appendix A to this FAP. Health and Safety procedures for onsite activities are presented in the Program HASP (MACTEC, 2011b) and the Site specific HASP, included as Appendix B to this FAP.

Laboratory analyses will be performed by Test America of Buffalo, New York. Off-site laboratory analysis will comply with the NYSDEC Analytical Services Protocols (ASP) (NYSDEC, 2005).

The components of the scope of work include:

- Conduct a Site visit and marking locations for utility clearance (completed July 18 and 19, 2013);
- Perform utility clearance via ground penetrating radar (GPR) survey to evaluate the presence of underground structures which may be associated with the former MGP operations (completed July 18 and 19, 2013);
- Conduct a title search to identify the extent of the original property owned and occupied by the former MGP;
- Conduct a private well survey to evaluate groundwater use (private well for drinking or other purposes) in the area of the site,
- Install up to 40 direct push borings in a 50-foot grid pattern on the Site, including collection of up to 24 soil samples for VOC, semivolatile organic compound (SVOC), target analyte list (TAL) metals, cyanide analyses and 4 soil samples for polychlorinated biphenyls (PCB), pesticide and hydrocarbon fingerprint analyses (plus quality control) to evaluate horizontal and vertical extent of MGP-related soil contamination;
- Install an additional 3 direct push borings adjacent to residential properties located on Brandy Brook Road, including collection of up to 3 soil samples for VOC, SVOC, metals including mercury, cyanide, total organic carbon (TOC) and hydrocarbon fingerprint analyses to evaluate horizontal and vertical extent of MGP-related contamination;

- Conduct hand borings from a minimum of 5 transects along the stretch of Brandy Brook from the Site leading to Brandy Brook Road (including one background transect) for visual contamination observations. Collect up to 8 sediment samples for VOC, SVOC, metals including mercury, cyanide, pesticides, PCB, TOC, grain size and hydrocarbon fingerprint analyses for evaluating horizontal and vertical extent of MGP-related contamination;
- Install and develop 10, 1-inch diameter microwells in 10 of the 40 direct push borings to evaluate groundwater quality and provide groundwater flow information. Although no offsite wells are currently planned, additional offsite wells will be added to fully define the contaminant plume if necessary;
- Collect a of round of groundwater elevation measurements from the 10 new microwells and 3 existing monitoring wells to evaluate groundwater surface elevation;
- Sample groundwater from the 10 new microwells and 3 existing monitoring wells for VOC, SVOC, metals including mercury, cyanide, pesticide, PCB and hydrocarbon fingerprint analyses to evaluate groundwater quality;
- Conduct sediment coring along transects across Pontiac Bay from up to 27 locations for visual contamination observations (until cores are visually clean). Collect up to 8 sediment samples for VOC, SVOC, metals including mercury, cyanide, TOC and grain size analyses for evaluating horizontal and vertical extent of MGP-related contamination;
- Conduct surface water sampling from 4 locations in Brandy Brook and 2 locations in Lake Flower, including VOC, SVOC, TAL metals, cyanide, hardness and hydrocarbon fingerprint analyses for evaluating surface water quality;
- Conduct a Site (OU 01) survey, including certified metes and bounds, ½-foot topographical elevation contours, sampling points, and microwells (elevations);
- Conduct an off-Site survey of Brandy Brook to include 1-foot topographical elevation contours and sediment sampling transects; and
- Conduct a FWIA at the Site, Brandy Brook, and Lake Flower.
- Produce a report of the investigation findings

A summary of these field tasks and methodologies are described in more detail in Table 4.1, as well as in the following subsections. Proposed sample locations are shown on Figure 4.1 and Figure 4.2.

4.1 GENERAL FIELD OPERATIONS

Companion documents to this FAP that will govern the execution of the field exploration activities include MACTEC's Program QAPP (MACTEC, 2011a) and HASP (MACTEC, 2011b). In addition to these program documents, Appendix A provides a QAPjP, and Appendix B provides details related to health and safety for on-Site activities as presented in the Site-specific HASP.

Subcontractors chosen to support the field activities include:

- Direct push soil borings and microwell installation will be performed by Geologic NY, Inc.;
- Vibracore sediment sampling will be performed by TG&B Marine Services, Inc.;
- Site survey will be completed by Prudent Engineering LLP; and,
- Soil, groundwater, and sediment analyses will be provided by Test America Laboratories, Inc.

4.1.1 Health and Safety

The Site-specific HASP is provided as Appendix B to this document. Based on available Site information, MACTEC anticipates that the fieldwork will be conducted in Level D personal protection. Specific investigation activities, utility clearance procedures, and required level of personal protection are set forth in the Site-specific HASP. Criteria for upgrading or downgrading the specified level of protection are also provided in the Site-specific HASP. Additional health and safety requirements are set forth in the Program HASP (MACTEC, 2011b). Should Site conditions pose a threat to those present on-Site, and/or should Site conditions warrant an upgrade from Level D, as defined by the HASP, work will stop and the situation will be reevaluated by the NYSDEC and MACTEC.

4.1.2 Mobilization

Mobilization will include obtaining utility clearances for proposed locations, procurement of subcontractors, and the acquisition and coordination of supplies. The NYSDEC will be responsible for obtaining access to the Site, as well as off-Site locations.

4.1.3 Access and Clearance

Exploration locations will be placed, to the extent practical, on a limited number of properties to facilitate access. Current proposed explorations are located on: 1) the Site former MGP property (OU 01), 2) Brandy Brook, including the Town of North Elba right of ways (ROW) from three residential properties located on Brandy Brook Road (OU 02), and 3) in Pontiac Bay and Lake Flower (OU 03). MACTEC will coordinate access with the NYSDEC and respective property owners.

For clearances of exploration locations, MACTEC and its drilling subcontractor will be responsible for marking locations in the field and coordinating utility clearance with Dig Safely – New York (for public property), the Town of North Elba, and the Site property owner. Because of the potential for underground utilities that likely exist from former MGP operations at the Site, a GPR survey of the on Site proposed locations was conducted on July 18 and 19, 2013. Underground utilities were not identified.

4.1.4 Sample Identification

Samples will be identified by: NYSDEC project number-media type and location ID – depth. Refer to Appendix A (QAPjP) for sample labeling description. Appendix D contains soil grid and sediment tracking logs.

4.2 SITE INVESTIGATION ACTIVITIES

The fieldwork is anticipated to be conducted as described in the following subsections. Proposed sampling locations are shown on Figures 4.1 and 4.2. Prior to commencing field investigations at the Site, MACTEC's surveying subcontractor will conduct title research to identify the extent of the original parcel where former MGP-related processes were located.

4.2.1 Site Inspection

A Site inspection was conducted on July 18 and 19, 2013 and consisted of meeting with the NYSDEC project manager on the property to perform a site reconnaissance of the property and surrounding residential properties, including Brandy Brook and Lake Flower to discuss project specifics (schedules, field program, timelines, etc.).

4.2.2 Geophysical Ground Penetrating Radar Survey

A GPR survey was conducted at the Site on July 18 and 19, 2013 to identify potential subsurface utilities and/or potential subsurface structures associated with the former MGP processes. Target depths ranged up to 15 feet below ground surface (bgs), shallow profiling antennas. Data generated will aid in the placement of direct push soil boring locations. Based on an interpretation of data

obtained during the survey, underground features or utilities were not identified. The GPR survey results will be presented in the RI report.

4.2.3 Direct Push Investigation

A direct push investigation will be conducted to further evaluate nature and extent of MGP-related waste present in soils on the Site (OU 01) and in the area south of Brandy Brook Road, between the brook and Brandy Brook Road ROW (OU 02). The extent of contamination both vertical and horizontal will be evaluated based on a combination of visual observations and analytical analysis.

4.2.3.1 On-Site Soil Sampling

Soil samples will be collected either by using direct push technology as described in the Section 4.5.1 of the QAPP (MACTEC, 2011a) or with hand tools (e.g. augers or shovels) if areas are inaccessible to a drill rig. Samples will be collected for physical and chemical analysis, as well as visual observations and geological classification.

The existing set of soil data does not give sufficient coverage to adequately define the limits of soil exceeding the unrestricted use SCOs for MGP-related contaminants. To supplement existing data and further evaluate the nature and extent of MGP waste, approximately 40 direct push borings will be advanced on the Site (OU 01) on a 50 foot grid across the Site. Soils from the direct push borings will be logged for soil characteristics and visual evidence of MGP-related waste. The grid for the location of the proposed borings is shown on Figure 4.1; actual boring locations are subject to change following the site mobilization/inspection and utility clearance. Dig-Safely New York, and the results of the GPR survey (as detailed in subsection 4.2.2) will be utilized to clear soil boring locations on the Site property. The borings will be advanced to refusal, which is assumed to be between 8 and 12 feet bgs. Ten borings will be completed as microwells (see 4.2.3.3 below).

Direst push soil samples will be collected from representative borings from the Site with and without visual evidence of contamination for analysis, as detailed in Table 4.1:

- Representative samples will be collected of visibly contaminated soils with different characteristics (e.g. odor, color, texture).
- Samples without visible contamination will be collected to represent soils located beneath and adjacent to areas of visible waste, and areas where wastes may have been released to the

environment based on processes or former structures (e.g. near gas holder, adjacent to or beneath former buildings).

Because many of the soil borings are targeting areas believed to contain MGP-related soil contamination (elevated contamination), it is expected that visual observation coupled with a sub-set of analytical laboratory data will provide sufficient information to determine the extent of MGP contamination. Up to 24 soil samples will be sent to the laboratory for analysis of some or all of the following: VOCs by United States Environmental Protection Agency (USEPA) Method 8260 (samples will be field preserved with methanol), SVOCs by USEPA Method 8270, pesticides/PCBs by USEPA Methods 8081/8082, RCRA 8 metals including mercury by USEPA Method 6010C/7470, Cyanide by USEPA method 9010, and Hydrocarbon fingerprint New York State Department of Health (NYSDOH) method 310-13.

Three samples of waste materials will also be analyzed for waste characterization parameters including Target Compound List metals, reactivity, pH, ignitability and corrosivity to provide information which will be used in designing an IRM.

4.2.3.2 Off-Site Soil Sampling

Three off-site direct push borings will be advanced in the area south of Brandy Brook Road, between the brook and Brandy Brook Road ROW (OU 02). Soil samples will be collected as detailed in the subsection above (4.2.3.1). The three off-site direct push borings will be conducted to evaluate the nature and extent of MPG-related wastes in this section of Brandy Brook, just above the discharge point to Pontiac Bay. The locations of the three off-site borings are shown on Figure 4.1 and are subject to change following the site mobilization/inspection and utility clearance. The three off-site borings will be advanced to depths ranging between approximately 8 and 12 feet bgs.

Three soil samples from the off-site borings will be sent to the laboratory for analysis of VOCs by USEPA Method 8260 (samples will be field preserved with methanol), SVOCs by USEPA Method 8270, pesticides/PCBs by USEPA Methods 8081/8082, metals including mercury by USEPA Method 6010C/7470, TOC by Llyod-Kahn method, and Hydrocarbon Fingerprint by NYSDOH method 310-13.

A groundwater grab sample for VOC analysis will be collected from one off-site boring where MGP related wastes are identified during soil sampling.

4.2.3.3 Microwell Installation

To better evaluate groundwater contaminant concentrations in overburden, as well as flow direction across and downgradient from the Site, up to ten of the direct push borings described previously, will be completed as microwells. Proposed microwell locations are shown on Figure 4.1. Groundwater at the Site is anticipated to be present between two and five feet bgs, based on previous investigations conducted at the Site. The microwells will be installed and used for water level measurements and groundwater quality sampling. Microwell construction is described in the Section 4.4.4 of the QAPP (MACTEC, 2011a). In general, microwells will be constructed with schedule 40 polyvinyl chloride, with five or 10 foot lengths of 0.01-inch machine slotted well screens. Each direct push soil boring will be completed to a depth of refusal. Subsequent construction of the corresponding microwell will be based on visual, olfactory and photoionization detector readings of the collected soil core. In areas where LNAPL (e.g., light oils) is suspected or observed, wells screens will be 10 feet in length with 2 feet of the screen positioned above the water table to intercept potential floating product. In areas in which DNAPL (e.g., heavy tar) is suspected or observed, microwells will be completed with a 10-foot screen positioned at the bottom of the penetrated unconsolidated aquifer. Exceptions to either case are if confining layers (e.g., clay) are encountered. The well screens will not be placed in or across confining layers. . The microwells will be constructed with a # 0 sand pack to one foot above the screen, and a bentonite seal to the ground surface. The microwells will be completed with a locking cap and a six inch flush mount cover.

4.2.3.4 Microwell Development

The microwells will be developed for twenty minutes with a peristaltic pump to clean the screen and verify that the microwells are conductive with groundwater.

4.2.4 Water Level Measurements

A synoptic round of water levels will be measured from newly installed microwells and existing microwells to further evaluate groundwater flow direction. Procedures are described in the Section 4.7.1 of the QAPP (MACTEC, 2011a).

4.2.5 Groundwater Sampling

After microwells have been installed and developed, groundwater samples will be collected from the 10 new microwells and three existing on site microwell locations. Groundwater analytical data will be used to assess the distribution of contamination in the vicinity of the Site. Groundwater samples will be collected following the development of the newly installed monitoring wells. Prior to well sampling, a round of water levels (depth to groundwater) will be measured. Monitoring wells will then be sampled using low-flow sampling procedures as described in the Section 4.5.4.3.2 of the QAPP (MACTEC, 2011a). Samples will be collected from the least contaminated to the most contaminated locations as determined from the assumed groundwater flow direction and historic analytical data.

Field measurements for pH, temperature, specific conductivity, oxidation reduction potential, dissolved oxygen, and turbidity will be collected through a flow through cell (with the exception of turbidity) from each monitoring well during pre-sample purging to evaluate well stabilization, as well as to collect geochemical parameters for evaluation. Field measurements and monitoring well sampling activities will be documented using a Low Flow Groundwater Data Record (QAPP Figure 4.17; MACTEC, 2011a).

Purge water will be released to the ground surface at the well location and allowed to infiltrate. Purge water will not be containerized and stored on-site unless NAPL is encountered. NAPL will be containerized and disposed at an appropriate off-site facility.

Groundwater samples from microwells will be analyzed for VOCs by USEPA Method 8260, SVOCs by USEPA Method 8270, Metals by USEPA Method 6010, Mercury by USEPA Method 7471, and Cyanide by USEPA Method 9010 as described in the NYSDEC ASP of June 2005 (NYSDEC, 2005). Three groundwater samples from microwells will also be analyzed for pesticides and PCBs by USEPA

Methods 8081/8082 and four samples will be analyzed for hydrocarbon finger print by Method NYSDOH 310-13. The laboratory will provide NYSDEC Category B deliverables.

A groundwater grab sample for VOC analysis will be collected from one off-site boring where MGP related wastes are identified during soil sampling.

4.2.6 Sediment Hand Boring Sampling

Sediment sampling is being conducted in areas of Brandy Brook and Pontiac Bay/Lake Flower presumed to contain MGP wastes. Samples from Brandy Brook will be collected using hand tools (e.g. hand geoprobing, shovel or hand auger) and will be conducted at the proposed locations to determine extent of contamination. Based on historical information, sediment contaminated with neat product is predominantly located beneath less contaminated to clean to sediment and is confined to the mucky sediment layer. Attempts will be made to sample the mucky sediment layer and deeper hard sand layer to verify these findings. In Brandy Brook, one sample transect will be located upstream of the Site to represent background conditions. Four transects will be sampled in areas adjacent to and downstream of the Site. Borings will be advanced in the center of the stream channel and on each side of the stream until sediments or stream bank soil show no visual sign of MGP-related contamination (vertically and horizontally). The actual transect locations will be refined during the RI field investigation.

Sediment sampling will be conducted according to Subsection 4.5.5 of the Program QAPP (MACTEC, 2011a) and documented on sediment sampling field data record (FDR).

4.2.7 Sediment Core Sampling

Sediment samples from Lake Flower (OU 03) will be collected using a barge mounted vibracore system, which is used to drive a 2.625 inch diameter polycarbonate tube (poly-tube) in a 3 inch core barrel, into the lake sediment. The core barrel and poly-tube are winched from the sediment, separated and the poly-tube with sediment core will be brought on shore to be shuttled to the site for processing. Processing the cores involves using shears to split open the cores to allow for logging of the sediment. Eight sediment samples will be collected from OU 03 sediment cores. Sediment samples will be analyzed for VOCs by USEPA Method 8260, SVOCs by USEPA Method 8270, Metals by USEPA

Method 6010, Mercury by USEPA Method 7471, and Cyanide by USEPA Method 9010, Pesticides and PCBs by USEPA Methods 8081/8082, TOC by Llyod Kahn, method and Hydrocarbon Finger print by Method NYSDOH 310-13. Two of the eight samples will be analyzed for grain size using the sieve and hydrometer method. Once the cores have been logged and samples collected, the unused sediment will be placed into a 55 gallon United States Department of Transportation (USDOT) container and stored on site for future disposal during the remedial action.

Sediment sampling will be conducted according to Subsection 4.55 of the Program QAPP (MACTEC, 2011a) and each sample will be documented on a sediment sampling FDR (Figure 4-14 of the Program QAPP (MACTEC, 2011a)).

4.2.8 Surface Water Sampling

A total of six surface water samples, two from locations within Pontiac Bay (OU 03) and four from locations in Brandy Brook (OU 02) will be collected to assess surface water quality. Prior to sampling surface water from a given location the following field parameters will be collected; turbidity, temperature, specific conductance, pH, dissolved oxygen, and oxidation reduction potential. Surface water samples will be collected using a peristaltic pump with tubing, which will be weighted to ensure samples are obtained from the proper sampling interval within the water column. Surface water for metals analysis with turbidity readings greater than 50 nephelometric turbidity units will be collected for both total and dissolved metals (i.e. field filtered).

Surface water sample locations will be selected in the field based on the location of contaminated sediments. A background surface water sample will be co-located with the background sediment samples.

Surface water samples will be analyzed for VOCs by USEPA Method 8260, SVOCs by USEPA Method 8270, Metals by USEPA Method 6010, Mercury by USEPA Method 7471, and Cyanide by USEPA Method 9010, Hardness by SM Method 2340, and Hydrocarbon Finger print by Method NYSDOH 310-13.

Surface water sampling will be conducted according to Subsection 4.5.4.1 of the Program QAPP (MACTEC, 2011a) and each sample will be documented on a surface water sampling FDR (Figure 4.14 of the Program QAPP (MACTEC, 2011a).

As previously discussed based on the topography of the site there may be a groundwater divied and therefore a surface water discharge point south of the site. If groundwater is determined to be flowing to the south from the site sampling the potential surface water discharge should be considered.

4.2.9 Site Survey

Upon completion of the OU 01 and OU 02 field activities, MACTEC's subcontractor will complete a survey of the new and existing microwells, direct push soil boring locations, Brandy Brook sediment and surface water transect locations, a certified boundary of the Site and topographic elevation survey of the Site and Brandy Brook extending to Pontiac Bay. The topographic survey will include ½-foot elevation contours of the Site and 1-foot elevation contours of Brandy Brook (extending five-feet from the top of the stream bed). Horizontal and vertical locations will also be presented to MACTEC in excel format to be used with geographic information system software. Horizontal locations will be tied to the NYS Plane Coordinate System using North American Datum of 1983.

Vertical elevations of groundwater wells will be tied to msl, using North American Vertical Datum of 1988, and measured to an accuracy of 0.01 foot. Horizontal well measurements will be to an accuracy of 0.1 foot.

Sediment sampling locations in Pontiac Bay and Lake Flower will also be surveyed for horizontal location using a Trimble Global Positioning System with sub-meter accuracy.

4.2.10 Fish and Wildlife Impact Analysis

A FWIA will be conducted for the Site. Objective of the FWIA are: (1) Identify the fish and wildlife resources that presently exist and that existed before contaminant introduction, and (2) provide information necessary for the design of a remedial investigation. Appendix C presents the multi-step process for completing the FWIA through Step II, A.

4.3 DECONTAMINATION AND MANAGEMENT OF INVESTIGATION DERIVED WASTE

4.3.1 Decontamination

Sampling methods and equipment for this field program have been chosen to minimize decontamination requirements mitigating potential for cross contamination. Disposable sampling equipment will be used as much as practical to minimize decontamination time and water disposal. Non-disposable sampling equipment will be decontaminated before and after the collection of each sample. Decontamination methods and materials are described in detail in Subsection 4.3 of the QAPP.

Non disposable sampling equipment will be decontaminated by 1) washing the sample collection equipment with potable water and Liquinox, rinsing with potable water, rinsing with deionized water, and then allowing the equipment to air dry, or 2) steam cleaning the equipment and then allowing the equipment to air dry. Drilling equipment will be decontaminated by steam cleaning with potable water prior to each boring, and before leaving the Site. Drilling equipment (i.e. drill rods and casing) will be decontaminated on a temporary decontamination pad constructed at the Site. Decontamination fluids will be released on-Site to the ground surface in the area of sample collection.

4.3.2 Investigation Derived Wastes

Soil investigation derived waste (IDW) will be placed on polyethylene sheeting within the fenced portion of the site and covered with weighted polyethylene sheeting. Sediment IDW will be containerized in USDOT 55-gallon drums and left on site. Drums will be labeled as described in the QAPjP. IDW left on site will be disposed during a future remedial action.

5.0 DATA EVALUATION AND RI REPORT SUBMITTAL

Upon completion of the field investigations and receipt of analytical data, MACTEC will prepare a Draft RI Report in accordance with DER-10 (NYSDEC, 2010). The Draft RI Report will include a summary of the Site background and history including results of investigations conducted prior to the RI. Additional background information reviewed during subsequent tasks will be included. The Draft RI Report will summarize data generated during the RI field investigation and a comparison of laboratory analytical results to applicable NYS groundwater standards (NYSDEC, 1999). Boring logs and environmental sampling data will be included as appendices to the RI Draft Report.

Upon receipt of NYSDEC comments, MACTEC will address the comments and submit a Draft Final RI Report to the NYSDEC for final review. The Final report will incorporate the NYSDEC review comments. Three hard copies and one electronic copy of the Final RI Report will be sent to the NYSDEC Project Manager. Laboratory and location information will also be submitted in the NYSDEC EQuIS electronic data deliverable format. The NYSDEC will be responsible for forwarding copies of the report to other state and county agencies if necessary.

6.0 FEASIBILITY STUDY

Data gathered during the RI will be used to evaluate the need for conducting an IRM at the Site (OU 01). If the NYSDEC determines the need for an IRM, a conceptual design for excavation and disposal of contaminated soils will be developed.

The information provided in the RI Report will be used to prepare a FS to evaluate remedial alternatives for the Site, if necessary.

7.0 REFERENCES

MACTEC Engineering and Consulting, P.C. (MACTEC), 2011a. Program Quality Assurance Program Plan. Prepared for the New York State Department of Environmental Conservation, Albany, New York. June 2011.

MACTEC, 2011b. *Program Health and Safety Plan*. Prepared for New York State Department of Environmental Conservation, Albany, New York. June 2011.

MACTEC, 2007. *Final Site Characterization Report, Former Saranac Lake Gas Company Site*. Prepared for New York State Department of Environmental Conservation, Ray Brook, New York. October 2007.

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New York State, 1999. New York Codes, Rules, and Regulations, Title 6, Part 700-705 Water Quality Regulations Surface Water and Groundwater Classifications and Standards. Amended August 1999.

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NYSDEC, 2005. "Analytical Services Protocols"; 6/05 Edition; June 2005.

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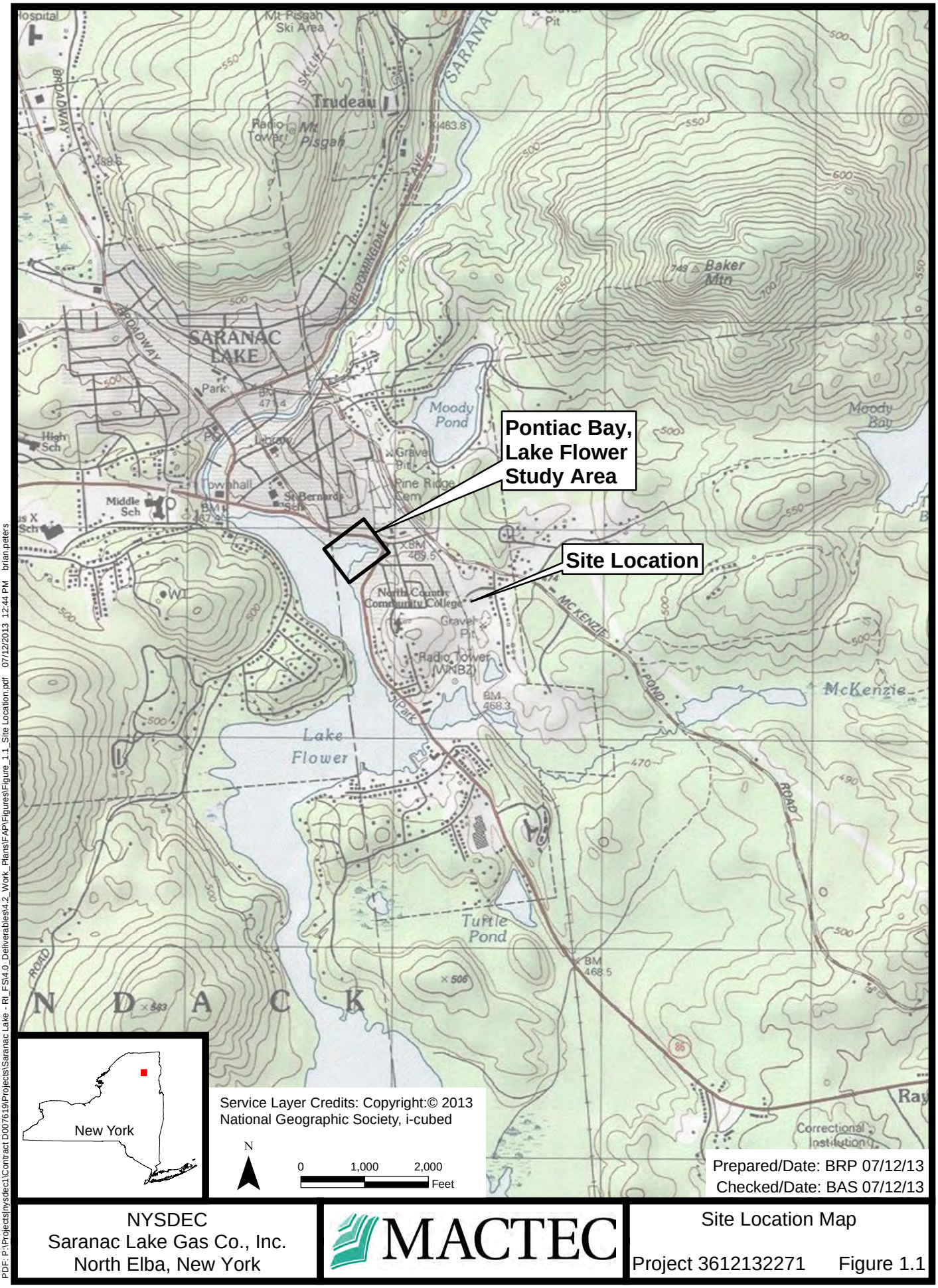
NYSDEC, 1989. Spill Report #8905678, Saranac Lake Gas Co. September 11, 1989.

New York State Museum and Science Service (New York), 1970. Geologic Map of New York, Adirondack Sheet. Map and Chart Series No. 15.

FIGURES



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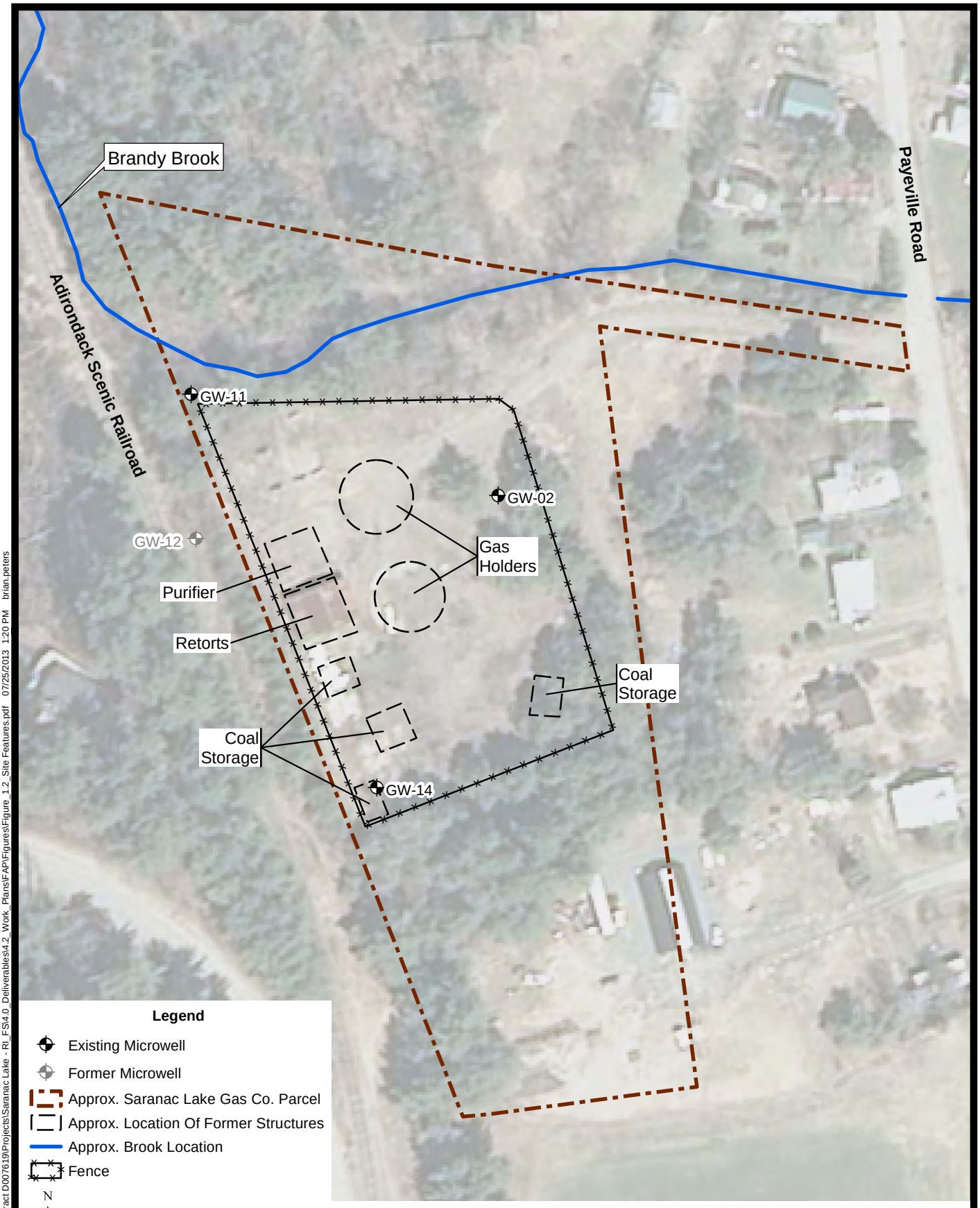
Site Location Map

Project 3612132271 Figure 1.1



Essex County color digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

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Checked/Date: BAS 07/17/13

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Site Features

Project 3612132271 Figure 1.2

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Brandy Brook

Adirondack Scenic Railroad

Payeville Road

GS-15

GS-01

GS-11

GS-10

GS-09

GS-08

TP-01

GS-02

GS-12

TP-03

GS-03

TP-02

GS-07

TP-04

GS-06

GS-04

GS-13

GS-05

TP-05

GS-16

GS-14

Legend

MGP-related VOCs and/or
MGP-related SVOCs
Exceeding NYS Standards:

- VOCs | SVOCs
- > 50,000 µg/kg
- 5,000 - 50,000 µg/kg
- 500 - 5,000 µg/kg
- < 50 µg/kg

- Direct Push Location (NYS Standards Not Exceeded)
- Microwell Location (NYS Standards Not Exceeded)
- Test Pit Location (NYS Standards Not Exceeded)
- Approximate Saranac Lake Gas Co. Parcel
- Approximate Location Of Former Structures
- Approximate Brook Location
- Fence

MGP = Manufactured Gas Plant
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
NYS Standards = Part 375 SCOs for Unrestricted Use
Soil samples collected by MACTEC in 2007.

Essex County color digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

N

0 40 80 Feet

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MGP-Related Contaminants
Detected in Soil
Project 3612132271 Figure 3.1

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Brandy Brook

Adirondack Scenic Railroad

Payeville Road

GS-15

GS-01

GS-11

GS-10

GS-09

GS-08

GS-02

GS-12

GS-03

GS-07

GS-04

GS-06

GS-13

GS-05

GS-16

GS-14

Legend

MGP-related VOCs and/or
MGP-related SVOCs
Exceeding NYS Standards:

- VOCs | SVOCs
- > 5,000 µg/L
- 500 - 5,000 µg/L
- 50 - 500 µg/L
- 5 - 50 µg/L
- < 5 µg/L
- Not Sampled

- Direct Push Groundwater Grab Location (NYS Standards Not Exceeded)
- Approximate Saranac Lake Gas Co. Parcel
- Approximate Location Of Former Structures
- Approximate Brook Location
- Fence

MGP = Manufactured Gas Plant
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
NYS Standards = Class GA Groundwater Standards
Groundwater grab samples collected by MACTEC in 2007.

Essex County color digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

N

0 40 80 Feet

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MGP-Related Contaminants
Detected in Groundwater
Project 3612132271 Figure 3.2

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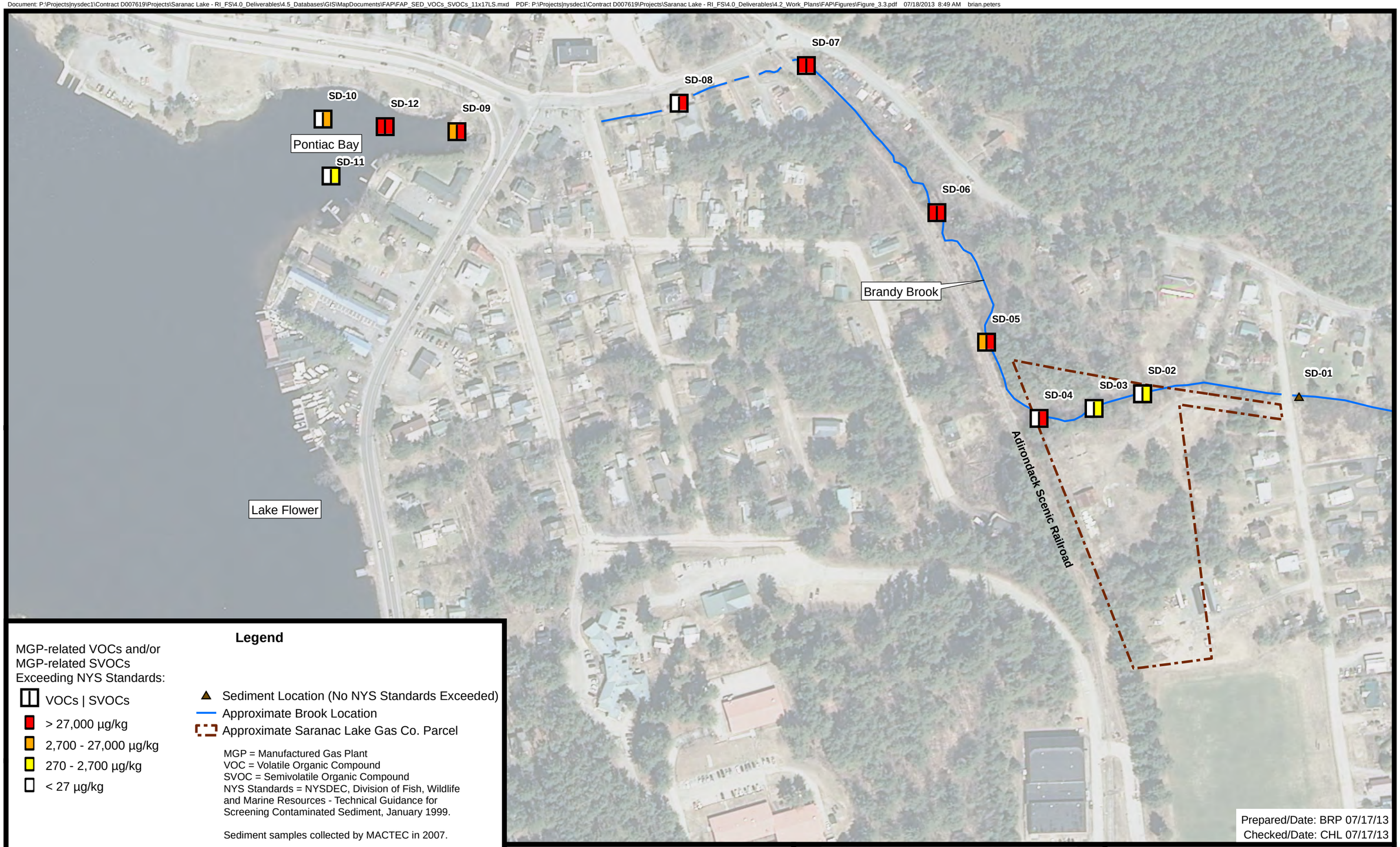

Legend

MGP-related VOCs and/or MGP-related SVOCs Exceeding NYS Standards:

- VOCs | SVOCs
- > 27,000 µg/kg
- 2,700 - 27,000 µg/kg
- 270 - 2,700 µg/kg
- < 27 µg/kg

- Sediment Location (No NYS Standards Exceeded)
- Approximate Brook Location
- Approximate Saranac Lake Gas Co. Parcel

MGP = Manufactured Gas Plant
VOC = Volatile Organic Compound
SVOC = Semivolatile Organic Compound
NYS Standards = NYSDEC, Division of Fish, Wildlife and Marine Resources - Technical Guidance for Screening Contaminated Sediment, January 1999.

Sediment samples collected by MACTEC in 2007.

Essex County color digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

0 100 200 Feet

N

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MGP-Related Contaminants Detected in Sediment
Project 3612132271 Figure 3.3

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Pontiac Bay

Lake Flower

Brandy Brook Rd

DP-1

DP-2

DP-3

SD-105

SD-104

SD-103

SD-102

SD-101

Brandy Brook

Adirondack Scenic Railroad

50 Foot Sample Grid.
Up to 40 proposed borings approximately 8-10 feet below ground surface.
Actual locations to be determined in the field based upon visual observations.

A B C D E F G H I J K L M N

1 2 3 4 5 6 7 8 9 10 11 12 13 14

GW-11

GW-02

GW-14

Legend

Proposed Locations:

- Microwell
- Direct Push Soil Profile
- Background Sediment Sampling Transect
- Surface Water and Sediment Sampling Transect
- 50 Foot Sample Grid
- No samples planned at this time in this 50 Foot grid

- Existing Microwell
- Fence
- Approximate Brook Location
- Approximate Location Of Former Structures
- Approximate Saranac Lake Gas Co. Parcel

N

0 80 160 Feet

Essex County color digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

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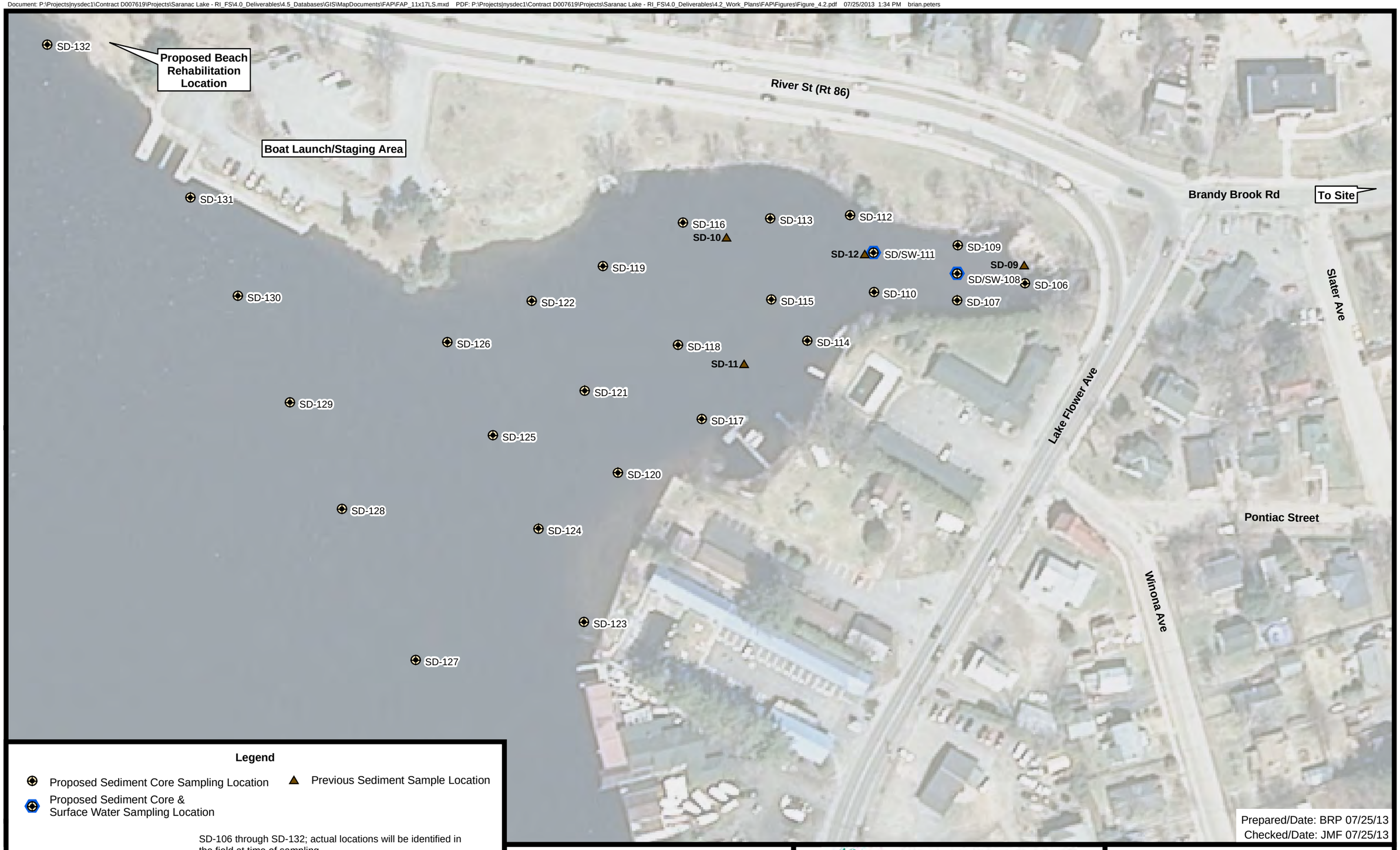
Proposed Direct Push and Sediment Sampling Locations
Project 3612132271 Figure 4.1



Legend

- Proposed Sediment Core Sampling Location
- Previous Sediment Sample Location
- Proposed Sediment Core & Surface Water Sampling Location

SD-106 through SD-132; actual locations will be identified in the field at time of sampling.

N

0 45 90 Feet

Essex County color digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

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Proposed Sediment Core and Surface Water Sampling Locations
Project 3612132271 Figure 4.2

TABLE

Table 4.1: Proposed Field Tasks, Methodology, and Analytical Program

LOCATION TYPE	LOCATION ID	DESCRIPTION AND METHODOLOGY	RATIONALE	ANALYTICAL
Saranac Lake Remedial Investigation				
On-Site Direct Push Soil Profiling	The locations are based on 50 foot-Sample Grid (The actual number of borings completed will be dependent on conditions encountered in the field.)	Complete up to 40 direct push soil borings on a 50 foot grid on-Site to depths of approximately 8-12 feet bgs. The water table is present at approximately 6 feet bgs. Up to 24 soil samples may be collected from representative borings with and without visual evidence of contamination.	Borings will be logged for soil characteristics and visual evidence of MGP waste. Representative samples will be obtained to evaluate and characterize soil contamination at the Site, and locate/delineate the extent of the MGP waste.	24 soil samples plus QA/QC for VOCs, SVOCs, Metals, Mercury, and Cyanide. Approximately four samples plus QA/QC for Pesticides/PCBs, and Hydrocarbon fingerprint. Three samples will be collected for waste disposal parameters including; TCLP, Ignitability, Reactivity, pH, and Corrosivity.
Off-Site Direct Push Soil Profiling	DP-01 through DP-03	Complete three borings to depths of 8 to 12 feet bgs adjacent to Brandy Brook along Brandy Brook Road.	Borings will be conducted to evaluate the nature and extent of MGP waste in this section adjacent to Brandy Brook.	3 soil samples for VOCs, SVOCs, Metals, Mercury, Cyanide, Pesticides/PCBs, and Hydrocarbon fingerprint.
On-Site Direct Push Microwell Installation and Groundwater Sampling	MW-101 through MW-110, GW-02, GW-11 and GW-14	Install 10 microwells using direct push methods. Wells to be screened screens across the water table (estimate 10 foot screens from 2-12 feet bgs). Measure depth to water.	Samples will be obtained from the 10 new and 3 existing microwells using low flow methods to evaluate groundwater quality and gradients at the site.	13 groundwater low flow samples plus QA/QC for VOC, SVOC, Metals, Mercury, and Cyanide. 3 samples for pesticides/PCBs, and 4 samples for Hydrocarbon fingerprint analysis.
Sediment Sampling in Brandy Brook	Transects SD-101 through SD-105 (The actual number of hand boring dependant on conditions encountered in the field.)	Advance hand borings along four transects across Brandy Brook downstream from the Site to the railroad bridge and one background transect upstream of the Site. Explorations will be completed using hand augers, shovels, and/or geoprobe hand tools. Each transect will consist of a midstream boring and a boring on the bank on either side of the stream. The sediment boring will be completed to depths of up to four feet (if possible) along transects. Samples collected for analysis will be a representation of MGP contaminated sediment.	Evaluate the nature and extent of MGP contamination both vertical and horizontal. Additional stream bank borings will be completed as needed to identify the horizontal extent of contamination.	Eight soil/sediment samples plus QA/QC for VOC, SVOC, Metals, Mercury, Cyanide, and TOC by Lloyd Khan. 3 samples for pesticides/PCBs and Grain size, and 4 samples for Hydrocarbon fingerprint analysis.
Sediment Vibracoring in Pontiac Bay of Lake Flower	SD-106 through SD-132 (The actual number of sediment cores collected will be dependant on conditions encountered in the field.)	Complete up to 27 sediment cores using Vibracore direct push methods (as detailed in Appendix A-1) to evaluate the extent of MGP contamination in Pontiac Bay of Lake Flower. Sediment cores will be collected from up to eight transects across Pontiac Bay and Lake Flower in a rough grid pattern to depths of approximately 10 feet. Transects will be extended until sediment cores are visually free of MGP-related contamination to the extent possible. Sediment core locations will be surveyed by GPS at the time of collection. Samples collected for analysis will be a representation of MGP contaminated sediment.	Evaluate the extent of MGP-related sediment contamination in Pontiac Bay and Lake Flower. The extent of contamination will be based on whether sediment cores are visually free of MGP-related waste.	Eight sediment samples plus QA/QC for VOC, SVOC, Metals, Mercury, Cyanide, and TOC by Lloyd Khan. Two samples will be collected for Grain size analysis (sieve and hydrometer).
Surface Water Sampling	Brandy Brook: SW-101A, SW-102A, SW-103A, and SW-105A / Pontiac Bay: SW-108, SW-111	Collect surface water samples from Brandy Brook (4) and from Pontiac Bay in Lake Flower (2).	Characterize surface water quality upstream and downstream from the site, as well as Pontiac Bay.	Six surface water samples plus QA/QC for VOC, SVOC, Metals, Mercury, Cyanide, Hardness, and Hydrocarbon fingerprint.
Certified Boundary Survey and Location Survey	NA	Licensed surveyor to complete certified boundary survey, a contour map of site property with 0.5 foot contours, and elevation / location of sample points. A contour map of the off site Brandy Brook area with 1 foot contours and the elevation / location of off site sample locations.	Define boundary, easements, encroachments, etc. on the site and locations of major structures, roads, fences, etc.. around the site. Information will also be used for estimating area/volume for potential soil/sediment IRM.	NA

Notes:
Refer to QAPjP for Sample Identification

VOC = volatile organic compounds, Method 8260.
SVOC = semivolatile organic compounds, Method 8270.
Metals = TAL metals, Method 6010.
Mercury = Method 7470.
Cyanide = Method 9010.
Hydrocarbon Fingerprint = NYSDOH Method 310-13.
Pest = Pesticides, Method 8082.
PCB = polychlorinated biphenyls, Method 8081.
TOC = total organic carbon, Lloyd Khan.
Hardness by SM method 2340.
NA = Not Applicable
QA/QC = quality assurance / quality control
TCL = Target Compound List

APPENDIX A

PROJECT SPECIFIC QUALITY ASSURANCE PROJECT PLAN (QAPjP)

APPENDIX A
QUALITY ASSURANCE PROJECT PLAN
SARANAC LAKE RI/FS

This Site-specific Quality Assurance Project Plan (QAPjP) identifies variations to sections of NYSDEC Quality Assurance Program Plan (QAPP) (MACTEC, June 2011). This document describes remedial investigation (RI) activities that are specific to the Saranac Lake Gas Company site (Site). Variances include: the handling of investigation derived waste (IDW), sampling and analysis program, sampling identification, and drum labeling.

General Procedures. The general procedures used to conduct the RI at the Saranac Lake Site will be taken from the following sections of the QAPP:

Section 2.0	Program Organization and Responsibilities
Section 6.0	Calibration Procedures
Section 7.0	Analytical Program
Section 8.0	Data Reduction, Validation, and Reporting
Section 9.0	Internal Quality Control
Section 10.0	Audits
Section 11.0	Preventive Maintenance
Section 12.0	Data Assessment
Section 13.0	Corrective Action
Section 14.0	Reports to Management

Sampling Procedures. The following sampling methods and procedures set forth in the QAPP will be used:

QA/QC Procedures	Section 3.0
Sampling Procedures	Section 4.0
Decontamination	Subsection 4.3
Utility Clearance	Subsection 4.4.1
Geophysical Methods	Subsection 4.4.1
Exploratory Drilling	Subsection 4.4.3

Monitoring Well/Piezometer Installation	Subsection 4.4.4
Sample Techniques	Sections 4.5
General Soil Sampling Methodology	Subsection 4.5.2
Low Flow Groundwater Sampling	Subsection 4.5.4.3
Sediment Sampling	Subsection 4.5.5
Drum Sampling	Section 4.6
Water Level Measurements	Subsection 4.7.1
Site Surveys	Section 4.8
Management of IDW	Section 4.9
Sample Custody Procedures	Section 5.0
Field Instrument Calibration	Section 6.0

The following variances to the above procedures are described in sections 1.0 to 1.4.

1.0 INVESTIGATION DERIVED WASTE

Investigation derived waste IDW may include decontamination fluids, purge water, soil and sediment. Decontamination of equipment will follow procedures described in the QAPP and all decontamination fluids will be released to the ground surface at the location the samples were collected. All of the groundwater purged from site wells and piezometers will be released to the ground surface at the location the samples were collected.

Excess soil and sediment generated from geoprobes, and hand probes will be used for backfill in the boring location if possible, otherwise it will be stockpiled onsite on top of ploy sheeting and covered with ploy sheeting.

IDW from vibracore sediment samples will be containerized in United States Department of Transportation (USDOT) 55-gallon drums. Off-site transport and disposal of IDW (hazardous and non-hazardous) will be left onsite and disposed during a future interim remedial measure.

1.1 SAMPLING AND ANALYSIS PROGRAM

Data Quality Objectives (DQOs) for the Saranac Lake Gas Company site sampling activities are summarized in Table A-1. DQOs are described in accordance with USEPA guidelines (USEPA, 1987) and the NYSDEC Analytical Services Protocols (ASP) (NYSDEC, 2005).

Analytical data requirements were established using the methods described in the ASP. Analytical methods to be used for laboratory analysis are presented in Table A-2. Analytical Category B deliverables as described in the ASP will be provided by the laboratory. Data Usability Summary Report (DUSR) will be issued based on DEC guidelines (NYSDEC, 2002).

1.2 SAMPLING IDENTIFICATION

Sample identification varies from Subsection 4.1 of the QAPP. The sample ID starts with the Site number 516008. After the Site ID, the next digits represent the sample type, as outlined below:

Sample type will include the following identifications:

QS = Sampler Blank (i.e., Rinsate Blank)
TB = Trip Blank
DP = Geoprobe Soil Sample
MW = Monitoring Well Groundwater Sample
PZ = Microwell Groundwater Sample
SD = Hand Probe Sediment Sample
SW = Surface Water Sample

Sample Labeling Nomenclature**:** Samples collected for laboratory analysis will be identified as follows

Sample Type	**Nomenclature Sequence**	**Example ID**	**Comments**
Sampler Blank	DEC ID# - QS ID	516008-QS001	Rinsate Blank
Trip Blank	DEC ID# - QT ID	516008-QT001	
Geoprobe Soil	DEC ID# - DP ID – Depth	516008-DP001-__	Depth populated at sample time
Monitoring Well	DEC ID# - GW ID- Depth	516008-GW001-__	Depth populated at sample time
Microwell	DEC ID# - PZ ID - Depth	516008-PZ001-__	Depth populated at sample time
Sediment	DEC ID# - SD ID – Depth	516008-SD001-__	Depth populated at sample time
Surface Water	DEC ID# - SW ID - Depth	516008-SW001-__	Depth populated at sample time

1.3 DRUM LABELING

Drums will be labeled with the following information:

- Drum contents and sample ID;
- Site name and the NYSDEC Site Number; and
- Date drum filling began and date drum was sealed.

Upon completion of the project, the NYSDEC Project Manager will be notified in writing about the location, number, and any relevant information regarding drums staged on the site. Drums shall be staged as directed by the NYSDEC.

1.4 VIBRACORE SEDIMENT SAMPLING

Sediment samples will be collected from Lake Flower (e.g., Pontiac Bay) utilizing a barge mounted vibracore system, as described in TG&B Marine Services, Inc. Technical Proposal, Volume 1 attached in Attachment A-1. The barge will be maneuvered to predetermined locations within Lake Flower and anchored in place using spuds driven into the sediment. The exact core location will documented with a GPS unit with sub-meter accuracy and depth of water will be measured and documented.

Sediment cores will be collected by driving a 3-inch diameter stainless steel pipe with a 2.625-inch ID polycarbonate core tube fitted inside, 10 feet into the bottom sediment. The stainless steel pipe is equipped with a cutting edge and retaining fingers at the lower end. Once the sample depth has been reached the pipe and core tube are winched out of the sediment and the core tube is removed and labeled. The core tube is brought on shore and processed (i.e., cut open with shears and logged). If inspection of the core shows signs of contamination either olfactory or visual additional locations will be sampled. The vibracore sampling will commence with the locations closest to the discharge point of Brandy Brook. Sampling will continue at predetermined locations further off shore, as long as contamination is being observed. As noted in Section 1.0 all of the sediment collected from Lake Flower will be containerized and disposed of as IDW.

REFERENCES

MACTEC Engineering and Consulting, Inc., 2011. Program Quality Assurance Program Plan. Prepared for the New York State Department of Environmental Conservation, Albany, New York. June 2011.

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

NYSDEC, 2005. *"Analytical Services Protocols"*; 6/05 Edition; June 2005.

United States Environmental Protection Agency USEPA, 1987. "Data Quality Objectives for Remedial Response Activities"; Office of Emergency and Remedial Response and Office of Waste Programs Enforcement; Washington DC; EPA/540/G-87/003; March 1987.

Table A-1:

Analytical DQO Levels

Parameter	Use	Data Quality Level
PH, Dissolved Oxygen, Temperature, Specific Conductance, Turbidity	Provides physical and chemical data on groundwater samples for use during sampling collection.	Level I
PID screening	Provides qualitative real-time information on air quality in the breathing zone for health and safety decisions, and to identify potentially contaminated groundwater and soil vapor.	Level I
VOCs	Provides analytical information to assist in supporting decision for the Remedial Investigation.	Level III
SVOCs	Provides analytical information to assist in supporting decision for the Remedial Investigation.	Level III
TOC	Provides analytical information to assist in supporting decision for the Remedial Investigation.	Level III
Inorganics	Provides analytical information to assist in supporting decision for the Remedial Investigation.	Level III
Pesticides	Provides analytical information to assist in supporting decision for the Remedial Investigation.	Level III
PCBs	Provides analytical information to assist in supporting decision for the Remedial Investigation.	Level III
Hydrocarbon Fingerprint	Provides analytical information to assist in supporting decision for the Remedial Investigation.	Level III

Notes:
TCL = target compound list
VOCs = volatile organic compounds
SVOC = semi-volatile organic compounds
TOC = Total Organic Carbon
PCBs = polychlorinated biphenyl

Table A-2: Analytical Methods

Matrix	Parameter	Analytical Method
Soil (Site)	VOCs	EPA method 8260
	SVOCs	EPA method 8270
	Metals	EPA method 6010
	Mercury	EPA method 7471
	Cyanide	EPA method 9010
	PCB/Pesticides	EPA method 8082/8081
	Hydrocarbon Fingerprint	NYSDOH 310-13
	TCLP	
	Ignitability	
	Reactivity	
	pH	
	Corrosivity	
Soil (Brandy Brook Road)	VOCs	EPA method 8260
	SVOCs	EPA method 8270
	Metals	EPA method 6010
	Mercury	EPA method 7471
	TOC	Lloyd Kahn
	Hydrocarbon Fingerprint	NYSDOH 310-13
Sediment (Brandy Brook)	VOCs	EPA method 8260
	SVOCs	EPA method 8270
	Metals	EPA method 6010
	Mercury	EPA method 7471
	Cyanide	EPA method 9010
	PCB/Pesticides	EPA method 8082/8081
	TOC	Llyod Kahn
	Grain Size	Sieve and hydrometer method
	Hydrocarbon Fingerprint	NYSDOH 310-13
Sediment (Lake Flower)	VOCs	EPA method 8260
	SVOCs	EPA method 8270
	Metals	EPA method 6010
	Mercury	EPA method 7471
	Cyanide	EPA method 9010
	TOC	Llyod Kahn
	Grain Size	Sieve and hydrometer method
Groundwater	VOCs	EPA method 8260
	SVOCs	EPA method 8270
	Metals	EPA method 6010
	Mercury	EPA method 7471
	Cyanide	EPA method 9010
	PCB/Pesticides	EPA method 8082/8081
	Hydrocarbon Fingerprint	NYSDOH 310-13
Surface Water	VOCs	EPA method 8260
	SVOCs	EPA method 8270
	Metals	EPA method 6010
	Mercury	EPA method 7471
	Cyanide	EPA method 9010
	Hardness	SM method 2340
	Hydrocarbon Fingerprint	NYSDOH 310-13

Notes:
VOCs = volatile organic compounds
SVOCs = Semi-volatile organic compounds
TOC = Total Organic Carbon
PCBs = polychlorinated biphenyl

Attachment A-1

TG&B

Marine Services, Inc.

Technical Proposal, Volume 1

In Response to:

Saranac Lake Gas Company Site, Saranac Lake, New York
Remedial Investigation Work Plan
Sediment Core Sampling Services

Submitted by:

TG&B Marine Services, Inc.
Monument Beach, MA

Submitted to:

AMEC Environment & Infrastructure
Portland, Maine 04112-7050

June 14, 2013

P.O. Box 773 Monument Beach, MA 02553

Marine Investigations Technical Proposal

TG&B Marine Services, Inc. is pleased to submit this technical proposal in response to AMEC Environment & Infrastructure request to perform marine investigations at the Saranac Lake Gas Company Site in Saranac Lake, New York. The offer meets or exceeds the specification in all respects. Over the past seven years, TG&B conducted similar services for AMEC Environment & Infrastructure. TG&B is a small business, founded in 1987, and provides environmental sampling services throughout the Northeast.

TG&B typically conducts 50-60 similar marine sampling and current studies per year. Many of these projects are specific to the investigation of former manufactured gas plant sites.

TG&B personnel have extensive experience working in harbors and coastal areas through New England. All personnel are experienced mariners, all have US Coast Guard Licenses, and all have 40 hr. HAZWOPER certifications with current 8 hr refreshers. TG&B owns and operates several boats designed for sediment coring and deploying instrumentation in coastal waters. For this project, we will use the following vessel:

R/V “Coring Carolina” coring platform, which is equipped with the following:

14 foot A-frame `	Coring winch
Moonpool	75 cfm air compressor
Generator	Anchoring system
Vibrocore system	Spuds (2, for station holding)
Pressure Washer	

Leica RTK GPS with sub-meter accuracy
Inflatable skiff to run samples to shore

This vessel has a draft of less than one foot and is well suited for work at this site.

Methodology

Sediment Cores :

TG&B will collect cores at approximately 26 locations to a penetration depth of 10 feet. Cores will be collected in clear 2-5/8 inch ID polycarbonate tubes.

Using the RTK GPS System with predetermined coordinates, the boat will be maneuvered back to the precise location and spuds will be set to insure the coring platform remains stationary. Water depth will then measured with a weighted tape and the precise position of the actual core location will be stored into the RTK GPS computer.

TG&B will drive the vibrocore samples to a penetration depth of ten feet (or refusal). The vibrocore system to be used on this project is a BH-5 pneumatically-driven system. It consists of a 5-inch diameter piston in a housing mounted on top of, and secured to, the core pipe. The

entire unit weighs 275 lbs. The piston is driven by air and creating and rapid up and down motion which creates a vibratory force. The air is delivered through hoses, from a 75 cfm shipboard air compressor.

The core barrel is a 3-inch diameter stainless steel pipe with a cutting edge and retaining fingers at the lower end. A 2-5/8 inch ID polycarbonate tube is fitted inside the core barrel. A check valve at the top of the barrel assists in retaining the sample in the tube. In softer sediments a piston is inserted into the core barrel and used to create a suction which greatly increases the sample recovery percentage.

The coring unit is lowered to the bottom with a winch wire through a moonpool in the deck in the vertical position to a point where the lower end of the barrel is just touching the seabed. At this point the vibrator is actuated and the wire is slackened to allow the pipe to penetrate the bottom. When the desired penetration is reached, the unit is winched back up through the moonpool to the deck. The core barrel is removed from the vibrocore head, and the core tube is extracted. TG&B personnel will log the required data and mark the core tube as specified.

The sample core tube will be delivered to a location on shore for processing. TG&B will provide a table that is fitted with a tray to safely hold the core while it is cut open. Cutting shears will also be provided as well as 2-55 gallon drums.

The core barrel will be pressure washed using lake surface water.

We are comfortable that the field work will take no more than three days.

TG&B Resumes:

Mark P. Avakian
TG&B Marine Services, Inc.

Experience:
1986-present
President, TG&B Marine Services, Inc.
Mr. Avakian has 30 years experience managing and conducting oceanographic, geotechnical (vibrocoring), geophysical and environmental data collection projects. As owner of research/workboats for 26 years, he is an experienced mariner familiar with vessel operations and navigation equipment. His responsibilities include design, fabrication, deployment and recovery of moored instrumentation arrays and operation of various coring devices and geophysical survey equipment. He has a U.S. Coast Guard-license, is 40 hour HAZWOPER-certified, and has performed a wide variety of environmental sampling operations including work at several superfund sites. Mr. Avakian is experienced in the design and fabrication of innovative sampling equipment and outfitting vessels and barges for drilling and sampling work. He has also provided logistics and expertise in marine based drilling operations and well development.

1984 – 1987
Marine Consultant
As a consultant Mr. Avakian worked on marine programs worldwide for companies such as EG&G Environmental Consultants, Ocean Surveys, Battelle Ocean Sciences, EG&G WASC,

Arthur D. Little, and others. He has deployed and recovered deep water moorings offshore South America, Indonesia, Africa, Europe and the U.S. He installed moored instrumentation and meteorological data acquisition systems in the Gulf of Alaska for various oil companies and performed similar work for NOAA in the Yukon River delta. Mooring projects include outfitting vessels of opportunity with winches, A-frames, etc. and preparing many different types of current meters, transponders, waverider buoys, tide gages, and related instrumentation. He also participated in profiling and other circulation measurements for physical oceanographic studies. Mr. Avakian has supervised numerous acoustic flowmeters installations in hydroelectric plants throughout the world.

1981 –1984
Field Engineer, EG&G Environmental Consultants, Inc.
Mr. Avakian participated in various field efforts similar to those described above for marine data acquisition projects for MMS, offshore oil companies, and related customers.

Education:
Suffolk University, B.S., 1979

Other:
U.S. Coast Guard Captain's License
40 Hr HAZWOPER Certification and 8 hr. Refresher

Charles Perry
TG&B Marine Services, Inc.

Experience:
2004-present
Field Supervisor/Captain, TG&B Marine Services, Inc.
Mr. Perry's responsibilities include running vibrocoring projects and captaining boats for TG&B. He has served as coring supervisor and port security boom installer on many projects throughout New England and the Great Lakes. He is an experienced mechanic and is responsible for repair and maintenance of all coring equipment, motors and engines.

1999-2008
Owner, Perry Mooring and Diving, Inc.
Mr. Perry ran a mooring company covering four harbors in Bourne, Massachusetts

1989-1995
Crew, Woods Hole Oceanographic Institution
Mr. Perry was a crewmember aboard the R/V Atlantis II and R/V Knorr. In this capacity he worked on the back deck operating winches, cranes, and small boats; and participated in the deployment and recovery of scientific instrumentation.

Education:
Massachusetts Maritime Academy, 1996
American Military University, Masters Degree, Strategic Intelligence, 2009

Other:
US Coast Guard 100 Ton Master's License
40 hr. HAZWOPER-certified with 8 hr. Refresher
CPR certified

APPENDIX B

PROJECT SPECIFIC HEALTH AND SAFETY PLAN (HASP)

MACTEC, Inc.

MACTEC Short Form HASP

Site: Saranac Lake Gas Company Site Job Number: 3612132271
Street Address: 24 Payeville Road, Village of Saranac Lake, New York
Proposed Date(s) of Investigation: August 2013
Prepared by: Rebecca Gabryszewski Date: 7/03/2013
*Approved by: Kendra Bavor, CSP Date: 7-1-13
Site Description: Closed propane distribution company. Previously the site of the Saranac Lake Gas Company former manufactured gas plant used for manufacture of lighting gas. (See attached Site Location Map)

*Approval also serves as certification of a Hazard Assessment as required by 29 CFR 1910.132

MACTEC	Other contractor	Task Description
☒	☐	Mobilization/demobilizing
☒	☐	Overall inspection of the site
☒	☐	General Field Work/Oversight
☐	☒	Direct Push Boring Installation (on and off site)
☐	☒	Micro-Well Installation
☒	☐	Sediment sampling
☒	☐	Groundwater Sampling
☒	☐	Surface Water Sampling
☒	☐	Hand Borings
☒	☒	Sediment Coring in Lake Flowers
☐	☒	Survey
☐	☐	
☐	☐	

Dates of Required Training and Medical Surveillance:

		Names of Field Team*			
		Brandon Shaw	Charles Lyman	Charles Lyman	
	Req?	Dates	Dates	Dates	Dates
Medical Surveillance	YES	12/06/2012	5/16/2013		
Site Specific Medical Testing:_____					
40-Hour Initial	YES	5/13/2005	8/1993		
8-Hour Supervisor [1,3]			6/12/2001		
8-Hour Refresher	YES	8/17/2012	4/30/2013		
First Aid/CPR [1,2]			3/20/2012		
Respirator Fit Test [1]					
Respirator Brand [1]					
Hazard Communication [1]	YES	6/9/2013	6/9/2013		
Fall Protection [1]					
Confined Space Entry [1]					
Lead Awareness					

[1] If Applicable
[2] At least one worker must be trained in First Aid/CPR and should received Bloodborne Pathogen Training
[3] Required for Field Lead and Site Health and Safety Officer
*Field Team to be determined at time field work is assigned.

Known or Suspected Contaminants (include PELs/TLVs):

Contaminants of Concern	Historical Highest Sample Data (pre-cleanup)	PEL/TLV	Fact Sheet Included
Benzene	67 ppm (soil)	0.5 ppm	X
Toluene	160 ppm (soil)	20 ppm	X
Ethyl Benzene	100 ppm (soil)	100 ppm	X
Xylene	140 ppm (soil)	100 ppm	X
PAHs (Naphthalene)	3300 ppm (soil)		X
Cyanide	423 ppm (soil)	5 mg/m3	X

Air Monitoring Action Levels:

PID/FID Reading [1]	Detector Tube [1]	Dust Meter [1]	LEL[2]/O_2 [1]	Action	Level of PPE
Above Background				Stop work, back away from work area, evaluate potential source of contamination	

[1] Sustained readings measured in the breathing zone
[2] Readings at measured at the source (borehole, well, etc.)

AHAs: Check and attach all that apply (add applicable AHAs not already listed):
Activity and Hazard Specific AHAs:

☒	Mobilization/Demobilization and Site Preparation	☒	Soil Sampling
☒	Field Work – General	☒	Working near water
☒	Decontamination	☐	
☒	Groundwater Sampling	☐	
☒	Sampling with a hand auger	☐	
☒	Field Oversight	☐	
☒	Geoprobe (MACTEC oversight)	☐	
☒	Stream/Wetlands Work	☐	
☒	Insect Stings and Bites	☐	
☒	Working with Preservatives (Acids)	☐	
☒	Boating - Surface Water and Sediment Collection	☐	

Chemicals Brought to the Site:
List all chemicals brought to the site (e.g., preservatives, decontamination solutions, gasoline, etc.). Attach MSDS

Chemicals	MSDS Attached?
HYDROGEN CHLORIDE (HCL) (RESERVATIVE)	☒
NITRIC ACID (PRESERVATIVE)	☒
LIQUINOX/ ALCONOX	☒
ISOBUTYLENE	☒
CALIBRATION SOLUTIONS (YSI)-PH4, PH7, DO, ORP, 1413 SPECIFIC COND.	☒
METHANOL	☒
SULFURIC ACID	☒

Chemicals will be kept in their original containers. If transferred to another container, aside from days use by one individual, the new container will be labeled with the name of the chemical and the hazard warnings.

HAZARD IDENTIFICATION SUMMARY

Complete the checklist for summarizing the hazards identified in the AHAs

Standard Hazards			
☒ Falling Objects	☒ Slips and trips	☒ Pinch points	☒ Rotating equipment
☒ Falls	☒ Power equipment/tools	☐ Elevated work surfaces	☐ _____
Eye Hazards			
☒ Particulates	☒ Liquid splashes	☐ Welding Arc	☐ _____
Hearing Hazards			
☐ None	☒ Impact noise	☐ High frequency noise	☒ High ambient noise

Respiratory Hazards						
☐ None	☒ Dust/aerosols/particulates	☐ Organic Vapors	☐ Acid Gases	☐ O_2 deficient	☐ Metals	☐ Asbestos

Chemical Hazards			
☐ None	☒ Organic solvents	☐ Reactive metals	☐ PCBs
☒ Acids / bases	☐ Oxidizers	☒ Volatiles/Semi-volatiles	☐ _____

Environmental Hazards			
☐ None	☒ Temperature extremes: ☒ Cold ☒ Heat	☒ Wet location	☒ Bio hazards (snakes, insects, spiders, poisonous plants, etc.)
☐ Explosive vapors	☐ Confined space	☐ Engulfment Hazard	☐ _____

Electrical Hazards				
☐ None	☒ Energized equipment or circuits	☒ Overhead utilities	☒ Underground utilities	☐ Wet location

Fire Hazards			
☒ None	☐ Cutting, welding, or grinding generated sparks or heat sources	☐ Flammable materials present	☐ Oxygen enriched location

Ergonomic Hazards					
☒ Lifting	☒ Bending	☐ Twisting	☒ Pulling/tugging	☐ Repetitive motion	☒ Carrying
Computer Use in the: ☐ Office ☐ Field			☐ _____		

Radiological Hazards						
☒ None	☐ Alpha	☐ Beta	☐ Gamma/X-rays	☐ Neutron	☐ Radon	☐ Non-Ionizing

Other Hazards
☐

PPE and Monitoring Instruments

Initial Level of PPE *			
☒ Level D	☐ Modified Level D	☐ Level C	* Cannot use Short Form HASP for Level B or A work

Standard PPE					
☒ Hard Hat	☒ Safety boots	☒ Safety glasses	☐ Chem. Resistant Boots	☒ High visibility vest	☐ Other:_____

Eye and Face Protection			
☐ Face shield	☐ Vented goggles	☐ Unvented goggles	☐ Indirect vented goggles

Hearing Protection					
☒ Ear plugs	☐ Ear Muffs	☐ Ear plugs and muffs	☐ Other _____		
Respiratory Protection					
☒ None	☐ Dust mask	☐ Full Face APR	☐☐ Half Face APR	Cartridge Type: _____	Change Cartridges: _____
Protective Clothing					
☒ Work uniform	☐ White uncoated Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex®		
☐ Boot covers	☒ Reflective vest	☐ Chaps or Snake Legs	☒ Other Optional Coveralls		
Hand Protection					
☐ None	☐ Cotton gloves	☐ Leather gloves	☐ Glove liners	☐ Cut-resistant gloves	☒ Other –Nitrile Gloves
☐ Outer Gloves: List Type _____		☐ Inner Gloves: List Type_____			
Monitoring Instruments Required*					
Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows: ▪ When work begins on a different portion of the site. ▪ When contaminants other than those previously identified are being handled. ▪ When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling.) ▪ When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon.)					
☐ LEL/O2 Meter	☐ PID: 10.0-10.6 eV Lamp ☐ 11.7 eV Lamp	☐ FID	☐ Hydrogen Sulfide/Carbon Monoxide		
☐ Dräger Pump (or equivalent) List Tubes_____	☐ Dust Meter: ☐ Respirable dust ☐ Total dust	☐ Other _____			

*Monitoring instruments will be calibrated daily in accordance with manufacturer's instructions.

PPE Selection Guidelines

When selecting the appropriate PPE for the job, consider the following:

- **Safety glasses** – general eye protection – source of hazard, typically coming from straight on, required at most sites
- **Tinted Safety Glasses** – same as above, but when working in direct sunlight. May need two both tinted and untinted if working in both sunlight and shade/overcast skys.
- **Safety goggles** – needed for splash hazard, more severe eye exposures coming from all directions. Non-vented or indirect venting for chemical splash, non-vented for hazardous gases or very fine dust, vented for larger particulates coming from all directions.
- **Face shield** – needed to protect face from cuts, burns, chemicals (corrosives or chemicals with skin notation), etc.
- **Safety boots** – needed if danger of items being dropped on foot that could injure foot
- **Hard hat** – danger from items falling on head – any overhead work, tools, equipment, etc that is above the head and could fall on head of item fails, or falls off work platform. Typically required at most sites as a general PPE
- **Thin, chemical protective inner gloves** (e.g., thin Nitrile, PVC – do not use latex – many people are allergic to latex) –needed to protect hands from incidental contact with low risk contamination at very low concentrations (ppb or low ppm concentrations in groundwater or soil) or used in combination with outer gloves as a last defense against contamination. Need to specify type
- **Outer gloves** – thicker gloves (e.g., Nitrile, Butyl, Viton, etc.) – used when potential for high concentrations of contaminants (e.g., floating product, percent ranges of contaminant, opening drums, handling pure undiluted chemicals, etc.). Need to specify type.
- **Leather gloves, leather palm, cotton** – good in protecting hands against cuts – no protection from chemicals. May be used in combination with chemical protective gloves.
- **Boot Covers –** when there is contamination in surface soils or waking surface in general. When safety boots need protection from contact with contaminants.
- **White (uncoated) Tyveks** – protect clothing from getting dirty, good for protection against solid, non-volatile chemicals (e.g., asbestos, metals) – no chemical protection.
- **Polycoated Tyveks** – least protective of chemical protective clothing. Used when some risk of contamination getting on skin or clothing. Usually, lower ppm ranges of contaminants.
- **Saranex** – Greater protection against contamination than Polycoated Tyveks. Used to protect against PCBs or higher concentrations of contaminants in the soil or groundwater.
- **Other Chemical protective clothing** – if significant risk of dermal exposure, contact H&S to determine best kind.
- **Long sleeved shirts, long pants** – if working in areas with poison ivy/oak/sumac, poisonous insects, etc. and no chemicals exposure. May want to use uncoated Tyveks for work in areas where poisonous plants are known to occur to protect clothing.
- **Cartridge Respirator (Level C PPE)** – Need to calculate change schedule (contact Division EH&S Manager for this) to determine length of use. To be able to use cartridge respirators, need to know contaminants, estimate levels to be encountered in the breathing zone, need to ensure that cartridge will be effective against COCs, and need to be able to monitor for COCs using PID, FID, Dräger tubes, etc.. If can't do any of these, then Level B PPE is probably going to be needed.
- **High Visibility Vest** – needed for any road work (with in 15 feet of a road) or when working on a site with vehicular traffic or working around heavy equipment. Needed if work tasks would take employee concentration away from movement of vehicles and workers would have to rely on the other driver's ability to see the employee in order not to hit them. This includes heavy equipment as well as cars and trucks, on public roads or the jobsite. Not needed if wearing Polycoated Tyveks – as they are already high visibility.
- **Reflective Vest** – see above, but for use at night.
- **Hearing Protection** – needed if working at noise levels above 85 dBA on a time weighted average. If noise measurements are not available, use around noisy equipment, or in general, if you have to raise your voice to be heard when talking to someone standing two feet away.
- **Protective Chaps –** required when using a machete or chain saw or any other cut hazard to legs.

Work Zones:
The work zones will be defined relative to the location of the work activity. The Exclusion Zone is considered the area within a 10-foot diameter of the sampling location. The Contamination Reduction Zone is considered to be the area with in a 20-foot diameter of the sampling location. The decontamination zone being located upwind of the work area. Work zones will be maintained through the use of:

- ☐ Warning Tape
- ☒ Visual Observations
- ☒ Cones and Barriers

Decontamination Procedures and Equipment:
Note: See Decontamination JHA for further information

Level D Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Boots, and Gloves Wash and Rinse (if worn)	Scrub outer boots, and outer gloves decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal (if worn)	Remove outer boots and gloves. Deposit in plastic bag.
Station 4: Inner glove removal	Remove inner gloves and place in plastic bag.
Station 5: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Modified Level D and Level C PPE Decontamination Procedures

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

Site Communication:

- ☒ Verbal
- ☒ Two-way radio
- ☒ Cellular telephone
- ☒ Hand signals
  - Hand gripping throat ---------- Out of air, can't breathe
  - Grip partner's wrist or both hands around waist ---------- Leave area immediately
  - Hands on top of head ---------- Need assistance
  - Thumbs up ---------- OK, I am all right, I understand
  - Thumbs down ---------- No, negative
- ☐ Horn
- ☐ Siren
- ☐ Other:

EMERGENCY CONTACTS

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
Fire Department:	911		
Hospital:			
Police Department:	911		
Site Health And Safety Officer: Charles Lyman	Office: (207) 828-3280	Cell: (207) 461-0001	
MACTEC Project Manager: Jayme Connolly	Office: (207) 775-5401	Cell: (207) 205-3155	
Division EH&S Manager: Cindy Sundquist	Office: (207) 828-3309 Cell: (207) 650-7593	Home: (207) 892-4402	
NYSDEC Project Manager: Mike McLean	Office: (518) 897-1254		
OTHER: Ambulance	911		

Emergency Equipment:

The following emergency response equipment is required for this project and shall be readily available:

- ☒ Field First Aid Kit
- ☐ Fire Extinguisher (ABC type)
- ☐ Eyewash (Note: 15 minutes of free-flowing fresh water)
- ☐ Other: _____

EMERGENCY PROCEDURES

- The HSO (or alternate) should be immediately notified via the on-site communication system. The HSO assumes control of the emergency response.
- The HSO notifies the Project Manager and client contact of the emergency. The HSO shall then contact the Division ES&H Manager who will then contact the Corporate EH&S Manager.
- If applicable, the HSO shall notify off-site emergency responders (e.g. fire department, hospital, police department, etc.) and shall inform the response team as to the nature and location of the emergency on-site.
- If applicable, the HSO evacuates the site. Site workers should move to the predetermined evacuation point (See Site Map).
- For small fires, flames should be extinguished using the fire extinguisher. Large fires should be handled by the local fire department.
- In an unknown situation or if responding to toxic gas emergencies, appropriate PPE, including SCBAs (if available), should be donned. If appropriate PPE is unavailable, site workers should evacuate and call in emergency personnel.
- For chemical spills, follow the job specific JHA for spill containment
- If chemicals are accidentally spilled or splashed into eyes or on skin, use eyewash and wash affected area. Site worker should shower as soon as possible after incident.
- If a worker is injured, first aid shall be administered by certified first aid provider.
- If the emergency involves toxic gases, workers will back off and reassess. Prior to re-entering the work zone, the area must be determined to be safe. Entry will be using Level B PPE and utilize appropriate monitoring equipment to verify that the site is safe.
- An injured worker shall be decontaminated appropriately.
- After the response, the SHSO shall follow-up with the required company reporting procedures, including the completing the MACTEC Incident Analysis Report.

AMEC Early Injury Case Management Program

<table>
<tr><th>NON-EMERGENCY INCIDENT</th><th>EMERGENCY INCIDENT</th></tr>
<tr><td>Steps 1 & 2 must be completed before seeking medical attention other than local first aid.
1. Provide first-aid as necessary. Report the situation to your immediate supervisor AND HSE coordinator (all incidents with the apparent starting event should be reported within 1 hour of occurrence).
2. Injured employee:</td><td>1. Provide emergency first aid. Supervisor on duty must immediately call 911 or local emergency number; no employee may respond to outside queries without prior authorization. Any outside media calls concerning this incident must be referred immediately to Lauren Gallagher at 602-757-3211.
2. Once medical attention is sought and provided, the supervisor must:</td></tr>
<tr><td colspan="2">Call WorkCare 24/7 Hotline*
(888) II-XPRTS or (888) 449-7787</td></tr>
<tr><td>WorkCare will assess the situation and determine whether the incident requires further medical attention. During this process, WorkCare will perform the following:
• Explain the process to the caller.
• Determine the nature of the concern.
• Provide appropriate medical advice to the caller.
• Determine appropriate path forward with the caller.
• Maintain appropriate medical confidentiality.
• Help caller to execute path forward, including referral to the appropriate local medical facility.
• Send an email notification to the Corporate HSE Department.</td><td>WorkCare will be responsible for performing the following:
• Contact the treating physician.
• Request copies of all medical records from clinic.
• Send an email update to the Corporate HSE Department.</td></tr>
<tr><td colspan="2">3. IMMEDIATELY after contacting WorkCare send a brief email notification AND inform verbally (direct contact is required) ONE of HSE corporate representatives See Figure 11.3.
4. Make all other local notifications and client notifications.
5. Local Supervisor, HSE Coordinator, SSHO and any applicable safety committees to complete preliminary investigation, along with the initial Incident Report within 24 hours.
6. Corporate Loss Prevention Manager to complete Worker’s Compensation Insurance notifications as needed.
7. Corporate HSE to conduct further incident notifications, investigation, include in statistics, classify, and develop lessons learned materials.
* - NOTE: Step 2 is only applicable to the North-American operations and to incidents involving AMEC personnel. High potential near misses, subcontractors’ incidents, regulatory inspections, spills and property damages above $1,000 should be reported immediately, following directions from Step 3.</td></tr>
</table>

Site Specific Procedures are as follows:

FOLLOW THE “CAMP” in the FAP for dust and perimeter volatile monitoring.

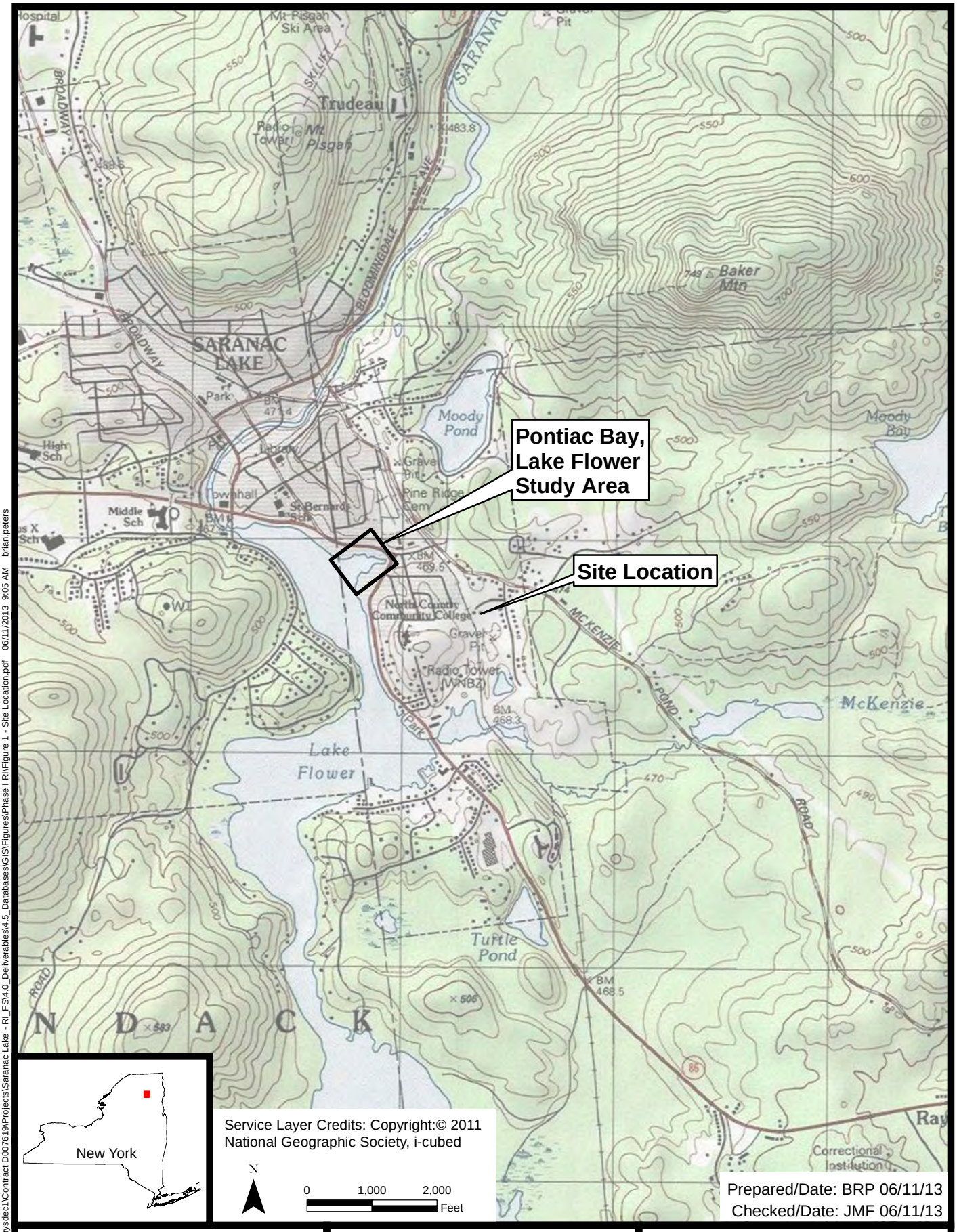
FIELD TEAM REVIEW: I acknowledge that I understand the requirements of this HASP, and agree to abide by the procedures and limitations specified herein. I also acknowledge that I have been given an opportunity to have my questions regarding the HASP and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during on-site activities.

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____



NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
North Elba, New York

MACTEC

Site Location Map

Project 3612132271 Figure 1

Routes to Emergency Medical Facilities

PRIMARY HOSPITAL:

Facility Name: Mountain Medical Urgent Care
Address: 345 Broadway, Saranac Lake New York 12983
Telephone Number: (518) 897-1000

DIRECTIONS TO PRIMARY HOSPITAL (attach map): SEE ATTACHED

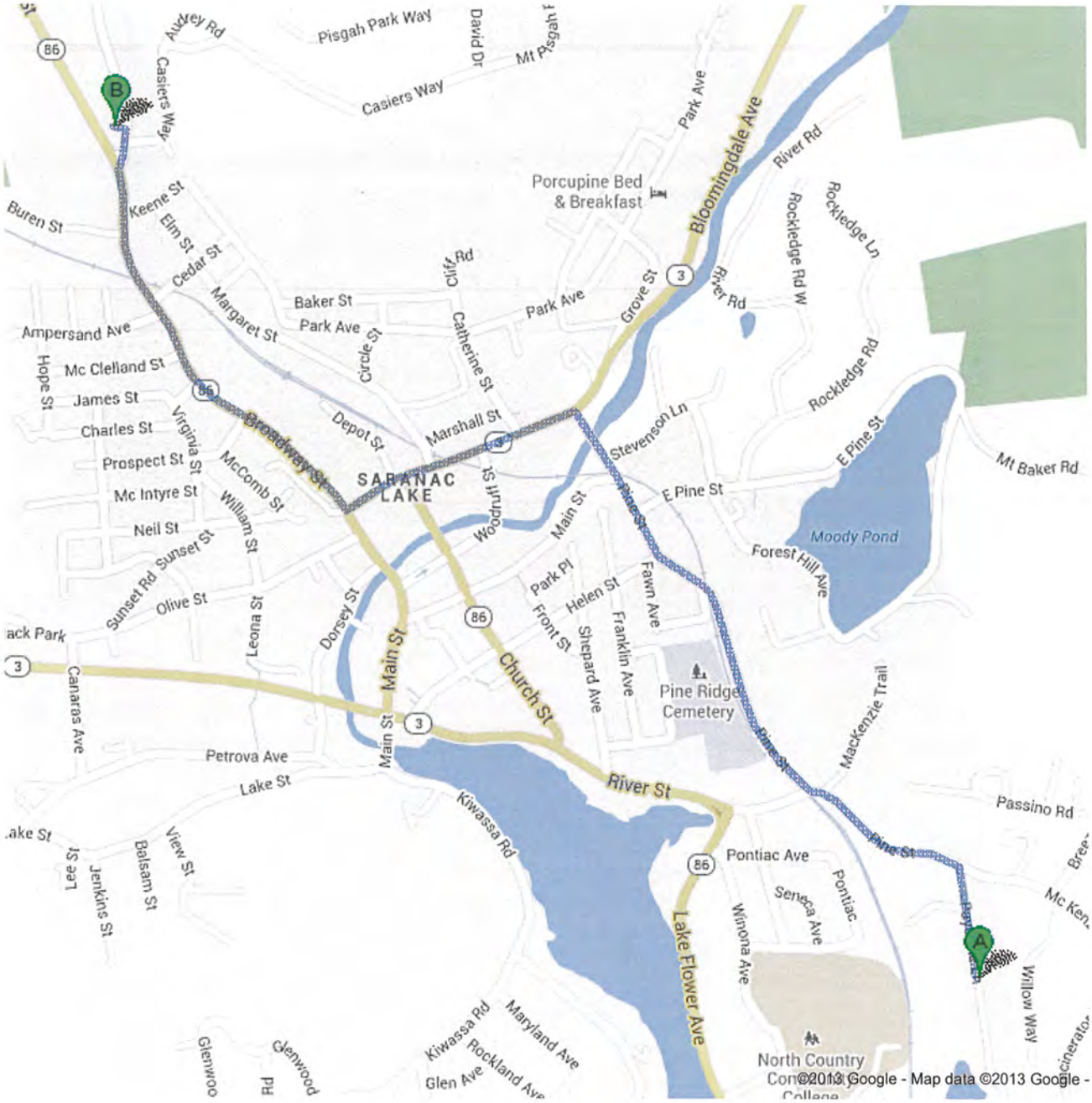
ALTERNATE HOSPITAL:

Facility Name: Adirondack Medical Center
Address: 2233 New York 86, Saranac Lake, New York 12983
Telephone Number: (518) 891-4141

DIRECTIONS TO ALTERNATE HOSPITAL (attach map): SEE ATTACHED

Google

Directions to 354 Broadway, Saranac Lake, NY 12983
2.0 mi – about **7 mins**

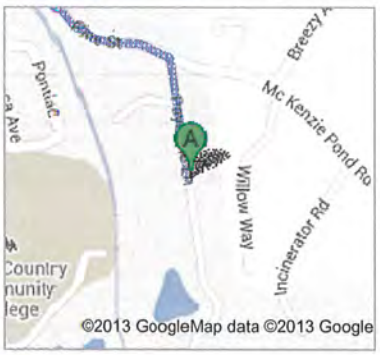


Mountain Medical
Urgent Care
354 Broadway
Tel (518)-897-1000

open M-F 8am - 8pm
Sat/Sun 10am - 6pm

24 Payeville Ln, Saranac Lake, NY 12983

1. Head **north** on **Payville Ln** toward **Adirondack Park Preserve**



go 0.2 mi
total 0.2 mi

2. Turn left onto **Pine St**
About 2 mins

go 0.9 mi
total 1.0 mi

3. Turn left onto **Bloomingdale Ave**
About 2 mins

go 0.3 mi
total 1.4 mi

4. Turn right onto **Broadway St**
About 1 min

go 0.6 mi
total 1.9 mi

5. Slight right onto **Old Lake Colby Rd**

go 305 ft
total 2.0 mi

6. Turn left
Destination will be on the right

go 92 ft
total 2.0 mi

354 Broadway, Saranac Lake, NY 12983

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

Google

Directions to Adirondack Medical Center
2233 New York 86, Saranac Lake, NY 12983
2.7 mi – about **8 mins**

Payeville Ln, Saranac Lake, NY 12983

1.	Head **north** on **Payeville Ln** toward **Adirondack Park Preserve**	go 0.2 mi total 0.2 mi
2.	Turn left onto **Pine St** About 2 mins	go 0.9 mi total 1.0 mi
3.	Turn left onto **Bloomingdale Ave** About 2 mins	go 0.3 mi total 1.4 mi
4.	Turn right onto **Broadway St** About 2 mins	go 1.0 mi total 2.4 mi
5.	Continue onto **NY-86 W/Lake Colby Dr** Continue to follow NY-86 W	go 0.2 mi total 2.6 mi
6.	Turn right onto **Adirondack Park** Destination will be on the right	go 0.1 mi total 2.7 mi

Adirondack Medical Center
2233 New York 86, Saranac Lake, NY 12983

Google

Directions to Adirondack Medical Center
2233 New York 86, Saranac Lake, NY 12983
2.7 mi – about **8 mins**


LAKE COLBY
Trudeau Rd
Beechwood Dr
Cherry Tree Ln
Vista Dr
Trudeau Rd
86
B
Adirondack Medical Center
Mt Pisgah Ski Area
3
Lake Colby
Grace St
86
Little Colby Pond
Broadway St
Bloomingdale Ave
St Bernards Cemetery
3
SARANAC LAKE
Moody Pond
Pine Ridge Cemetery
Main St
Church St
River St
Breezy Acre Way
Lake Flower Ave
Zadds Rd
A
North Country Community College
Algonquin Ave
George H Lapan Memorial Hwy
3
86
Lake Flower Ave
©2013 Google - Map data ©2013 Google -

Payeville Ln, Saranac Lake, NY 12983

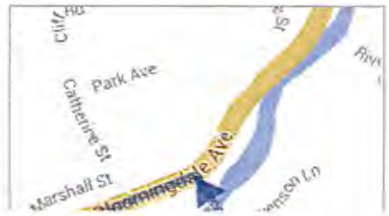
1. Head **north** on **Payeville Ln** toward **Adirondack Park Preserve**

go 0.2 mi
total 0.2 mi

2. Turn left onto **Pine St**
About 2 mins

go 0.9 mi
total 1.0 mi

3. Turn left onto **Bloomingdale Ave**
About 2 mins



go 0.3 mi
total 1.4 mi

4. Turn right onto **Broadway St**
About 2 mins

go 1.0 mi
total 2.4 mi

86 5. Continue onto **NY-86 W/Lake Colby Dr**
Continue to follow NY-86 W

go 0.2 mi
total 2.6 mi

6. Turn right onto **Adirondack Park**
Destination will be on the right

go 0.1 mi
total 2.7 mi

B **Adirondack Medical Center**
2233 New York 86, Saranac Lake, NY 12983

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may [illegible] results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2013 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

DAILY TAILGATE SAFETY MEETING CHECKLIST

Project: _____ Site: _____

Date: Location:

To be reviewed on the first day of site activities and when new workers arrive on site:

Agenda:

During the project, one or more of the agenda items could be selected for the required daily site training.

Check-off: Date

		___	___	___	___	___
1.	Planned work for this day (discuss)	☐	☐	☐	☐	☐
2.	Physical hazards and controls (discuss/review)	☐	☐	☐	☐	☐
3.	Chemical hazards and controls (discuss/review)	☐	☐	☐	☐	☐
4.	Biological hazards and controls (discuss/review)	☐	☐	☐	☐	☐
5.	Level of personal protective equipment: _____	☐	☐	☐	☐	☐
6.	Personal protective equipment required per the hazard assessment:	☐	☐	☐	☐	☐

SPECIFY TYPE	
Protective coveralls	
Safety glasses/goggles	ANSI approved
Hard hat	ANSI approved
Foot protection	Safety toe boots
Work gloves	
Chemical gloves	Nitrile outer/vinyl inner
Hearing protection	
Other	

7.	Review inspection and maintenance procedures and the limitations of the PPE to be used.	☐	☐	☐	☐	☐
8.	Decontamination procedure (discuss/review)	☐	☐	☐	☐	☐
9.	Exclusion zone maintained	☐	☐	☐	☐	☐
10.	Site emergency response plan (discuss/review)	☐	☐	☐	☐	☐
11.	Signs and symptoms of overexposure to chemicals anticipated on site	☐	☐	☐	☐	☐
12.	General health and safety rules	☐	☐	☐	☐	☐
13.	Specific health and safety requirements relating to site activities including: (discuss/review)	☐	☐	☐	☐	☐
14.	Drilling/boring	☐	☐	☐	☐	☐
15.	UST	☐	☐	☐	☐	☐
16.	Excavations (including UG utility locations)	☐	☐	☐	☐	☐
17.	Heavy equipment	☐	☐	☐	☐	☐
18.	Slips, trips, and falls	☐	☐	☐	☐	☐
19.	Lockout/tagout	☐	☐	☐	☐	☐
20.	Working in temperature extremes	☐	☐	☐	☐	☐
21.	Rain or other weather advisories	☐	☐	☐	☐	☐
22.	Other health & safety issues (discuss/note)	☐	☐	☐	☐	☐

I have participated in the daily safety meeting discussing the topics indicated and fully understand my responsibility for complying with all health and safety requirements. I have had the opportunity to have my questions on site health and safety issues and procedures answered.

Employee Name	Employee Signature	Date

Incident Flow Chart

Call Immediatley

Emergency → Incident Occurs → Non-Emergency

CALL 911 Emergency

Supervisor Immediately Calls After Medical Attention is Sought and Provided

Contact Supervisor HSE Coordinator and WorkCare (24/7) Hotline (888)1-XPRTS or (888) 449-7787

Verbally Contact One HSE Representative Below Within 2 Hours

E&I Corporate HSE Department Contact List

Name/Email	Office Location	Contact Information
Bruce Voss bruce.voss@amec.com	Catherdral City, CA	760.202.3737 (office) 951.897.6381 (cell)
Chad Barnes chad.barnes@amec.com	Phoenix, AZ	602.733.6000 (office) 480.495.9846 (cell)
Cindy Sundquist cynthia.sundquist@amec.com	Portland, ME	207.828.3309 (office) 207.650.7593 (cell) 207.892.4402 (home)
Don Kubik don.kubik@amec.com	Oakland, CA	510.663.4100 (office) 510.368.6433 (cell)
Gabe Sandholm gabe.sandholm@amec.com	Minneapolis, MN	612.252.3785 (office) 206.683.9190 (cell)
John Mazur john.mazur@amec.com	Wilmington, NC	910.452.1185 (office) 910.431.2330 (cell) 910.681.0538 (home)
Lori Dowling lori.dowling@amec.com	Prince George, BC	250.564.3243 (office)
Philip Neville philip.neville@amec.com	Thorold, ON	905.687.6616 (office) 905.380.4465 (cell)
Tim Kihn tim.kihn@amec.com	Edmonton, AB	780.944.6363 (office) 780.717.5058 (cell)
Vlad Ivensky (can call 24/7) vlad.ivesky@amec.com	Plymouth Meeting, PA	610.877.6144 (office) 484.919.5175 (cell) 215.947.0393 (home)

**High potential near misses, subcontractor incidents, regulatory inspections, spills, and property damage greater than $1000, should be reported within 60 minutes to one of the above HSE Representatives.*

Revised 17 July 2012-hb

Check one
Initial Report: ☐
Update: ☐
Final Report: ☐ ___

INCIDENT ANALYSIS REPORT
AMEC Environment & Infrastructure
Confidential - Privileged

Incident Potential
Letter: Select One
Number: Select One
Investigation Level: Select One

Group: Select One HSE Manager: ____ Incident Review Panel Team (if applicable): ____

Incident Date: _____ Report Date: _____

Section 1 – General Information

Employee Name: ____ Sex: ☐ M ☐ F Date of Birth: ____ Age Range: Select One Time of incident: ____ ☐ am | ☐ pm

Job Position: Select One Hire Date: ____ Time employee began work: _____

Business Line: Select One Department Number: ____ Project Manager: ____

Project Name: ____ Project Number: ____ Client: ____

Office where employee works from: ____ Immediate Supervisor: ____ Hours employee worked during last 7 days: ____ hrs

Location: Select One Is this a Company controlled work site: ☐ Yes ☐ Incident Assigned to: Select One

Location description: ____

Section 2 – Incident Type - Process (**mark at least ONE BOLD TYPE** and all that apply)

☐ **Fatality** ☐ **Environmental** ☐ **Injury/Illness Incident** If Injury/illness: Select One

☐ **Security** ☐ **Near Miss / Hazard ID** ☐ **Property Damage** If Damage: Select One ☐ 3rd Party?

☐ Hospitalization ☐ Regulatory Inspection ☐ Notice of Violation or Citation ☐ Agency Reportable?

☐ Motor Vehicle Incident Involving Injury ☐ Other (describe): ___

Outcome/Result: Select One Source of Hazard: Select One If "other", specify: ___ Immediate Cause: Select One

A. If **injury/illness**: Indicate the part of the body: Select One If "other", specify: ___
Indicate body part location: Select One If "other", specify: ___
Injury Type: Select One If "other", specify: ___ Illness Type: Select One If "other", specify: ___

B. If **property damage**: describe what happened and estimate ($) of damage to all objects involved? ___

C. If **environmental**: Type of Environmental incident?: Select One Name, CAS#, physical state and quantity? ___
Receiving Environment?: Select One Mechanism of Incident?: Select One If "other", specify: ___
Nature of Breach?: Select One Duration of Breach?: Select One

D. If **security**: Security Incident Type: Select One If Physical: Select One If Criminal: Select One If Intellectual: Select One

E. If an **inspection by a regulatory agency**, what agency, who were the inspectors, inspector contact information? ___

Section 3 – Incident Description

Attach and number additional pages, as needed, to ensure all details related to the incident are captured.

A. List the names of all persons involved in the incident, and employer information: ___

B. List the names of any witnesses, their employer, and a local/company telephone number or address: ___

C. Name of Employee's supervisor: ___ Contact phone number for supervisor: ___

D. What specific job/task or action was the employee(s) doing just prior to the incident: ___

E. Was a tool or equipment involved? ☐ Yes ☐ No What was it: ___ Last Inspection Date: ___Defects: ___

F. Explain in **detail** what happened: ___

G. Explain in **detail** what object or substance directly harmed the employee: ___

H. What were the weather conditions at time of incident?: ___

I. What was the lighting like at time of incident? Bright ☐ Shadows ☐ Dark ☐ Other: ___

J. List any damaged equipment or property (other than motor vehicles). Provide model and serial number **and** estimated costs to repair/replace damaged equipment or property, if applicable: ___

Section 4 - Incident Analysis

A. Was a Health and Safety Plan (HASP) or Activity Hazard Analysis (AHA) completed for the work being performed? ☐ Yes ☐ No
If "yes", Who prepared the document?: ___

B. Who and when was the last manager (Project, Unit, etc.) at the site of the incident?: ___

C. When and what safety training **directly related** to the incident has the person(s) involved had?: ___

D. List attached documentation (HASP acknowledgement forms, kickoff/daily/weekly meetings, inspections, photographs): ___

Section 5 - Incident Investigation Results and Corrective Actions

This section to be completed by the Group HSE Manager/IRP with support from location where incident occurred.

Causal Factors (Acts or Omissions / Conditions)

(Attach and number any additional pages as needed to completely address this section)

	IMMEDIATE CAUSE	IMMEDIATE CAUSE SUB-TYPE	DESCRIPTION
1	Select One	____	____
2	Select One	____	____
3	Select One	____	____
4	Select One	____	____

Root Cause(s) Analysis - The below items represents major root cause categories which have been determined to be Less Than Adequate (LTA). A more detailed determination of the root cause will be facilitated, if needed, by the applicable Group HSE Manager / IRP.

	ROOT CAUSE TYPE	ROOT CAUSE SUB-TYPE	DESCRIPTION
1	Select One	____	____
2	Select One	____	____
3	Select One	____	____
4	Select One	____	____

Corrective Actions

Root Cause #	Corrective Actions Taken (Attach additional pages as needed to completely address this section)	Responsible Person	Proposed Completion Date	Closed on Date	Verified by and Date Verified
____	___	___	___	___	___
____	___	___	___	___	___
____	___	___	___	___	___
____	___	___	___	___	___
____	___	___	___	___	___

Section 6 - Notifications, Certification & Approvals

Check the appropriate boxes indicating the applicable reports have been made to the following applicable organizations:

Auto Insurance Carrier was called ☐ **Group HSE Manager Notified** ☐

WorkCare was called ☐ **Post-incident Drug/Alcohol Testing Performed** ☐

Incident Report prepared by: ___

Employee (s): ___	Date: ___	Employee's Supervisor: ___	Date: ___
HSE Coordinator/Project/Unit Manager: ___	Date: ___	Group HSE Manager:___	Date: ___

ATTACHMENT 2

VEHICLE INCIDENT REPORT

Confidential - Privileged

Section 1 - General Information

Date of Incident: _____

Time incident occurred: _____ ☐ am | ☐ pm | Illumination: ☐ Dark ☐ Dusk ☐ Light | Road Condition: ☐ Dry ☐ Wet ☐ Icy/snow

Were police summoned to scene? ☐ Yes ☐ No Police Department and Location: _____

Report #; _____ Officer's Name: _____ Officer's Badge Number: _____

Section 2 - Company Driver and Vehicle

Driver's name: _____ D/L #: _____ State: _____

Driver's home office address: _____ Driver's Phone #: _____

Company Vehicle #: _____ Year: _____ Model: _____ License #: _____ State: _____

Company car?: ☐ Yes ☐ No Personal Vehicle?: ☐ Yes ☐ No Rental Vehicle?: ☐ Yes ☐ No

If rental, rented from: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Damage to vehicle: _____

Was an employee injured?: ☐ Yes ☐ No If yes, please describe: _____

Injuries to others?: ☐ Yes ☐ No If yes, please describe: _____

Vehicle was being used for: Company business ☐ Yes ☐ No Personal business ☐ Yes ☐ No

Towed?: ☐ Yes ☐ No If yes, by whom?: _____ To Where?: _____

Section 3 - Other Driver and Vehicle Information

Driver's Name: _____ D/L # : _____ State: _____

Current address: _____ City: _____ State: _____

Telephone: _____ Work: _____ Cell: _____

Registered Owner's Name: _____ Address: _____ City: _____ State: _____

(verify registration document)

The Other Vehicle: Make: _____ Model: _____ Year: _____ License #: _____ State: _____

Insurance company name: _____ Address: _____ Phone #: _____

Policy No.: _____ Contact Person: _____ Phone #: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Passenger/Witness Name(s): _____ Address: _____ Telephone: _____

Damage: (*Make note of pre-existing damage and take pictures if possible – you may attach additional pages if necessary):* _____

Injuries to other driver/passengers: _____

Section 4 – Approvals (signatures required)

Form completed by (please print): _____ Date: _____

Signature: _____

Office/Project Manager (please print): _____ Date: _____

Signature: _____

Things to Do First In The Event Of a Motor Vehicle Incident

GENERAL INFORMATION

1. Do not decide on your own whether a particular incident is "covered" by insurance. Should there be any doubt, it is always preferable to report an occurrence, as this allows underwriters, the Risk Management Department and insurance adjusters to determine if a covered loss has taken place.

2. Policy Conditions do require that all losses and occurrences, which may result in a claim be promptly reported.

3. Do not admit liability or offer your opinion of liability to anyone.

4. Complete this IAR/VIR form promptly and forward with all applicable supporting documentation. It is essential both division and location information be provided.

5. For automobile collisions within the **United States**, please indicate on the IAR form that you have contacted Zurich at:

Zurich Insurance Company
1-800-987-3373 or
1-877-928-4531
24 hours a day, 7 days a week

6. For automobile collisions within **Canada**, please indicate on the IAR form that you have contacted Zurich at:

Crawford Adjusters Canada
Claims Alert
1-888-218-2346
24 hours a day, 7 days a week

The more details you have the better but, don't delay reporting if you don't have all of the information - that may be obtained later. A Zurich trained operator will answer your call and ask for all relevant information regarding the incident. The initial information required includes:

- Your division,
- Office location and division contact name – advise that you are an AMEC Company
- Name, drivers license and phone number of the driver involved in the loss
- Description of the vehicle which he/she was driving (i.e., year, make, model, license plate number, serial number)
- Date, time and location of incident
- Passenger information (if applicable)
- Third party information (i.e., name, phone number, address, vehicle information, insurance information)
- If any injuries occurred (if applicable)
- Police information
- Witness information (if applicable)

Call 911 if there are serious injuries!

If you are injured or think you were injured, **contact your supervisor and call WorkCare at 888-449-7787**. Your supervisor will notify your HSE Coordinator and your Group HSE Manager. For additional instructions on what to do, go to AMEC's HSE website at:

http://ee.amecnet.com/she/sheweb/incident_reporting.htm

1. Call for an officer if the incident occurred on public property (streets, highways or roads). Disputes often arise between the parties involved as to who was at fault; therefore, a police report is important. If an officer is unable to attend the scene of the collision, a counter police report may be filed at most stations. Insurance companies rely on police reports to determine liability.
2. Complete the Incident Investigation Report and the Vehicle Incident Report forms. It is important that both these forms are completed in detail. Include a diagram of the incident on the provided sheet. Incomplete information may lead to delays in processing associated claims and in helping to prevent this type of incident from occurring again.
3. Give only information that is required by the authorities or as directed by AMEC contractual requirements.
4. Sign only those statements required by the authorities or as directed by AMEC contractual requirements. Do not sign away your or the company's rights.

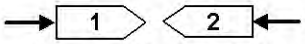
Vehicle Incident Diagram

This or a similar diagram must be completed with all VIRs

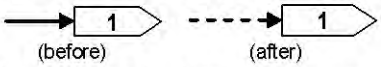
MACTEC, Inc.

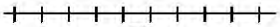
Vehicle Crash Diagram

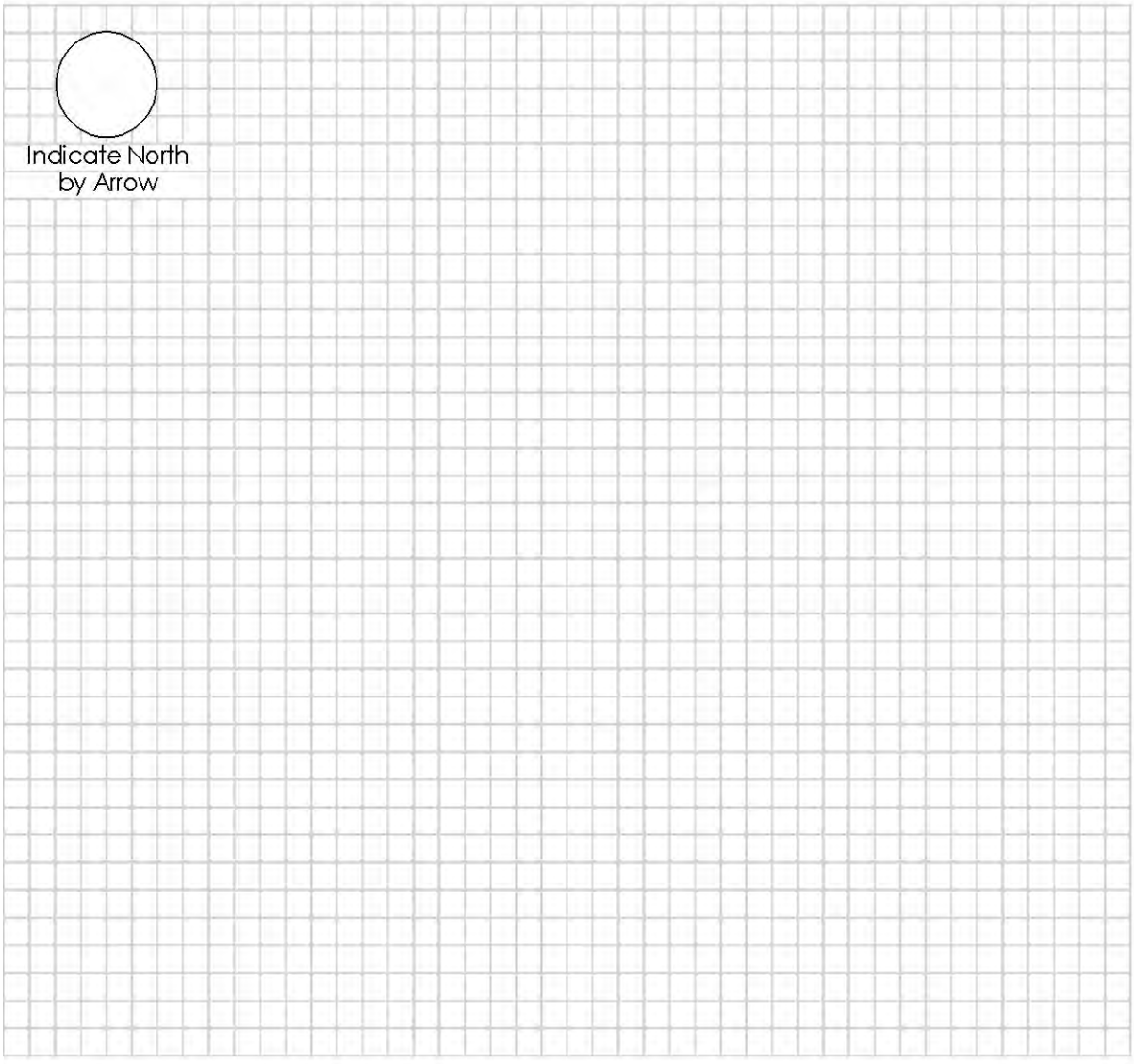
Instructions:

1. Number each vehicle and show directions 

2. Use a solid line to show path before incident and use a dotted line to show path after incient



3. Show pedestrian/non-motorist by: 
4. Show railroad by: 
5. Indicate north by arrow as: 
6. Show street or highway names or numbers
7. Show signs, signals, warning and traffic controls.



Prepared by: _____ Date: _____

GROUND DISTURBANCE INCIDENT REPORT

AMEC Environment & Infrastructure

Section 1 – General Information

Employee Name: _____ Time of incident: _____ ☐ am | ☐ pm Time Reported:_____ ☐ am | ☐ pm Report Date: _____

Project Name: _____ Project Number: _____ Client: _____

List of All Parties Present

Name	Company	Telephone No.	Role
____	____	____	____
____	____	____	____
____	____	____	____
____	____	____	____
____	____	____	____

Describe the chronological description of Incident and response:____

Section 2 – Date and Location of Event

A. *Date of Event: (MM/DD/YYYY)

B. ***Country** ***State** ***County** **City**

C. **Street address** **Nearest Intersection**

D. *Right of Way where event occurred

E. Public: ☐ City Street ☐ State Highway ☐ County Road ☐ Interstate Highway ☐ Public-Other

F. Private: ☐ Private Business ☐ Private Land Owner ☐ Private Easement

G. ☐ Pipeline ☐ Power /Transmission Line ☐ Dedicated Public Utility Easement

☐ Federal Land ☐ Railroad ☐ Data not collected ☐ Unknown/Other

List attached documentation (Public Utility Locates, Private Utility Locates, Copy of notifications submitted to Owner or other utility Owners, photographs): _____

Section 3 – Affected Facility Information

***What type of facility operation was affected?**

☐ Cable Television ☐ Electric ☐ Natural Gas ☐ Liquid Pipeline ☐ Sewer (Sanitary Sewer)

☐ Steam ☐ Telecommunications ☐ Water ☐ Unknown/Other

***What type of facility was affected?**

☐ Distribution ☐ Gathering ☐ Service/Drop ☐ Transmission ☐ Unknown/Other

Was the facility part of a joint trench?

☐ Unknown ☐ Yes ☐ No

Was the facility owner a member of One-Call Center?

☐ Unknown ☐ Yes ☐ No

Section 4 – Excavation Information

***Type of Excavator**

☐ Contractor ☐ County ☐ Developer ☐ Farmer ☐ Municipality ☐ Occupant
☐ Railroad ☐ State ☐ Utility ☐ Data not collected ☐ Unknown/Other

***Type of Excavation Equipment**

☐ Auger ☐ Backhoe/Trackhoe ☐ Boring ☐ Drilling ☐ Directional Drilling
☐ Explosives ☐ Farm Equipment ☐ Grader/Scraper ☐ Hand Tools ☐ Milling Equipment
☐ Probing Device ☐ Trencher ☐ Vacuum Equipment ☐ Data Not Collected ☐ Unknown/Other

***Type of Work Performed**

☐ Agriculture ☐ Cable Television ☐ Curb/Sidewalk ☐ Bldg. Construction ☐ Bldg. Demolition
☐ Drainage ☐ Driveway ☐ Electric ☐ Engineering/Survey ☐ Fencing
☐ Grading ☐ Irrigation ☐ Landscaping ☐ Liquid Pipeline ☐ Milling
☐ Natural Gas ☐ Pole ☐ Public Transit Auth. ☐ Railroad Maint. ☐ Road Work
☐ Sewer (San/Storm) ☐ Site Development ☐ Steam ☐ Storm Drain/Culvert ☐ Street Light
☐ Telecommunication ☐ Traffic Signal ☐ Traffic Sign ☐ Water ☐ Waterway Improvement
☐ Data Not Collected ☐ Unknown/Other

Section 5 – Pre-Excavation Notification

***Was the One-Call Center notified?**

☐ Yes ☐ No If Yes, which One-Call Center? Ticket number:

Was Private Contract Locator used?

☐ Yes ☐ No

Section 6 – Locating and Marking

***Type of Locator**

☐ Utility Owner ☐ Contract Locator ☐ Data Not Collected

***Were facility marks visible in the area of excavation?**

☐ Yes ☐ No ☐ Data Not Collected

***Were facilities marked correctly?**

☐ Yes ☐ No ☐ Data Not Collected

What technology was used to locate utilities?

☐ Maps ☐ Active(transmitter+receiver) ☐ Passive (receiver only) ☐ GPR
☐ Acoustic ☐ Magnetic ☐ Infrared ☐ Unknown/Other

What Factors affected the ability to locate services?

☐ Soil Type:_____ ☐ Non-Grounded ☐ Common Bonded ☐ Depth
☐ Electromagnetic interference ☐ Parallel facilities ☐ Congested facilities ☐ Unknown/Other

Section 7 – Excavator Downtime

Did Excavator incur down time?

☐ Yes ☐ No

If yes, how much time?

☐ Unknown ☐ Less than 1 hour ☐ 1 hour ☐ 2 hours ☐ 3 or more hours Exact Value _____If

Estimated cost of down time?

☐ Unknown ☐ $0 ☐ $1 to 500 ☐ $501 to 1,000 ☐ $1,001 to 2,500 ☐ $2,501 to 5,000
☐ $5,001 to 25,000 ☐ $25,001 to 50,000 ☐ $50,001 and over Exact Value _____

Section 8 – Description of Damage

***Was there damage to a facility?**
☐ Yes ☐ No (i.e. near miss)
***Did the damage cause an interruption in service?**
☐ Yes ☐ No ☐ Data Not Collected ☐ Unknown/Other
If yes, duration of interruption
☐ Unknown ☐ Less than 1 hour ☐ 1 to 2 hrs ☐ 2 to 4 hrs ☐ 4 to 8 hrs ☐ 8 to 12 hrs ☐ 12 to 24 hrs
☐ 1 to 2 days ☐ 2 to 3 days ☐ 3 or more days ☐ Data Not Collected Exact Value _____
Approximately how many customers were affected?
☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 10 ☐ 11 to 50 ☐ 51 or more Exact Value _____
Estimated cost of damage / repair/restoration
☐ Unknown ☐ $0 ☐ $1 to 500 ☐ $501 to 1,000 ☐ $1,001 to 2,500 ☐ $2,501 to 5,000
☐ $5,001 to 25,000 ☐ $25,001 to 50,000 ☐ $50,001 and over Exact Value _____
Number of people injured
☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 9 ☐ 10 to 19 ☐ 20 to 49 ☐ 50 to 99
☐ 100 or more Exact Value _____
Number of fatalities
☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 9 ☐ 10 to 19 ☐ 20 to 49 ☐ 50 to 99
☐ 100 or more Exact Value _____

Was there a Product Release?
Product Release: ☐ No ☐ Yes ☐ N/A Type: ____ **If Yes, Incident Type is Environmental Report.**
Volume: ____ Spill Controls: ____
Repair Process: ____

Section 9 – Description of the Root Cause

Please choose one

One-Call Notification Practices Not Sufficient
☐ No notification made to the One-Call Center
☐ Notification to one-call center made, but not sufficient
☐ Wrong information provided to One Call Center

Locating Practices Not Sufficient
☐ Facility could not be found or located
☐ Facility marking or location not sufficient
☐ Facility was not located or marked
☐ Incorrect facility records/maps

Excavation Practices Not Sufficient
☐ Failure to maintain marks
☐ Failure to support exposed facilities
☐ Failure to use hand tools where required
☐ Failure to test-hole (pot-hole)
☐ Improper backfilling practices
☐ Failure to maintain clearance
☐ Other insufficient excavation practices

Miscellaneous Root Causes
☐ One-Call Center error
☐ Abandoned facility
☐ Deteriorated facility
☐ Previous damage
☐ Data Not Collected
☐ Other

Section 10 - Notifications, Certification & Approvals

Check the appropriate boxes indicating the applicable reports have been made to the following applicable organizations:

One Call was called ☐ **Spills Reporting Agency Notified** ☐

Emergency Responders (Fire) was called ☐ **Post-incident Drug/Alcohol Testing Performed**

List of All Agencies Contacted

Name/Agency	Phone #	Date	Time

Incident Report prepared by: ____

Employee (s): ____	Date: ____	Employee's Supervisor: ____	Date: ____
HSE Coordinator/Project/Unit Manager: ____	Date: ____	Group HSE Manager:____	Date: ____

APPENDIX A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Benzene
CAS Number: 71-43-2
Synonyms:
Phenyl hydride Benzol

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ____
Liquid X
Gas ____

Odor: Aromatic

Odor Threshold 4.68 ppm

Vapor Density: 2.7 g/L

Ionization Potential (IP): 9.24 eV

IDLH: 500 ppm

Carcinogen: OSHA X
IARC X
NTP ____
ACGIH X
NIOSH X

Skin absorbable: YES

Skin corrosive: No

Signs/Symptoms of Acute Exposure:

Eye, skin and nose irritation; headache, nausea, staggered gait, drowsiness, dizziness, headaches, vomiting, convulsions and unconsciousness

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	1 ppm	5 ppm	
ACGIH TLVs	0.5 ppm	2.5 ppm	
NIOSH RELs	0.1 ppm	1 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Micro tip 10.6 eV	Isobutylene 100 ppm	1.80	0.4

Checked by: Joanne Bacchus Date: 06/04/08

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits Viton, Teflon, Barricade, CPF3, Responder
Tychem

Gloves Viton, Teflon, Polyvinyl Alcohol (PVA) - do not use in water

Boots Teflon

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 4 ppm

MUC Full-Face APR = TWA x 50 = 20 ppm

FIRE/REACTIVITY DATA

Flash Point: 12 °F

LEL/UEL: 1.2/ 7.8%

Fire Extinguishing Media:

Dry Chemical X Foam X

Water Spray X CO_2 X

Incompatibilities:

Reacts violently with oxidizers, halogens, sulfuric acid, nitric acid

Attacks plastic and rubber.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name: Toluene

CAS Number: 108-88-3

Synonyms: Methylbenzene, Methyl Benzol, Phenyl Methane Toluol

HEALTH HAZARD DATA

Color:	Colorless
Physical State:	Solid
	Liquid X
	Gas
Odor:	Sweet Pungent
Odor Threshold:	0.16 - 37 ppm
Vapor Density:	3.7 g/L
Vapor Pressure	21 mmHg
Ionization Potential (IP):	8.82 eV
IDLH:	500 ppm

Carcinogen:	OSHA	X
	IARC	
	NTP	
	ACGIH	
	NIOSH	X
Skin absorbable:	yes X	no ___
Skin corrosive:	yes ___	no X

Signs/Symptoms of Acute Exposure:
Irritant to eyes and nose, dizziness, fatigue, confusion, weakness, headache, dilated pupils, dermatitis, lacrimation nervousness

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	200 ppm		300 ppm
ACGIH TLVs	20 ppm		
NIOSH RELs	100 ppm	150 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	10.6	Isobutylene 100 ppm	1.81	18 ppm
PID	HNU 11.7 eV	Isobutylene 100 ppm	1.14	57 ppm

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits	Teflon, Viton, CPF3, PE/EVAL, Barricade, Responder, Tychem Trellchem
Gloves	Viton, Teflon Polyvinyl alcohol (do not use in water)
Boots	Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 181 ppm
*MUC Full-Face APR = TWA x 50 = 900 ppm

*Use if conducted quantitative fit testing (Portacount), otherwise use MUC for 1/2 respirator if did qualitative fit testing (Irritant smoke)

FIRE/REACTIVITY DATA

Flash Point: 40° F

LEL/UEL: 1.1% / 7.1%

Fire Extinguishing Media:

Dry Chemical	X	Foam	X
Water Spray	X	CO_2	X

Incompatibilities:
Strong oxidizers

Checked by: Cindy Sundquist Date: 4/27/10

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name: Ethylbenzene

CAS Number: 100-41-4

Synonyms: Ethylbenzol, Phenylethane

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid / Liquid X / Gas

Odor: Aromatic

Odor Threshold: 0.092 - 0.6 PPM

Vapor Density: 3.66 g/L

Ionization Potential (IP): 8.76 eV

IDLH: 800 ppm

Carcinogen: OSHA / IARC / NTP / ACGIH / NIOSH

Skin absorbable: yes ___ no _X_

Skin corrosive: yes ___ no ___

Signs/Symptoms of Acute Exposure: Irritant to eyes, skin, and mucous membranes; dermatitis, and headache

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		
ACGIH TLVs	100 ppm	125 ppm	
NIOSH RELs	100 ppm	125 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6 eV	Isobutylene 100 ppm	1.63	163
PID	HNu 10.2 eV	Isobutylene 100 ppm		
FID	Foxboro TVA 1000 (10.6 eV)	Methane	3.7	370

Checked by: Emmet F. Curtis Date: 12/5/03

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Viton, Barricade, Tychem Responder, Teflon

Gloves: Viton, teflon

Boots: Teflon

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR= TWA x 10 = 500 ppm

MUC Full-Face APR= TWA x 10 = 500 ppm

FIRE/REACTIVITY DATA

Flash Point: 55° F

LEL/UEL: 0.8% / 6.7%

Fire Extinguishing Media:

Dry Chemical	X	Alcohol Resistant Foam	X
Water Spray	___	CO_2	X

Incompatibilities: Strong oxidizers

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

APPENDIX A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Xylene 108-38-3,
CAS Number: 95-47-6, 106-42-3
Synonyms:
Dimethylbenzene, Xylol

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid X (below 56°F)
Liquid X
Gas

Odor: Aromatic

Odor Threshold: 20 ppm

Vapor Density: 4.3 g/L

Ionization Potential (IP): 8.56 eV

IDLH: 900 ppm

Carcinogen: OSHA
IARC
NTP
ACGIH
NIOSH

Skin absorbable: yes ___ no X
Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Irritant to eyes, skin, nose, throat,
dizziness, drowsiness, excitement

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		
ACGIH TLVs	100 ppm	150 ppm	
NIOSH RELs	100 ppm	150 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6 eV	Isobutylene 100 ppm	1.2	120 ppm
PID	HNu w/ 10.2 eV	Benzene 100 ppm	1.04	104 ppm

Checked by: Emmet F. Curtis Date: 12/5/03

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits: Teflon, Viton, PE/EVAL
Gloves: Teflon, Viton
Polyvinyl Alcohol (Do not use in water)
Boots: Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR=TWA x 10 = 500 ppm
MUC Full-Face APR=TWA x 10 = 500 ppm

FIRE/REACTIVITY DATA

Flash Point: 81° F

LEL/UEL: 0.9% / 6.7%

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray X CO_2 X

Incompatibilities:
Strong oxidizers
Strong Acids

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

APPENDIX A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Polycyclic Aromatic Hydrocarbons
CAS Number: 12-90-00
Synonyms:
Coal Tar Pitch Volatiles
(CAS 65996-93-2)

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid Residue
Liquid
Gas

Odor: NA

Odor Threshold NA

Vapor Density: >1.0 g/L

Ionization Potential (IP): NA

IDLH: 80 mg/m3

Carcinogen: OSHA
IARC X
NTP X
ACGIH X
NIOSH X

Skin absorbable: YES

Skin corrosive: YES

Signs/Symptoms of Acute Exposure:
Dermatitis, bronchitis.

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	0.2 mg/m3		
ACGIH TLVs	0.2 mg/m3		
NIOSH RELs	0.1 mg/m3		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Resonse or Conversion Factor	Meter Specific Action Level
Dust meter **Action limit will be based on soil concentrations. Contact C. Sundquist for action limits	Any		N/A	**

Checked by: Date:

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits Tyvek

Gloves Nitrile or neoprene

Boots Neoprene

Service Limit Concentration (ppm): NA

MUC 1/2 Mask APR = TWA x 10 = **2 mg/m3

MUC Full-Face APR = TWA x *50 = **10 mg/m3

*If quantitative fit testing is conducted, otherwise, use protection factor of 10

**Action limit will be based on soil concentrations. Contact C. Sundquist for action limits

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: NA

Fire Extinguishing Media:

Dry Chemical X Foam X

Water Spray CO_2 X

Incompatibilities:
Strong Oxidizers

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name
Cyanide*
CAS Number: 151-50-8
Synonyms
Potassium cyanide, sodium cyanide
calcium cyanide

HEALTH HAZARD DATA

Color: white, granular, crystalline solid

Physical State: Solid X; Liquid; Gas

Odor: Almond-like odor

Odor Threshold:

Vapor Density

Ionization Potential (IP): NA

IDLH: 25 mg/m³

Carcinogen: OSHA; IARC; NTP; ACGIH; NIOSH

Skin absorbable: yes X no

Skin corrosive: yes ___ no ___

Signs/Symptoms of Acute Exposure
Headache; confusion; nausea; skin & eye irritation; weakness; slow gasping respiration; thyroid and blood change

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL	5 mg/m³	---	---
ACGIH TLVs	---	---	4.7 ppm 5 mg/m³
NIOSH RELs	---	---	4.7 ppm 5 mg/m³

AIR MONITORING

Type	Brand/Mode No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level

Checked by: Emmet F. Curtis Date: 2/28/00

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials

Suits

Gloves

Boots

Service Limit Concentration (ppm): NA

MUC 1/2 Mask APR=TWA x 10= 25 mg/m³

MUC Full-Face APR=TWA x 10= 25 mg/m³

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: NA / NA

Fire Extinguishing Media

Dry Chemical	X	Foam	X
Water Spray	X	CO_2	X

Incompatibilities
Strong oxidizers, such as acids, acid salts chlorates, and nitrates

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

* Listed here as a non-specific cyanide salt. Synonyms list possible cyanide compounds.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for Site Visit	1A) N/A	1A) Prior to leaving for site ▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ If respiratory protection is required/potentially required, ensure that training and fit-testing has occurred within the past year. ▪ Familiarize yourself with route to the site
	1B) Vehicle defects	1B) Inspect company owned/leased vehicle for defects such as: ▪ Flat tires ▪ Windshield wipers worn or torn ▪ Oil puddles under vehicle ▪ Headlights, brake lights, turn signals not working
	1C) Insufficient emergency equipment, unsecured loads	1C) Insufficient emergency equipment, unsecured loads ▪ Ensure vehicle has first aid kit and that all medications are current (if first aid kits are not provided at the site) ▪ Ensure vehicle is equpped with warning flashers and/or flares and that the warning flashers work ▪ Cell phones are recommended to call for help in the event of an emergency ▪ Vehicles carrying tools must have a safety cage in place. All tools must be properly secured ▪ Vehicles must be equipped with chocks if the vehicle is to be left running, unattended. ▪ Ensure sufficient gasoline is in the tank
2. Operating vehicles – general	2A) Collisions, unsafe driving conditions	2A) Drive Defensively! ▪ Seat belts must be used at all times when operating any vehicle on company business. ▪ Drive at safe speed for road conditions ▪ Maintain adequate following distance ▪ Pull over and stop if you have to look at a map ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary
3. Driving to the jobsite	3A) Dusty, winding, narrow roads	3A) Dusty, winding, narrow roads ▪ Drive confidently and defensively at all times. ▪ Go slow around corners, occasionally clearing the windshield.
	3B) Rocky or one-lane roads	3B) Rocky or one-lane roads ▪ Stay clear of gullies and trenches, drive slowly over rocks. ▪ Yield right-of-way to oncoming vehicles---find a safe place to pull over.
	3C) Stormy weather, near confused tourists	3C) Stormy weather, near confused tourists ▪ Inquire about conditions before leaving the office. ▪ Be aware of oncoming storms. ▪ Drive to avoid accident situations created by the mistakes of others.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3D) When angry or irritated	3D) When angry or irritated ▪ Attitude adjustment; change the subject or work out the problem before driving the vehicle. Let someone else drive.
	3E) Turning around on narrow roads	3E) Turning around on narrow roads ▪ Safely turn out with as much room as possible. ▪ Know what is ahead and behind the vehicle. ▪ Use a backer if available.
	3F) Sick or medicated	3F) Sick or medicated ▪ Let others on the crew know you do not feel well. ▪ Let someone else drive.
	3G) On wet or slimy roads	3G) On wet or slimy roads ▪ Drive slow and safe, wear seatbelts.
	3H) Animals on road	3H) Animals on road ▪ Drive slowly, watch for other animals nearby. ▪ Be alert for animals darting out of wooded areas
4. Gain permission to enter site	4A) Hostile landowner, livestock, pets	4A) Hostile landowner, livestock, pets ▪ Talk to land owner, be courteous and diplomatic ▪ Ensure all animals have been secured away from work area
5. Mobilization/ Demobilization of Equipment and Supplies	5A) Struck by Heavy Equipment/Vehicles	5A) Struck by heavy equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times ▪ Employees shall wear a high visibility vest or T-shirt (reflective vest required if working at night). ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation.
	5B) Struck by Equipment/Supplies	5B) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
	5C) Overexertion Unloading/Loading Supplies	5C) Overexertion Unloading/Loading Supplies ▪ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting. ▪ Tightly secure all loads to the truck bed to avoid load shifting while in transit.
	5D) Caught in/on/between	5D) Caught in/on/between ▪ Do not place yourself between two vehicles or between a vehicle and a fixed object.
	5E) Slip/Trip/Fall	5E) 1E). Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. ▪ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ▪ Drivers will check surface before stepping, not jumping down.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	5F) Vehicle accident	5F) Vehicle accident ▪ Employees should follow MACTEC vehicle operation policy and be aware of all stationary and mobile vehicles.
6. Site Preparation	6A) Slip/Trip/Fall	6A) Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas
7. Installation of soil erosion and sediment controls	7A) Overexertion	7A) Overexertion ▪ Workers will be trained in the proper method of placing erosion controls. ▪ Do not bend and twist at the waist while lifting or exerting force.
	7B) Struck by Equipment/Supplies	7C) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
8. Driving back from the jobsite	8A) See hazards listed under item #3	8A) See safe work practices under item #3

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Minimum Recommended PPE*: hard hat, steel-toed boots, safety glasses
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization/ Demobilization and Site Preparation	1A) See Mobilization/Demobilization and Site Preparation JHA	1A) See Mobilization/Demobilization and Site Preparation JHA
2. Communication	2A) Safety, crew unity	2A) Talk to each other. ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the wherabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Review Emergency Evacuation Procedures (see below).
3. Walking and working in the field	3A) Falling down, twisted ankles and knees, poor footing	3A) Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	3B) Falling objects	3B) Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds.
	3C) Chemical/Toxicological Hazards	3C) Chemical/Toxicological Hazards ▪ See HASP for appropriate level of PPE ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labelled ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
	3D) Damage to eyes	3D) Protect eyes: ▪ Watch where you walk, ecpecially around trees and brush with limbs sticking out. ▪ Exercise caution when clearing limbs from tree trunks. Advise wearing eye protection. ▪ Ultraviolet light from the sun can be damaging to the eyes; look for sunglasses that specify significant protection from UV-A and UV-B radiation. If safety glasses require, use one's with tinted lenses
	3E) Bee and wasp stings	3E) See JHA for Insect Stings and Bites
	3F) Ticks and infected mosquitos	3F) See JHA for Insect Stings and Bites
	3G) Wild Animals	3G) Wild Animals ▪ Avoid phyisical contact with wild animals ▪ Do not threaten and/or conrner animals ▪ Make noise to get the animal to retreat. ▪ Stay in or return to vehicle/equipment if in danger

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3H) Contact with poisonous plants or the oil from those plants:	3H) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Do not allow plant to touch any part of your body/clothing. ▪ Wear PPE as described in the HASP and wear Tyveks, gloves and boot covers if contact with plant is likely ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
		 POISON IVY (Rhus toxicondendron L.) POISON OAK (Rhus diversiloba) POISON SUMAC (Rhus toxicondendron vernix)
	3I) Back Injuries	3I) Back Injuries ▪ Site personnel will be instructed on proper lifting techniques. ▪ Mechanical devices should be used to reduce manual handling of materials. ▪ Split heavy loads in to smaller loads ▪ Team lifting should be utilized if mechanical devices are not available. ▪ Make sure that path is clear prior to lift.
	3J) Shoveling	3J) Shoveling ▪ Select the proper shovel for the task. A long handled, flat bladed shovel is recommend for loose material ▪ Inspect the handle for splinters and/or cracks ▪ Ensure that the blade is securely attached to the handle ▪ Never be more than 15 inches from the material you are shoveling ▪ Stand with your feet about hip width for balance and keep the shovel close to your body. ▪ Bend from the knees (not the back) and tighten your stomach muscles as you lift. ▪ Avoid twisting movements. If you need to move the snow to one side reposition your feet to face the direction the snow will be going. ▪ Avoid lifting large shoveling too much at once. When lifting heavy material, pick up less to reduce the weight lifted. ▪ Pace yourself to avoid getting out of breath and becoming fatigued too soon. ▪ Be alert for signs of stress such as pain, numbness, burning and tingling. Stop immediately if you feel any of these symptoms.
	3K) Slips/Trips/Falls	3K) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; unloading areas should be on even terrain; mark or repair possible tripping hazards. ▪ Site SHSO inspect the entire work area to identify and mark hazards. ▪ Maintain three points of contact when climbing ladders or onto/off of equipment

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3L) Overhead Hazards	3L) Overhead Hazards ▪ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ▪ All ground personnel will stay clear of suspended loads. ▪ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ▪ All overhead hazards will be identified prior to commencing work operations.
	3M) Dropped Objects	3M) Dropped Objects ▪ Steel toe boots meeting ANSI Standard Z41 will be worn.
	3N) Noise	3N) Noise ▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); all equipment will be equipped with manufacturer's required mufflers. Hearing protection shall be worn by all personnel working in or near heavy equipment.
	3O) Eye Injuries	3O) Eye Injuries ▪ Safety glasses meeting ANSI Standard Z87 will be worn.
	3P) Heavy Equipment (overhead hazards, spills, struck by or against)	3P) Heavy Equipment ▪ All operators will be trained and qualified to operate equipment ▪ Equipment will have seat belts. ▪ Operators will wear seat belts when operating equipment. ▪ Do not operate equipment on grades that exceed manufacturer's recommendations. ▪ Equipment will have guards, canopies or grills to protect from flying objects. ▪ Ground personnel will stay clear of all suspended loads. ▪ Personel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. ▪ Ground personnel will wear high visibility vests ▪ Spill and absorbent materials will be readily available. ▪ Drip pans, polyethylene sheeting or other means will be used for secondary containment. ▪ Ground personnel will stay out of the swing radius of excavators. ▪ Eye contact with operators will be made before approaching equipment. ▪ Operator will acknowledge eye contact by removing his hands from the controls. ▪ Equipment will not be approached on blind sides. ▪ All equipment will be equipped with backup alarms and use spotters when significant physical movement of equipment occurs on-site, (i.e., other than in place excavation or truck loading). ▪ Inspect rigging prior to each use.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3Q) Struck by vehicle/equipment	3Q) Struck by vehicle/equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads.
	3R) Struck/cut by tools	3R) Struck/cut by tools ▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or worksurface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools**.**
	3S) Caught in/on/between	3S) Caught in/on/between ▪ Workers will not position themselves between equipment and a stationary object. ▪ Workers will not wear long hair down (place in pony-tail and tuck into shirt) or jewelry if working with tools/machinery.
	3T) Contact with Electricity/Lightning	3T) Contact with Electricity/Lighting ▪ All electrical tools and equipment will be equipped with GFCI. ▪ Electrical extension cords will be of the “Hard” or “Extra Hard” service type. ▪ All extension cords shall have a three-blade grounding plug. ▪ Personnel shall not use extension cords with damaged outer covers, exposed inner wires, or splices. ▪ Electrical cords shall not be laid across roads where vehicular traffic may damage the cord without appropriate guarding. ▪ All electrical work will be conducted by a licensed electrician. ▪ All equipment will be locked out and tagged out and rendered in a zero energy state prior to commencing any operation that may exposed workers to electrical, mechanical, hydraulic, etc. hazards. ▪ All utilities will be marked prior to excavation activities. ▪ All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead powerlines known to be 50 kV or less and 35 feet from all others.) ▪ The SHSO shall halt outdoor site operations whenever lightning is visible, outdoor work will not resume until 30 minutes after the last sighting of lightning.
	3U) Equipment failure	3U) Equipment failure ▪ All equipment will be inspected before use. If any safety problems are noted, the equipment should be tagged and removed from service until repaired or replaced.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3V) Hand & power tool usage.	3V) Hand & power tool usage ▪ Daily inspections will be performed. ▪ Ensure guards are in place and are in good condition. ▪ Remove broken or damaged tools from service. ▪ Use the tool for its intended purpose. ▪ Use in accordance with manufacturers instructions. ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ See JHA for Power Tool Use - Electrical and Power Tool Use - Gasoline
	3W) Fire Protection	3W) Fire Protection ▪ Ensure that adequate number and type of fire extinguishers are present at the site ▪ Inspect fire extinguishers on a monthly basis – document ▪ All employees who are expected to use fire exinguishers will have received training on an annual basis. ▪ Obey no-smoking policy ▪ Open fires are prohibited ▪ Maintain good housekeeping. Keep rubbish and combustibles to a minimum. ▪ Keep flammable liquids in small containers with lids closed or a safety can. ▪ When dispensing flammable liquids, do in well vented area and bond and ground containers.
	3X) Confined Space Entry	3X) Confined Space Entry ▪ See JHA for Confined Space Entry
4. Environmental health considerations	4A) Heat Stress	4A) Take precautions to prevent heat stress ▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. NOTE: The severity of the effects of a given environmental heat stress is decreased by reducing the work load, increasing the frequency and/or duration of rest periods, and by introducing measures which will protect employees from hot environments. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Allow approximately 2 weeks with progressive degrees of heat exposure and physical exertion for substantial acclimatization. ▪ Acclimatization is necessary regardless of an employee's physical condition (the better one's physical condition, the quicker the acclimatization). Tailor the work schedule to fit the climate, the physical condition of employees, and mission requirements. ▪ A reduction of work load markedly decreases total heat stress. ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.

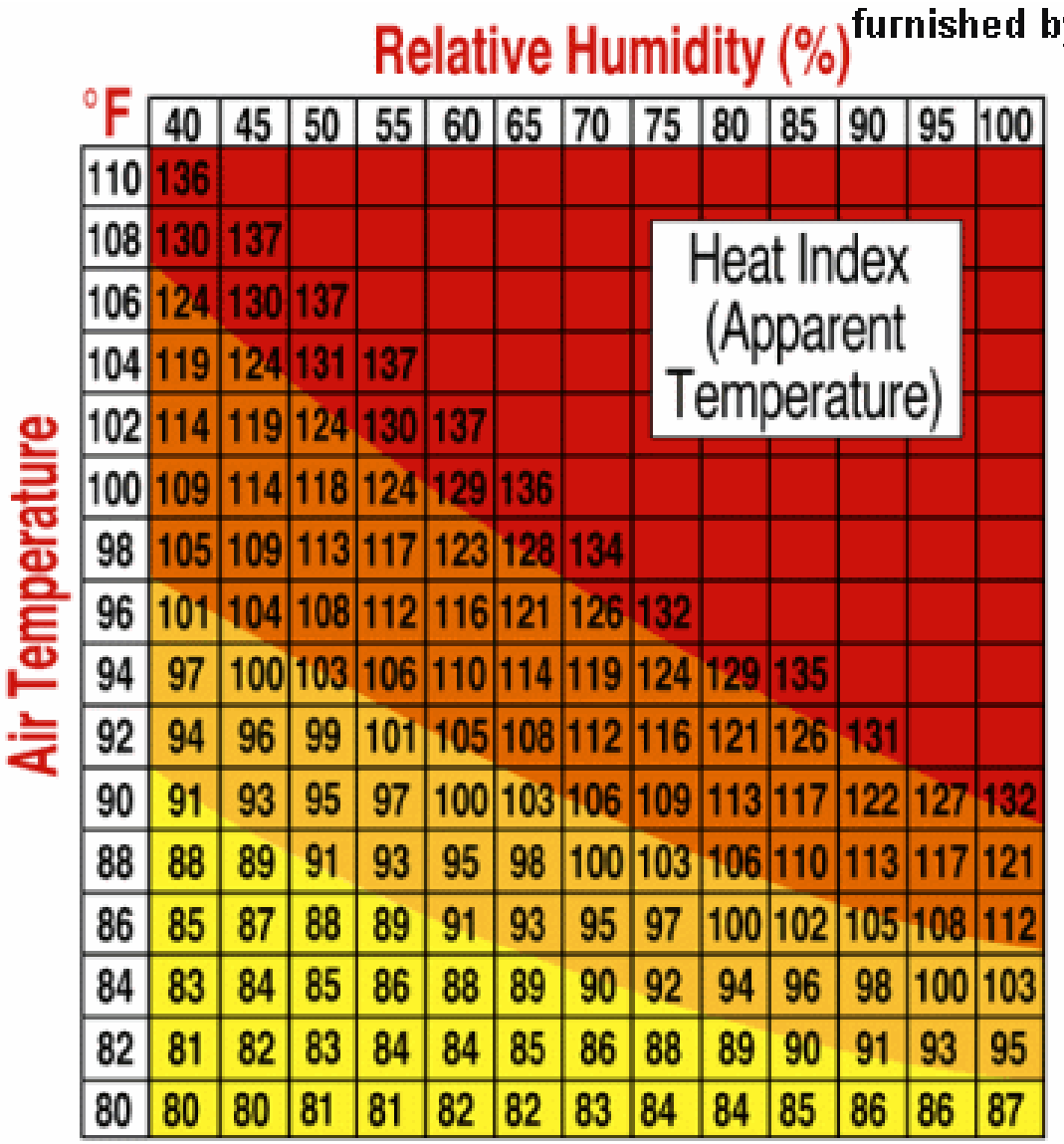
MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4B) Wet Bulb Globe Temperature (WBGT) Index	4B) WBGT ▪ Curtail or suspend physical work when conditions are extremely severe (see attached Heat Stress Index). ▪ Compute a Wet Bulb Globe Temperature Index to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed). WBGT THRESHOLD VALUES FOR INSTITUTING PREVENTIVE MEASURES 80-90 degrees F — Fatigue possible with prolonged exposure and physical activity. 90-105 degrees F — Heat exhaustion and heat stroke possible with prolonged exposure and physical activity. 105-130 degrees F — Heat exhaustion and heat stroke are likely with prolonged heat exposure and physical activity.
	4C) Cold Extremes	4C) Take precautions to prevent cold stress injuries ▪ Cover all exposed skin and be aware of frostbite. While cold air will not freeze the tissues of the lungs, slow down and use a mask or scarf to minimize the effect of cold air on air passages. ▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration.
	4D) Wind	4D) Effects of the wind ▪ Wind chill greatly affects heat loss (see attached Wind Chill Index). ▪ Avoid marking in old, defective timber, especially hardwoods, during periods of high winds due to snag hazards.
	4E) Thunderstorms	4E) Thunderstorms ▪ Monitor weather channels to determine if electrical storms are forcased. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thurnder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds. ▪ Only return to work 30 minutes after the after the last strike or sound of thunder

furnished by National Weather Service Gray, ME



With Prolonged Exposure and/or Physical Activity

Extreme Danger
Heat stroke or sunstroke highly likely
Danger
Sunstroke, muscle cramps, and/or heat exhaustion likely
Extreme Caution
Sunstroke, muscle cramps, and/or heat exhaustion possible
Caution
Fatigue possible

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Decontamination **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Establish Decontamination Station	1A) Materials Handling	1A) Materials Handling ▪ Use proper lifting techniques ▪ Use mechanical aids, if available, to move heavy items.
2. Decontamination / Steam cleaning.	2A) Struck by steam/hot water/pressure washing	2A) Struck by steam/hot water ▪ Workers not directly engaged in steam cleaning operations must stay clear. ▪ Workers using steam cleaning equipment must be trained on operation and safety devices/procedures using the owners/operators manual. ▪ Use face shield **and** safety glasses or goggles, if steam cleaning. ▪ Stay out of the splash/steam radius. ▪ Pressure washer must have dead man switch. ▪ Do not direct steam at anyone. ▪ Do not hold objects with your feet or hands. ▪ Ensure that direction of spray minimizes spread of contaminants of concern. ▪ Use shielding as necessary.
	2B) Exposure to contaminants	2B) Exposure to contaminants ▪ Conduct air monitoring (see HASP). ▪ Wear proper PPE (see HASP). ▪ See MSDSs for hazards associated with the decon solutions used (if other than water alone us used).
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
3. Vehicle Decontamination	3A) Vehicle traffic in and out of the CRZ	3A) Large Vehicle Traffic ▪ Always wear a hard hat, steel toe boots, and a high visibility vest (unless Tyveks are used and are high visibility). ▪ Vehicle drivers are not to exit the vehicle in the CRZ. ▪ Identify an individual to communicate with vehicle drivers and maintain order ▪ Trucks will be lined with plastic and kept out of direct contact with any contaminated materials during loading. Wear PPE when removing plastic lining from truck beds. ▪ If not in the vehicle, obtain eye contact with the driver, so he is aware of your presence and location in the CRZ. ▪ If you are driving the vehicle, be aware of personnel in the CRZ and maintain communication with the identified personnel.
	3B) Exposure to contaminants	3B) Exposure to contaminants ▪ Use safety glasses or goggles, Polycoated Tyvek (if level of contamination poses dermal hazard or to keep work clothes dry), high visibility vest (if high visibility Tyveks are not used) hard hats, steel toe boots, and gloves while cleaning contaminated materials. ▪ Do not doff PPE until decontamination of the vehicle is complete and a decontamination certificate has been issued by the HSO. ▪ Conduct air monitoring (see HASP). ▪ See MSDSs for hazards associated with the decon solutions (if other than water alone is used).

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Decontamination **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3C) Slips/Trips/Falls	3C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
4. Equipment and Sample Decontamination	4A) Chemical exposure when handling contaminated sample jars and equipment	4A) Chemical exposure ▪ Wear PPE as outlined in the HASP. ▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for contaminants ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.) if appropriate (see HASP)
	4B) Materials Handling related injuries	4B) Materials Handling related injuries ▪ Use proper lifting techniques when lifting heavy equipment ▪ Use two person lift for heavy coolers
5. Personal Decontamination	4C) Exposure to contaminants	4C) Exposure to contaminants ▪ Avoid bringing contaminated materials via shoes and clothing into the CRZ by examining such prior to exiting the EZ. ▪ Removal of PPE will be performed by the following tasks in the listed order: ▪ Gross boot wash and rinse and removal ▪ Outer glove removal ▪ Suit removal ▪ Respirator removal (if worn). ▪ Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Respirators will be removed and decontaminated at a specified location within the CRZ by a designated technician, then placed in storage bag. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ See MSDSs for hazards associated with the decontamination solutions used. ▪ Decon solutions will be disposed of according to the work plan.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Minimum Recommended PPE*: steel-toed boots, safety glasses, chemical resistant gloves
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization	1A) See JHA Mobilization/Demobilization/Site Preparation	1A) See JHA Mobilization/Demobilization/Site Preparation
2. General Site Hazards	2A) See JHA Field Work - General	2A) See JHA Field Work - General
	2B) Chemical exposure	2B) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
3. Calibrate monitoring equipment	3A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Opening the well cap, taking water level readings	4A) Contact with poisonous plants or the oil from poisonous plants	4A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	4B) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	4B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	4C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated groundwater/ soil); liquid splash; flammable atmospheres.	4C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Immediately monitor breathing zone after opening well to determine exposure and verify that level of PPE is adequate – see Action Levels in HASP ▪ Monitor headspace in well. After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before obtaining water level and before sampling. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	4D) Back strain due to lifting bailers or pumps and from moving equipment to well locations	4D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4E) Foot injuries from dropped equipment	4E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear Steel toed boots
5. Collecting water samples	5A) Fire/Explosion/Contamination hazard from refueling generators	5A) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	5B) Electrocution	5B) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	5C) Exposure to contaminants	5C) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	5D) Infectious water born diseases	5D) Infectious water born diseases ▪ Wear chemical resistant gloves and other PPE – as identified in HASP ▪ Prevent water from contacting skin ▪ Wash exposed skin with soap and water ASAP after sampling event ▪ Ensure that all equipment is adequately decontaminated using a 10% bleach solution
	5E) Exposure to water preservatives	5E) Exposure to water preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ When preserving samples always add acid to water, avoid the opposite. ▪ See JHA Working with Preservatives
	5F) Slips/trips/falls	5F) Slips/trips/falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums for removal ▪ Wear good slip resistant footwear
	5G) Repetitive Motion and other Ergonomic Issues	5G) Ergonomic Issues ▪ Use mechanical means where possible to raise and lower equipment into well. ▪ Alternate raising and lowering equipment between field sampling team members, and alternate bailing the well. ▪ Use safe lifting techniques.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
6. Sample Processing	6A) Contaminated water	6A) Contaminated water ▪ Wear appropriate PPE as identified in HASP ▪ Decontaminate outside of bottles ▪ Prevent water from contacting skin ▪ Work in well ventilated area – upwind of samples ▪ Waste will be returned to the operation office for storage and disposal
7. Shipping Samples	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage ▪ Wear appropriate chemical resistant gloves as identified in HASP. ▪ Wear leather or insulated gloves when handling dry ice. ▪ Follow safe lifting techniques – get help lifting heavy coolers. ▪ Samples that contain hazardous materials under the DOT definition, must be packaged, manifested and shipped by personnel that have the appropriate DOT HAZMAT training.

AHA – Soil Sampling w/ Hand Auger/Hand Tools

Activity/Work Task:	Soil Sampling w/ Hand Auger/Hand Tools		
Project Location:	**Portland, Maine**		
Contract Number:			
Date Prepared:	**12/07/2012**	**Date Accepted:**	
Prepared by (Name/Title):	Ryan Mankowski/Env.Prof. Tech 1		
Reviewed by (Name/Title):			

Notes: (Field Notes, Review Comments, etc.)

This AHA involves the following:

- Establishing site specific measures
-

This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the site HASP for additional requirements. Contractor to follow general site safety controls for Slips Trips and Falls, Biological hazards, cuts lacerations and pinch points, and emergency procedures.

Overall Risk Assessment Code (RAC) (Use highest code): **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Going to site, work preparation	1A) Mobilization / Demobilization and Site Preparation	1A) See JHA for Mobilization Demobilization and Site Preparation	**H**
2. Working at the site	2A) General Field Work – Walking and working in the field, Environmental conditions, communication	2A) See JHA for General Field Work	**L**

	2B) Working Near Utilities	2B) Working Near Utilities • See JHA for Utility Clearance Activities • See JHA for Field Work - Oversight • On private property/active facility, walk all planned locations with a appropriate representative prior to start of exploration to identify the location of marked/unmarked utilities (underground/overhead) and note any uncertainties. Field Lead should call PM and relay any issues. Document this inspection in the field book and note subcontractor's responses to any MACTEC concerns. • Coordinate with facility representatives to gain access to restricted areas. • For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet • Wear appropriate PPE • If working in close proximity to live utilities (i.e. transformers), do not tamper with the units in any way and maintain safe working distance based on voltage. • If working alone, always notify other crewmembers/project team members/facility personnel of your whereabouts. • Carry a radio and spare batteries or cell phone. • Let other crewmembers know when you see a hazard.	**M**
3. Preparing sample location	3A) Contact with poisonous plants or the oil from poisonous plants	3A) Contact with Poisonous plants or oil from poisonous plants ▪ Look for signs of poisonous plants and avoid. ▪ Wear PPE as described in the HASP. ▪ Do not touch anything part of your body/clothing. ▪ Always wash gloves before removing them ▪ Discard PPE in accordance with the HASP	**M**

	3B) Contact with biting insects (i.e., spiders, bees, etc.)	3B) Contact with biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.	**M**
	3C) Encounter wild/ dangerous animal	3C) Encounter wild/ dangerous animal • See JHA "Dog and Wildlife Safety"	**L**
	3D) Back strain due to lifting or moving equipment to sampling locations	3D) Back strain due to lifting or moving equipment to sampling locations ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques ▪ Split up heavy loads into smaller loads	**M**
	3E) Foot injuries	3E) Foot injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear steel toed boots with high tops ▪ Be observant of surroundings. Be mindful of holes and uneven terrain. Surfaces may be wet and muddy. Avoid puddles.	**L**
4. Hand Auguring/ Shoveling Test Holes	4A) Back injury from lifting and twisting equipment	4A) Back injury from lifting and twisting equipment • Use proper lifting and bending techniques. • Us 2 persons for lifting of heavy, bulky items over 50 lbs. • Use Mechanical means if available (e.g. auger jacks etc.) • Wobble auger or shovel to break suction of wet soils.	**M**

	4B) Injuries from transporting equipment to site i.e. stumbling or falling	4B) Injuries from transporting equipment to site i.e. stumbling or falling • Ensure surround are is clear of personnel and obstacles as you approach the test site. • Transport equipment in sections, beginning with equipment nearest tailgate of truck. • Use 2 person lift for heavy items • Assure pathway is clear	**M**
	4C) Injuries while adding extensions	4C) Injuries while adding extensions • Ensure that PPE is used. • Lift and connect extension with care. • Use proper lifting procedures.	**L**
	4D) Hit utilities or geo-textile membrane and contamination	4D) Hit utilities or geo-textile membrane and contamination • Locate utilities and mark. Sample in cleared area. • Use of hand tools. Be observant. Do not use excessive force. • Follow sampling work plan for location and depth.	**L**
	4E) Injury to others as equipment is removed	4E) Injury to others as equipment is removed • Assure that other are standing at a safety distance before removing equipment	**L**
	4F) Fingers injuries	4F) Fingers injuries • Assure fingers are clear as equipment is extracted - Wear PPE (gloves, eye protection, etc). • Be aware of the type of material being removed from test hole and handle appropriately	**M**
	4G) Electrocution	4G) Electrocution • A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. • Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. • Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water • Do not stand in wet areas while operating power equipment • Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. • When unplugging a cord, pull on the plug rather than the cord. • Never do repairs on electrical equipment unless you are both authorized and qualified to do so.	**M**

AHA – Soil Sampling w/ Hand Auger/Hand Tools

5. Sample Collection	5A) Exposure to contaminants	5A) Exposure to Contaminants ▪ Stand up wind when sampling and do not breathe dust (if conditions are dusty) ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Continually monitor soil samples for low level radiation. ▪ Wear chemical resistant PPE as identified in HASP / JHA ▪ Minimize sample contact ▪ Label sample in accordance with procedures	**H**
	5B) Exposure to preservatives	5B) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP / JHA. ▪ Review MSDSs	**H**
	5C) Slips/trips/falls	5C) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear	**H**
	5D) Vapors and Airborne Particulates	5D) Vapors and Airborne Particulates ▪ Monitor air concentrations using direct-reading, real-time instruments (See HASP for required monitoring instruments and action limits) ▪ If hazardous conditions are identified, stop work until precautions are taken ▪ Wear appropriate PPE including safety glasses with side shields, dust masks and respirators (See HASP)	**M**
	5E) Lifting Injury	5E) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples	**M**
	5F) Eye injury	5F) Eye Injury ▪ Wear eye protection during operation of Geoprobe or if misc. debris may harm your eyes.	**L**
	5G) Fire	5G) Have an A-B-C rated fire extinguisher on hand in case of small equipment fires. Only individuals trained in fire extinguisher use should use a fire extinguisher.	**L**

	5H) Sharp Sampling Tools	5H) Sharp Sampling Tools • Use correct tools for opening sleeves • When opening sleeve, cut away from body • Place soil core on sturdy surface prior to cutting	**L**
	5I) Sample Cross Contamination	5I) Sample Cross Contamination ▪ Decontaminate or dispose of sampling equipment between sampling locations ▪ Double-check sample labels to ensure accuracy and adhesion to containers	**M**
6. Disposal of leftover soil	6A) Contamination from impacted soil	6A) Properly dispose of any leftover soil sample ▪ Consult the Project Manager for proper disposal of soil. ▪ Don proper PPE when handling sample cores and disposing of soils. ▪ If soils are placed in a container (i.e. drum) properly label the drum.	**L**
7. Backfill Borehole.	7A) Contamination from impacted soil and/or groundwater	7A) Minimize contact with potentially impacted soil and/or groundwater ▪ Don proper PPE when backfilling the borehole. ▪ If the borehole is located in a paved area (i.e. asphalt/concrete), carefully patch the borehole using proper patching materials.	**L**
8. Solid/Liquid Waste Management/ Disposal	8A) Contaminated Materials and Container Pinch Points	8A) Contaminated Materials and Container Pinch Points ▪ Wear appropriate PPE including Nitrile and leather gloves (See HASP) ▪ Position hands/fingers to avoid pinching/smashing/crushing when closing drum rings	**L**
	8B) Heavy Materials and Containers Lifting/ Moving	8B) Contaminated Materials and Container Pinch Points ▪ Do not lift or move heavy containers without assistance ▪ Use proper bending/lifting techniques by lifting with arms and legs and not with back ▪ If possible, use powered lift truck, drum cart, or other mechanical means Take breaks if feeling faint or overexerted ▪ Spot drums in storage area prior to filling ▪ Wear appropriate PPE including leather gloves and steel-toed boots	**M**
9. Demobilize	9A) See Mobilization/ Demobilization and Site Preparation JHA	9A) See Mobilization/ Demobilization and Site Preparation JHA	**H**

AHA – Soil Sampling w/ Hand Auger/Hand Tools

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
PPE (Hard Hat, safety glasses, gloves, steel toe work boots, high visibility safety vest, hearing protection)	**Competent / Qualified Personnel:** Name – Position/Employer **Training requirements:** List specific certification (as applicable) Site Specific HASP Orientation Toolbox safety meeting Task kick-off meeting	Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. Inspect power cord sets prior to use. Inspect all PPE prior to use

Job Hazard Analysis Form

Job Title: Field Work - Oversight **Date of Analysis:** 4/13/10
Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for site visit	1A) N/A	▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Complete site specific/ client required training ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ First aid kits shall be available at the work site and on each transport vehicle. ▪ Familiarize yourself with route to the site ▪ Check weather forecast. Pack appropriate clothing and other items (e.g., sunscreen) for anticipated weather conditions ▪ Verify that subsurface utilities have been identified.
2. Traveling to the site by vehicle	2A) See JHA for Mobilization, Demobilization and Site Preparation	▪ See JHA for Mobilization, Demobilization and Site Preparation
3. Initial Arrival - Assess Site Conditions	3A) Communication with subcontractor and other site personnel	▪ Develop communication methods (agree on hand signals, warning alarms) ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the whereabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Hold and document Safety tailgate meetings ▪ Establish work zones, evacuation routes and rally locations.
	3B) Insect Bites and Stings	▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects. ▪ Inform crew members if allergic to insects and what to do if you need assistance. ▪ Avoid wearing heavy fragrances. ▪ Carry first-aid and sting relief kits. ▪ Carry identification of known allergies and necessary emergency medication. ▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails.

	3C) Poisonous plants	▪ Wear long sleeves, long pants and boots ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with high visibility spray paint if working at a fixed location. ▪ Look for signs of poisonous plants and demark area to aid in avoiding plant. ▪ Do not touch any plant part to any part of your body/clothing. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	3D) Vermin, leaches, animal borne disease	▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Wear long sleeve shirt and full length pants ▪ Be aware of your surroundings. ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas if possible ▪ Do not put hand/arm into/under an area that you cannot see into/under clearly ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers.
	3E) Chemical Hazards	▪ Wear chemical resistant PPE as identified in the HASP ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labeled
	3F) Overhead Power Lines	▪ Identify the location of all overhead power lines at the site. ▪ Maintain clearances depending on voltage - All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV or less). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead power lines known to be 50 kV or less and 35 feet from all others.) ▪ Re-locate work so it is not close to power lines ▪ Avoid storing materials under overhead power lines
	3G) Underground Utilities	▪ All utilities will be marked prior to excavation activities ▪ For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet ▪ Use lineman's gloves when locating underground power lines ▪ Work at adequate offsets from utility locations ▪ Immediately cease work if unknown utility markings are discovered.

	3H) Cold Stress	▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration. ▪ Be aware of signs of hypothermia, its prevention, detection and treatment. ▪ Have extra protection available, in case of an emergency such as blankets and heating devices. ▪ Don't work under extremely adverse weather conditions ▪ Stay in tune to current weather and extended forecasts.
	3I) Heat Stress	▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.
	3J) Lightning and Thunder	▪ Monitor weather channels to determine if electrical storms are forecasted. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thunder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds.
	3K) Severe Weather	▪ Watch for clouds and incoming weather. ▪ Monitor weather forecasts. ▪ Train workers about weather and appropriate precautions. ▪ Identify a shelter and a safe place in event of tornado etc
	3L) Sun	▪ Keep body protected ▪ Wear sunscreen, wide brimmed hat or hardhat. ▪ Schedule work for cool part of day. ▪ Take breaks in the shade.
	3M) High Crime Areas	▪ Do not enter areas where threats are present. ▪ Contract security where applicable. Use the buddy system. ▪ Maintain contact with support such as radio or cell phone ▪ Do not work after dark.

	3N) Operations conducted at an active facility	▪ Stay well clear of operations being conducted at the facility ▪ Keep alert for moving materials, equipment or vehicles ▪ Determine client specific PPE needs prior to arriving at the site ▪ Determine client specific emergency response procedures and follow as appropriate ▪ Participate in client required safety training ▪ Get copies of Clients MSDSs for any client chemicals that workers may be exposed to. ▪ Provide MSDSs to client for all chemicals brought to the site.
	3O) Remote Locations	▪ Carry a two-way radio and know how to use it. ▪ Work in teams. Account for all at the end of the work day. ▪ Make sure someone on crew is certified in first aid. ▪ Carry a first aid kit.
	3P) Set up Decon Station	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
4. Walk around the Site	4A) Poisonous plants	▪ See section 3C above
	4B) Vermin, leaches, animal borne disease	▪ See Section 3 D above ▪
	4C) Chemical Hazards	▪ See Section 3 E above
	4D) Slips/Trips/Falls	▪ Wear slip resistant footwear preferably laced boots with a minimum 8" high upper and non-skid soles for ankle support and traction. ▪ Pay attention to where you place your feet ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Site SHSO will inspect the entire work area to identify and mark hazards. ▪ Clear area of trip hazards; mark or barricade those that cannot be moved; ▪ Use caution when walking around excavated areas ▪ Stay back at least 5 feet from excavated areas ▪ Use caution when walking on or around loose soil. ▪ Be aware of surroundings. Avoid muddy areas if possible.

5. Oversight during drilling, or construction operations	5A) Heavy Equipment/ Vehicles	▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the swing radius and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Personnel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. Ground personnel will stay clear of all suspended loads. ▪ Ground personnel will wear high visibility vests ▪ Eye contact with operators will be made before approaching equipment.
	5B) Eye Injury	▪ Wear appropriate safety glasses (tinted for sun). ▪ Watch where you walk, especially around trees and brush with protruding limbs.
	5C) Foot Injury	▪ Wear steel toed boots ▪ Wear insulated steel toed boots during winter ▪ Ensure shoes/boots have good traction ▪ Pay attention to where you place your feet, especially when walking on uneven terrain
	5D) Head Injury	▪ Wear hardhat ▪ Do not walk or work under scaffolding or other elevated work unless there are guardrails and toeboards in place ▪ Flag or mark protruding objects at head level
	5E) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco.
	5F) Dust - particulates (respiratory)	▪ Use dust suppression methods ▪ Stand upwind of point of dust generation
	5G) Overhead Power Lines	▪ See Section 3F above.
	5H) Underground Utilities	▪ See Section 3G above
	5I) Standing/Static Posture	▪ Change posture on a frequent basis ▪ Stretch prior to any physical activity
	5J) Slips/`Trips/Falls	▪ See Section 4D above
	5K) Noise	▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs). ▪ All equipment will be equipped with manufacturer's required mufflers. ▪ Hearing protection shall be worn by all personnel working in or near heavy equipment. ▪ Hearing protection will be worn when workers need to shout when standing two feet away from each other. ▪ Segregate noisy equipment from the operators ▪ Use sound dampening around noisy equipment

	5L) Moving Equipment	▪ Clear area of obstructions and communicate with all workers involved that drilling is beginning ▪ Do not exceed manufacturer's recommended speed, force, torque, or other specifications. and penetrate the ground slowly with hands on the controls for at least the first foot of soil to minimize chance of auger kick-out ▪ Stay clear of rotating auger ▪ Use long-handled shovel to clear away cuttings when auger has stopped ▪ Do not wear loose clothing ▪ Wear appropriate PPE including leather gloves and steel-toed boots (See HASP)
6. Sampling Oversight	6A) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco. ▪ Calibrate meters in a clean, well ventilated area ▪ Store calibration gases in well vented area. Ensure chemical labels and warnings are legible.
	6B) Personnel Decontamination	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
	6C) Lifting	▪ Good lifting techniques (lift with legs not back) ▪ Mechanical devices (e.g., hand truck, cart, forklift, etc.) should be used to reduce manual handling of materials and drums. ▪ Team lifting should be utilized if mechanical devices are not available. (mandatory for items over 50 lbs) ▪ Split heavy loads in to smaller loads ▪ Make sure that path is clear prior to lift. ▪ Redesign work area to avoid low lifts ▪ Stretch prior to lifting ▪ Maintain a healthy life style and level of physical fitness.
	6D) Hand Tools	▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools. ▪ Daily inspections will be performed. ▪ Remove broken or damaged tools from service and tag out as defective ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ Do not use excessive force or impact ▪ Do not use tool improperly. Ensure all workers are trained

	6E) Slips/Trips/Falls	▪ See Section 4D above.
	6F) Struck by Vehicle	▪ Ground personnel in the vicinity of vehicles operations will be within the view of the operator at all times. ▪ Ground personnel will not stand directly behind vehicles when it is in operation ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads. ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary ▪ Place cones in the font and rear of the vehicle ▪ Prior to driving off, walk around vehicle to collect cones and identify any hazards - especially low level hazards that may be difficult to see when in the vehicle. ▪ Set up "Workers in the Road" or similar warning signs and cones to alert traffic. ▪ Use emergency flashers and roof top flashing light (recommended) to alert oncoming vehicular traffic. ▪ Remain alert at all times as to the traffic outside the vehicle. Step to the side of the road when distracted by by-standers. Keep unofficial personnel out of the work area. ▪ Exit vehicle with caution. ▪ Wear High Visibility Vest when outside the vehicle. ▪ Utilize vehicle as a shield from oncoming traffic, as practical
7. IDW pickup oversight	7A) Foot Injury	▪ See Section 5C above.
	7B) Chemical Hazards	▪ See Section 3E above.
	7C) Lifting	▪ See Section 6C above.
	7D) Slips/Trips/Falls	▪ See Section 4D above
8. Return to office/home	8A) See Mobilization/ Demobilization and Site Preparation JHA	**See Mobilization/ Demobilization and Site Preparation JHA**

AHA - Geoprobe Investigation – Oversight and Sample Collection ONLY

Activity/Work Task:	Geoprobe Investigation – Oversight and Sample Collection ONLY		
Project Location:			
Contract Number:			
Date Prepared:	8/29/2011	**Date Accepted:**	**5/3/2013**
Prepared by (Name/Title):			
Reviewed by (Name/Title):	Kendra Bavor, CSP		

Overall Risk Assessment Code (RAC) (Use highest code) **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

This AHA involves the following:

- Establishing site specific measures
-

This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the site HASP for additional requirements. Contractor to follow general site safety controls for Slips Trips and Falls, Biological hazards, cuts lacerations and pinch points, and emergency procedures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Subcontractor Drive Geoprobe onto site	1A) Malfunction of vehicle/equipment	1A) Drivers shall perform a pre-operational check of equipment, read and be familiar with any operator's manual. ▪ Report all needed repairs promptly. ▪ Operators shall not use defective/unsafe equipment.	**L**

	1B) Wreck of Geoprobe while being driven	1B) Wreck of Geoprobe while being driven ▪ All drivers shall be properly licensed. ▪ Supervisors shall verify that drivers are capable and qualified on each type of equipment before allowing the equipment to be used unsupervised. ▪ Keep wind shields, windshield wipers, side mirrors and side windows clean ▪ Drivers shall conduct a pre-operation vehicle safety check ▪ Drivers shall plan ahead to minimize or eliminate the need for backing. Always check to the rear before backing and use an observer when available. If an observer is not available, the driver shall walk around the vehicle to make sure rear is clear prior to backing. ▪ Seat belts shall be worn when driving by driver and passengers. ▪ Choose the safest location possible to park equipment. Avoid parking in blind spots of other equipment. ▪ Adjust vehicle speed for load and weather. Tire chains should be utilized as dictated by weather conditions. ▪ When operating a vehicle off the roadway, be aware of possible hidden objects in the grass and unstable terrain. ▪ Never allow anyone between truck and trailer when backing to hook trailer ▪ Perform periodic checks of equipment on long trips to assure the load is secure. ▪ Do not leave equipment unattended with the engine running. Shut off engine and set the parking brake when equipment is not in use.	**L**
2. Loading/unloading of equipment	2A) Crush and pinch points created when loading/unloading equipment 2B) Heavy lifting, twisting, bending 2C) Slip, trips and falls	2A) Crush and pinch points created when loading/unloading equipment ▪ Be aware of crushing and pinching hazards when loading, unloading and fastening down equipment. ▪ Make sure cargo is properly loaded and secured. ▪ Wear protective equipment consistent with the hazard (hard hats, safety glasses, leather gloves, safety shoes, etc.) 2B) Size up the load, utilize help for heavy items, split loads as necessary. Use proper body mechanics and ergonomic techniques. 2C) Keep walking area clear. Proper housekeeping.	**M**

3. Geoprobe operation by Subcontractor	3A) Vehicle movement/ unstable 3B) Crushing injuries, pinch points, entanglement and flying particles, 3C) Noise 3D) slip trips and falls, 3E) material under stress, equipment limitations, rope or cable blocks, hydraulic leaks 3F) utility lines, 3G) overhead loads, 3H) lifting 3I) Chemical exposure	Geoprobe operation by the Subcontractor. Read Owner's Manual. 3A) Always apply the parking brake and shut off engine before exiting the vehicle. • Ensure back up alarm is operational. • Complete a visual inspection of the equipment prior to operation. Replace or repair equipment if necessary. Complete a checklist to document inspections and corrective actions required. • Keep body parts clear of probe foot. • Be familiar with Emergency kill switch and controls. Test prior to probing. • When on sloped surface position the unit parallel to the slope with the control on the up hill side. • Use caution on soft or loose surface. Be aware of the weight of loaded vehicle. • Be aware of weather and windy conditions. Do not operate during lighting storm or high winds. 3B) Heed all Caution, Warning or Danger decals on machine. • Ensure everyone is clear of moving parts. • Designate only one experienced operator to avoid unexpected engagement. • Operate only from the control side. Do not reach across operating probe. • Avoid placing your hands on top of the tool string when raising/lowering the hammer or swinging/ folding probe assembly. • DO not wear loose clothing. Tie back hair when operating equipment. • PPE – safety shoes, hard hat, safety glasses, hearing protection, gloves. Optional Tyvek or coveralls. 3C) PPE – hearing protection. 3D) Maintain an orderly and clean site. • Housekeeping. • Barricade or establish work zones to minimize unauthorized entry. • Adequate lighting 3E) Know the capacities, equipment limitations and acceptable operating loads. Follow the equipment operator's manual and proper maintenance requirements. • Stand clear of potential release of energy. Keep body part clear of moving parts. • Use the correct tool for the job. • Limit the rate of the hammer lowering while advancing the tool string to avoid raising the probe foot more than 6 inches off the ground surface. • In the event problem or binding, the operator should release all control levers to neutral. • Inspect hydraulic lines. Repair or replace damaged hoses. 3F) Be aware of surroundings. Establish safe "dig" zones. Contact Dig Safe or "one call" system to mark underground utilities or tanks. • Before moving onto a site, evaluate height restrictions due to overhead utilities and vegetation. • Borings to be located a minimum of 10 feet from overhead lines. • Do not drive the machine with the mast extended.	**M**

		3G) Remain alert. Establish work zone to minimize workers under overhead loads. Avoid sudden jerks or overloading. Check load for balance and appropriate support prior to hoisting. 3H) Use mechanical means to lift heavy loads and removing rod. Don appropriate PPE for chemicals of concern. Work from upwind. Be aware or combustion fumes if equipment has auxiliary power. Practice good hygiene by washing hands, and no eating/smoking within the exclusion zone.	**L**
4. Operational area	4A) adverse weather conditions (temperature extremes), 4B) uneven terrain, 4C) poisonous plants/snakes/insects hazards	4A) Keep a weather eye. Monitor the weather forecast and actual conditions. • Wear appropriate clothing that does not restrict, cause over heat or is too loose. • Be aware of muddy conditions or puddles. 4B) Be aware of drop-offs, uneven ground and potential hidden objects which may cause loss of control when maneuvering rigs or create unstable drill set-ups. In heavily wooded area, scout to locate hidden objects. Use care when walking. 4C) Be aware of poisonous plants, insects, snakes, animals and animal waste products and carcasses. Wear long sleeve shirts, gloves, and high top boots when hazards cannot be avoided. Proper first aid supplies, insect repellents shall accompany field crews.	**M**
	4D) Contaminated soils, buried power or gas lines, landfills and containment of spills	4D) Contaminated soils, buried power or gas lines, landfills and containment of spills ▪ During drilling operations, always be aware of the possibility of encountering potentially hazardous materials, such as petroleum hydrocarbons, herbicides, pesticides, chemical manufacturing by-products or solid waste materials. ▪ In the event that any unknown or questionable materials are encountered, then the drilling operations are to be suspended immediately until further instructions are received from supervision. ▪ Do not handle any suspected contaminated materials unless trained to do so and proper protective methods are followed. ▪ During drilling operations, always be aware of the possibility of striking an un-located or improperly located gas or power line. ▪ In the event a buried utility line is struck, drilling operations are to be suspended **immediately**. - If the utility line is electric, keep personnel at least 10 feet from all metal surfaces connected with the drill rig. - If the utility is gas, then the area is to be evacuated and secured. Immediate notification to the utility company is MANDATORY. ▪ In the event of a gas or oil spill, the proper authorities are to be contacted immediately so that containment operations can be implemented.	**M**
5. Subcontractor Mixing grout on site and filling/placing in hole between the well pipe and bore hole wall	5A) Lifting 5B) Chemical exposure	5A) Size the load of materials to be moved and utilize appropriate help for lifting and moving. Use proper ergonomic and body mechanics to move materials (bags of grout, etc.). Use mechanical mixer for large quantities of grout. 5B) PPE – Safety glasses, safety shoes, gloves, optional tyvek/coveralls.	**M**
6. Subcontractor cutting soil acetate sleeve open to sample soil	6A) cutting of hand with a razor blade	6A) MACTEC personnel must let the subcontractor cut the sample liners as they have the appropriate tools to do so. 6B) Subcontractor must be aware of where hands are placed prior and during cutting with hand saw	**M**
7. Subcontractor driving drilling rig offsite.	7A) Reference item # 1	7A) Reference item #1.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
PPE (Hard Hat, safety glasses, gloves, steel toe work boots, high visibility safety vest, hearing protection)	**Competent / Qualified Personnel:** Name – Position/Employer **Training requirements:** List specific certification (as applicable) Site Specific HASP Orientation Toolbox safety meeting Task kick-off meeting	Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. Inspect power cord sets prior to use. Inspect all PPE prior to use

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Wetland and Fish Surveys **Date of Analysis:** 5/30/06

Minimum Recommended PPE*:
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Walking to and from stream or wetland	1A) Insect bites/stings	2A) Insect bites/stings ▪ Avoid wearing heavy fragrances. ▪ Carry first-aid and sting relief kits. ▪ Make sure all crew members are informed about others who are allergic and what to do if they need assistance. ▪ Carry necessary emergency medication. ▪ See JHA Insect Bites and Stings
	1B) Slips and falls	2B) Slips and falls ▪ Use traction devices on shoes. ▪ Move slowly, take your time. ▪ Use a walking staff to provide a three point support.
	1C) Eye injuries	2C) Eye injuries ▪ Travel with care through heavy brush. ▪ Use eye protection in brushy areas.
	1D) Scrapes and punctures	2D) Scrapes and punctures ▪ Wear proper clothing, long sleeved shirts and pants. No shorts.
	1E) Cuts/Lacerations due to machette use	2E) Cuts/Lacerations due to machette use ▪ Wear chaps or snake legs ▪ Cut away from the body ▪ Ensure blade of machette is sharp
	1F) Blow-down / heavy debris	2F) Blow-down / heavy debris ▪ Be aware of your surroundings, including hanging or leaning debris that may be dislodged and fall.
	1G) Animal encounters	2G) Animal encounters ▪ Moose: a. Make noise to avoid encounter. b. If you do encounter a moose, put a lot of room between you and the animal by walking around him/her if necessary. c. Do not look it in the eye. d. If charged, run away or climb a tree. e. Throwing something or shouting may deter an attack.
	1H) Severe injury in remote locations	2H) Severe injury in remote locations ▪ Carry a two-way radio and know how to use it. ▪ Work in teams. ▪ Make sure someone on crew is certified in first aid. ▪ Carry a first aid kit.
2. Entering Stream	3A) Slips and falls	3A) Slips and falls ▪ Use traction devices on shoes and waders. ▪ Move slowly, take your time. ▪ Use a walking staff to provide a three point support.
	3B) Sand or Mud – knee or ankle injury	3B) Sand or Mud ▪ Use shorter steps ▪ Use walking sticks to check firmness of soils ▪ Use buddy system ▪ Snowshoes that dissipate weight may be effective ▪ If leg gets caught, use slight back and forth motion to soften mud and remove slowly. Don't try to pull leg out with twisting or jerking motion. ▪ If possible, aeriate or bubble the mud to help releave suction.

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Wetland and Fish Surveys **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3C) Equipment	3C) Equipment ▪ Secure packs and hip waders with quick release straps and be ready to discard, if an emergency arises. ▪ Do not work in waders in water greater than 3 feet deep or in swift water. ▪ Wear bike or rafting helmets to protect from blows to the head.
	3D) Hypothermia	3D) Hypothermia ▪ Work in teams of two. ▪ Have warming devices available. ▪ Wear proper equipment that is in good condition. ▪ Be aware of signs of hypothermia, it's prevention, detection and treatment. ▪ Stay in tune to current weather and extended forecasts. ▪ See JHA General Field Work
	3E) High flow velocity	3E) High flow velocity ▪ Evaluate a stream before entering. ▪ Follow the "rule of 10" a. If stream is 1 foot deep and flowing @10 ft./sec, it is too hazardous to wade b. If stream is 2 feet deep and flowing at 5 ft./second, it is too hazardous to wade. c. If you do enter a stream and discover it is too dangerous to wade, back out using your wading pole for balance.
	3F) Severe weather	3F) Severe weather ▪ Suspend measurements during lightning storms or when a storm is approaching.
3. Entering Wetland	3A) Slips and falls	3A) Slips and falls • Use traction devices on shoes and boots. • Move slowly, take your time. • Use a walking staff to provide a three point support.
	3B) Sand or Mud – knee or ankle injury	3B) Sand or Mud ▪ Use shorter steps ▪ Use walking sticks to check firmness of soils ▪ Use buddy system ▪ Snowshoes that dissipate weight may be effective ▪ If leg gets caught, use slight back and forth motion to soften mud and remove slowly. Don't try to pull leg out with twisting or jerking motion. ▪ If possible, aeriate or bubble the mud to help releave suction.
	3C) Equipment	3C) Equipment ▪ Secure packs and boots with quick release straps and be ready to discard, if an emergency arises. ▪ Wear hard hat to protect from blows to the head if using an auger. ▪ Wear steel toe boots to protect feet from dropping equipment (auger)

MACTEC

Job Hazard Analysis - Short Form HASP

Job Title: Wetland and Fish Surveys **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3D) Temperature extremes (hot or cold)	3D) Hypothermia ▪ Work in teams of two. ▪ Have warming devices available. ▪ Wear proper equipment that is in good condition. ▪ Be aware of signs of hypothermia and/or heat stroke, it's prevention, detection and treatment. ▪ Stay in tune to current weather and extended forecasts. ▪ See JHA General Field Work
	3E) Severe weather	3E) Severe weather ▪ Suspend measurements during lightning storms or when a storm is approaching.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Insect Stings and Bites **Date of Analysis:** 4/20/06

Minimum Recommended PPE*: Long sleeved shirt and pants, light colored clothing
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Traveling/working in areas with potential Tick Bites –Example outdoor wooded areas or fields.	1. Lyme Disease, Rocky Mountain Spotted Fever, etc.	▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Each outer garment should overlap the one above it. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails. ▪ Search the body on a regular basis, especially hair and clothing; ticks generally do not attach for the first couple of hours. ▪ If a tick becomes attached, pull it by grasping it as close as possible to the point of attachment and pull straight out with gentle pressure. Wash skin with soap and water then cleanse with rubbing alcohol. Place the tick in an empty container for later identification, if the victim should have a reaction. Record dates of exposure and removal. ▪ Do not try to remove the tick by burning with a match or covering it with chemical agents. ▪ If you can not remove the tick, or the head detaches, seek propmt medical help. ▪ Watch for warning signs of illness: a large red spot on the bite area; fever, chills, headache, joint and muscle ache, significant fatigue, and facial paralysis are reactions that may appear within two weeks of the attack. Symptoms specific to Lyme disease include: confusion, short-term memory loss, and disorientation.
2. Working/traveling in areas with potential bee and wasp stings-Example wooded areas and fields	2. Allergic reactions, painful stings	▪ Be alert to hives in brush or in hollow logs. Watch for insects travelling in and out of one location. ▪ If you or anyone you are working with is known to have allergic reactions to bee stings, tell the rest of the crew and your supervisor. Make sure you carry emergency medication with you at all times. ▪ Wear long sleeve shirts and trousers; tuck in shirt.. Bright colors and metal objects may attract bees. ▪ If you are stung, cold compresses may bring relief. ▪ If a stinger is left behind, scrape it off the skin. Do not use a tweezers as this squeezes the venom sack, worsening the injury. ▪ If the victim develops hives, asthmatic breathing, tissue swelling, or a drop in blood pressure, seek medical help immediately. Give victim antihistime, (Benadryl, chlo-amine tabs).
3. Traveling/working in areas of potential Mosquito Bites-Example- Woods, fields, near bodies of water and etc.	3. Skin irritation, encephalitis	▪ Wear long sleeves and trousers. ▪ Avoid heavy scents. ▪ Use insect repellants. If using DEET, do not apply directly to skin, apply to clothing only. ▪ Carry after-bite medication to reduce skin irritation.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Working with Preservatives (Acids) **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: Safety glasses/goggles, nitrile gloves,
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Opening the box of ampoules	1A) Cuts or punctures with a knife	1A) Cuts or punctures with a knife ▪ Use appropriate techniques when handling a knife. Always cut away from you.
	1B) Broken ampoules in the box. Cuts from the broken glass.	1B) Broken ampoules in the box. Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Dispose of the preservative and broken glass by approved methods.
	1C) Broken ampoules in the box. Breathing fumes.	1C) Broken ampoules in the box. Breathing fumes. ▪ Wear safety goggles and protective gloves. ▪ Always work in a well-ventilated area.
2. Breaking top of glass ampoule	2A) Cuts from the broken glass.	2A) Cuts from the broken glass ▪ Wear safety goggles and protective gloves. ▪ Use a paper towel to wrap ampoule in to snap the top or use an ampoule breaker. ▪ Always point the ampoule away from you when you snap off the top.
	2B) Skin contact chemical burns.	2B) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves. ▪ Fumes may come into contact with the perspiration on your skin and rehydrate to form an acid. ▪ If your skin itches, flush affected area for 15 minutes with water.
	2C) Eye contact	2C) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	2D) Breathing fumes	2D) Breathing fumes ▪ HNO_3 and HCL have high vapor pressure. Always work in a well-ventilated area.
3. Adding acid to sample	3A) Chemical reaction	3A) Chemical reaction ▪ Wear safety goggles and protective gloves. Acid may react with high alkaline sample and fizz (releases CO_2).
	3B) Eye contact	3B) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	3C) Skin contact chemical burns.	3C) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves.
4. Ampoule disposal	4A) Cuts from the broken glass.	4A) Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Place used ampoules in an empty, non-reactive container in the field and bring it back to the office. Dispose of the preservative and broken glass by approved methods.

AHA - Surface Water and Sediment Sampling from a Boat
Activity Description

Activity/Work Task:	Boating- Surface water and sediment collection		
Project Location:			
Contract Number:	**Project #**		
Date Prepared:	**9/20/12**	**Date Accepted:**	**3-7-13**
Prepared by (Name/Title):	Tige Cunningham/Project Scientist		
Reviewed by (Name/Title):	Kendra Bavor - CSP		

Overall Risk Assessment Code (RAC) (Use highest code): **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

This AHA involves the following:

- Establishing site specific measures
- Collecting samples from a boat
- The **Safe Boating Checklist** and a **Float Plan** must be filled out prior to use of a boat
- See Appendix F of the HASP for the Boating Safety and Personal Floatation Device Selection Guide

This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the site HASP for additional requirements. Contractor to follow general site safety controls for Slips Trips and Falls, Biological hazards, cuts lacerations and pinch points, and emergency procedures.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
1. Prepare for site visit	1A) Slips, trips, falls	1A) Slips, trips, falls ▪ Familiarize self with site prior to visit. ▪ Complete appropriate training before going on site. ▪ Provide appropriate person in district office your itinerary. ▪ Prepare listing of emergency phone numbers, both on and offsite. ▪ Identify site/activity PPE needs ▪ Ensure that First Aid training is current, and that tetanus booster are current	**L**
2. Check and calibrate sampling equipment.	2A) Muscle Strain - lifting, twisting, tugging	2A) Muscle Strain - lifting, twisting, tugging ▪ Inspect all PPE and equipment and ensure that it is working properly. ▪ Get assistance from a coworker or use mechanical means to move equipment (dolly, cart, etc.)	

	2B) Slips, trips and falls	2B) Slips, trips, and falls ▪ Wear proper footwear ▪ Pay attention to where walking	
3. Load/carry equipment to the site.	3A) Slips, trips, falls	3A) Slips, trips, falls ▪ See AHA for Mobilization / Demobilization and Site Preparation	**M**
	3B) Muscle Strain - lifting, twisting, tugging	3B) Muscle Strain - lifting, twisting, tugging ▪ Proper lifting, posture, ergonomic practices and body mechanics. ▪ Share the load, move items in smaller shifts, or use cart. ▪ Loading the boat: ensure no twisting. ▪ Use a trailer if possible to launch boat. ▪ Empty boat of gear prior to loading or moving boat to/from vehicle. ▪ Ensure boat is properly secured in the vehicle prior to moving. ▪ Tie a red cloth to the furthest point of the boat if overhanging from the vehicle. ▪ Ensure enough able bodies to move and launch the boat to share the load.	
	3C) Irate property owners, pets	3C) Irate property owners, pets ▪ Call property owners in advance. ▪ Check in to introduce yourself upon arrival. ▪ Be courteous and diplomatic	
	3D) Crime	3D) Crime ▪ Do not enter areas where threats are present. ▪ Contract security where applicable. Use the buddy system. ▪ Maintain contact with support such as radio or cell phone.	
	3E) Struck by traffic – launch boat.	3E) Struck by traffic – launch boat. ▪ Wear hi visibility safety vest, use buddy system. ▪ Use traffic cones and a lookout. Launch from public boat launch facilities.	
	3F) Battery handling – acid exposure	3F) Battery handling – acid exposure ▪ Use care when handling batteries. ▪ Wear gloves and protective clothing when caring batteries. ▪ Check for leaks and damage prior to use of batteries.	

	3G) Launch and load boat: Capsize	3G) Launch and load boat: Capsize ▪ Be aware of the boat maximum weight, person capacity, and engine size limit. ▪ Balance the gear and people in the boat. ▪ Personnel must wear approved, properly sized and buckled PFD when on the water. ▪ Ensure lines and body parts are out of the water before operating engine. ▪ Avoid operation within swimming areas. ▪ Provide signal flags and communication to protect the public of your activities. ▪ Test motor prior to shoving away from the pier. ▪ Ensure all appropriate equipment is provided and accessible according to AMEC EH&S Manual – Boating Safety. ▪ Include bailer, anchor, second means of propulsion, line and throwable floatation.	
	3H) Pinch points – attaching/mounting the motor	3H) Pinch points – attaching/mounting the motor ▪ Mind where hands and body parts are when moving and loading equipment.	
	3I) Fueling – chemical exposure, fumes, environmental spills.	3I) Fueling – chemical exposure, fumes, environmental spills. ▪ See AHA Gasoline	**M**
	3J) Noise – engine (optional)	3J) Noise – engine (optional) ▪ Wear hearing protection. ▪ Provide shielding from noise such as bulkhead, or sound dampening. ▪ Operate with engine box in place to dampen noise	
4. Field parameters	4A) Falling into water and capsize	4A) Falling into water and capsize ▪ Use equipment that facilitates reaching the location from a safe distance (extensions, etc.). ▪ Work using the buddy system. ▪ Wear PFD when working on the water. ▪ Balance equipment and people. ▪ Avoid leaning over the side of the boat. ▪ Anchor or secure the vessel to hold station. ▪ Steer boat to meet waves on the bow. ▪ Stay seated while in boat. ▪ If moving about, keep weight low.	
	4B) Slips trips and falls	4B) Slips trips and falls ▪ Wear appropriate footwear. ▪ Survey and clear walking area. ▪ Do not walk on slippery surfaces. ▪ Maintain good housekeeping. ▪ Provide walkways, platforms or secure walking surface. ▪ Use the buddy system and maintain communications with support staff.	

	4C) Vermin, leaches, Insect/animal born disease	4C) Vermin, leaches, Insect/animal born disease ▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Be aware of your surroundings. ▪ Wear insect netting clothing or apply insect repellant on all exposed skin surfaces as appropriate – consider sample contamination ▪ Wear long sleeve shirt and full length pants ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas if possible ▪ Tuck pants leg into boot ▪ Do not put hand/arm into/under an area that you can not see into/under clearly ▪ Do not touch any suspected contaminant without appropriate hand PPE ▪ Wash hands as soon as possible upon completion of task. ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers. ▪ Contract vermin relocation, if applicable. ▪ Remain vigilant and respectful of wildlife. (See JHA for Insects, Stings and Bites) ▪ Wear wind impervious outerwear ▪ During warm months – wear a long sleeve cotton/breathable fabric shirt and pants.	
	4D) Weather – temperature extremes, hypothermia, sun stroke, heat exhaustion, dehydration, sun burn.	4D) Weather – temperature extremes, hypothermia, sun stroke, heat exhaustion, dehydration, sun burn. ▪ Train workers about weather and appropriate precautions. ▪ Heat: Familiarize self with signs of heat related illnesses: cramps, heat rash, dehydration, heat exhaustion, and heat stroke. ▪ Sun: o Keep body protected o Wear sunscreen, wide brimmed hat or hardhat. o Drink plenty of fluids to remain hydrated. (Follow AMEC guidelines, procedures and training for fluid intake, sunscreen use, proper clothing, work schedule, etc.) o Schedule work for cool part of day. o Take breaks in the shade. ▪ Wind: o Wear layered clothing, gloves, hard hat with winter liner, etc. ▪ Cold: o During cold weather - layer clothing	

	4E) Weather – inclement and strong winds	4E) Weather – inclement and strong winds ▪ Watch for clouds and incoming weather. ▪ Monitor weather forecasts. ▪ Have a float plan and communications when on and off the water. ▪ Return to shore if weather threatens. ▪ Stay close to shore if possible and abandon work until winds subside. ▪ Schedule work when weather is calm (early morning or evening.) ▪ Provide proper lighting if working after dark.	
	4F) Run aground – shifting or unbalanced vessel - equipment/personnel/slip/ fall/overboard	4F) Run aground – shifting or unbalanced vessel - equipment/personnel/slip/ fall/overboard ▪ Operate at safe speed. ▪ Post a look out for shallow or submerge obstacles. ▪ Remain seated when under way. ▪ Be wary of tides, flooding, flash floods and dam releases. ▪ Use anchor to kedge or pull back toward the way you came and deeper water. ▪ Use a pole or paddle, lighten the vessel to float off.	**L**
5. Sample collection	5A) Same as Item #4 above.	5A) Same as Item #4 above.	
	5B) Bending, pulling, twisting	5B) Bending, pulling, twisting ▪ Use a vibrating or wiggling motion on the sample device to break the soil suction. ▪ Proper lifting technique.	
	5C) Splash	5C) Splash ▪ Wear appropriate safety glasses (tinted for sun). ▪ Be aware if sampling water through a filter, if it becomes plugged with sediment it may unexpectedly "blow off" the hose and splash. ▪ Change filter prior to sedimentation back pressure. ▪ Minimize pouring distance to limit the splash between containers.	
	5D) Chemical exposure	5D) Chemical exposure ▪ Wear PPE including protective gloves, coveralls, safety glasses as appropriate. ▪ Work upwind of the sample location. Minimize exposure using a shovel/spoon or tool to collect the sample. ▪ Review and understand MSDS for all chemicals being handled. ▪ Be careful when handling acids and caustic substances. ▪ Wear adequate PPE and wash hands after completion of task.	
	5E) Vegetation, sticks, reeds, - cuts and punctures.	5E) Vegetation, sticks, reeds, - cuts and punctures. ▪ Clear access to site. ▪ Be familiar with toxic plants such as poison ivy. ▪ Avoid such plants. ▪ Wash thoroughly after accidental contact with toxic materials and plants.	

AHA - Surface Water and Sediment Sampling from a Boat
Activity Description

6. Vessel Operations	6A) Lack of boating skills, boating incident	6A) Lack of boating skills, boating incident ▪ Complete USCG/Power Squadron or other recognized boating course. ▪ All employees must wear PFDs while underway. ▪ Maintain vessel and proper safety equipment. ▪ Carry cell phone or radio. ▪ File a float plan and work in pairs.	**M**
7. Sample preparation.	7A) Lifting heavy objects (covers, pumps, sampling equipment, coolers, etc.) Muscle strain	7A) Lifting heavy objects (covers, pumps, sampling equipment, coolers, etc.) Muscle strain ▪ Use proper ergonomics when lifting heavy objects ▪ Use appropriate mechanical assistance and tools when possible.	**M**
	7B) Chemical Exposure	7B) Chemical Exposure ▪ Wear PPE including protective gloves, coveralls, safety glasses as appropriate. ▪ Wash/wipe or decontaminate exterior of sample containers and equipment. ▪ Use care handling preservatives (acids/bases.)	
	7C) Sharps and knives	7C) Sharps and knives ▪ Use care handling tape dispensers, knives and sharp objects. ▪ Use guarded dispensers	
	7D) Extreme cold (ice preservation)	7D) Extreme cold (ice preservation) ▪ Minimize exposure to ice. ▪ Use a shovel/spoon or tool to fill bags for preserving samples in coolers.	
8. Site exit and drive home or next site.	8A) Vehicle contamination	8A) Vehicle contamination ▪ Wash hands promptly. ▪ Contaminated PPE (Booties, tyvek, latex gloves) should be disposed on-site. ▪ Remove boots and soiled clothing for secure storage in trunk; decontaminate as soon as possible. ▪ Update exposure log.	**M**
	8B) Traffic hazards.	8B) Traffic hazards. ▪ Follow AHA for Mobilization / Demobilization and Site Preparation	
		• A throwable floatation device (ring) shall also be onboard during boat operation.	
	8C). Equipment Malfunction	5C). Equipment Malfunction	
		• Take a basic tool kit aboard the boat including boat plugs, fire extinguisher, and first aid kit.	
		• Carry extra engine parts and fluids in the event of engine problems.	
		• Be alert and rid the area of any spilled gas and gas fumes before doing any work on electrical parts that may cause a spark.	
	8D). Communications	5D) Communications	
		• A two-way or marine radio shall be maintained on board the boat at all times. If in a coverage area, a cell phone can be used for a communication device.	

AHA - Surface Water and Sediment Sampling from a Boat
Activity Description

9. Collecting Samples	9A). Capsizing Boat/Falling Overboard	6). Capsizing Boat/Falling Overboard	**M**
		• Make sure a proper anchor is in the boat to stabilize the boat at the sampling location.	
		• Ensure proper distribution of the load in the boat to avoid tipping and capsizing. Standing in the boat should be minimized.	
		• An appropriate Coast Guard approved personal floatation device shall be worn by each individual on board to protect against drowning.	

AHA - Surface Water and Sediment Sampling from a Boat
Activity Description

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
PPE (work gloves, PFDs, safety glasses, gloves, steel toe work boots, high visibility safety vest) Boating first Aid kit Boating Safety Kit (flares, air horn, marine radio, cell phone, tool kit)	**Competent / Qualified Personnel:** See HASP (Name – Position/Employer) **Training requirements:** List specific certification (as applicable) Site Specific HASP Orientation Toolbox safety meeting Task kick-off meeting	Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. Full boat inspection prior to use. Inspect all PPE prior to use

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for sampling event	1A) Chemical exposure	1A) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
2. Mobilization	4A) See JHA Mobilization/Demobilization/Site Preparation	2A) See JHA Mobilization/Demobilization/Site Preparation
3. General Site Hazards	3A) See JHA Field Work - General	3A) See JHA Field Work - General
4. Carrying equipment to site location	4B) Back or muscle strain	4A) Back or muscle strain ▪ Use proper lifting techniques when lifting pumps or generators ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
5. Calibrate monitoring equipment	5A) Exposure to calibration gases	5A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
6. Preparing sampling location	6A) Contact with poisonous plants or the oil from poisonous plants	6A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Wear PPE as described in the HASP. ▪ Do not touch anything part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP.
	6B) Contact with biting insects (i.e., spiders, bees, etc.)	6B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	6C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated soil); flammable atmospheres.	6C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	6D) Back strain due to lifting or moving equipment to sampling locations	6D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	6E) Foot injuries from dropped equipment	6E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear steel toed boots
7. Collecting soil samples	7A) Working around drill rigs	7A) See JHA - Drilling
	7B) Encountering underground or overhead utilities	7B) Have all utilities located.
	7C) Fire/Explosion/Contamination hazard from refueling generators	7C) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	7D) Electrocution	7D) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	7E) Exposure to contaminants	7E) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	7F) Exposure to preservatives	7F) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ Review MSDSs
	7G) Slips/trips/falls	7G) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear
	7H) Lifting Injury	7H) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples
	7I) Eye injury	7I) Eye Injury ▪ Wear eye protection when using picks or similar devices to loosen soil
	7J) Fire	7J) Fire ▪ When using gas powered auger, maintain fire watch whenever fueling or otherwise handling gasoline ▪ See JHA - Gasoline

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
8. Soil sampling using floor corer	8A) Back injury	8A) Back Injury ▪ Use proper lifting techniques when moving floor corer and generator ▪ Use mechanincal aids if available ▪ Use two person lift for heavy items.
	8B) Electric Shock	8B) Electric Shock ▪ Use electric cords free from defects ▪ Keep cords out of water ▪ Ensure all electrical equipment is properly grounded ▪ Use GFCI
	8C) Hearing	8C) Hearing ▪ Wear hearing protection
	8D) Fire	8D) Fire ▪ When using generator, maintain fire watch whenever refueling or otherwise handling gasoline ▪ See JHA - Gasoline
	8E) Contamination	8E) Contamination ▪ Use appropriate PPE for the contaminants of concern (see HASP). ▪ Minimize sample contact ▪ Label sample in accordance with procedures ▪ Monitor breathing zone levels.

Job Hazard Analysis Form

JHA No.: JHA - Novi - ____ - ___ - ___

Job Title: Working Near Water **Date of Analysis:** _____

Job Location: _____ **Project Manager:** _____

Instructions: The Team Leader will gather the appropriate team, including subject matter experts, operators, and support personnel, to analyze the job for hazards. Using the below table or similar format, address the three phases of this process:

- **Identify Key Job Steps:** Break the job down into individual key steps where work activities are presented in sequential order.

- **Identify Job Hazards:** Create a list of known or potential hazards within each step of the job. Consider hazards associated with the various tools, equipment or other hardware involved in the job. Consider environmental hazards such as thermal stress, biohazards, etc.

- **Identify Safe Practices and Equipment:** List one or more prevention or control measures to address each hazard identified, emphasizing engineering and administrative controls over PPE. Once this has been completed, the JHA Team will determine whether the job can be performed in a manner that eliminates the identified hazards.

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Field Work Near Water	1A) Slips, trips, falls	1A) Familiarize self with site prior to visit. ▪ Complete appropriate training before going on site. ▪ Provide appropriate person in district office your itinerary. ▪ Prepare listing of emergency phone numbers, both on and offsite. ▪ Identify site/activity PPE needs. ▪ Ensure that First Aid training is current, and that tetanus booster is current. ▪ Be aware of your surroundings
	1B) Falling into water	1B) Falling into water ▪ Use equipment that facilitates reaching the location from a safe distance (extensions, etc.). ▪ Work using the buddy system. ▪ Wear PFD when working on or near the water. ▪ Avoid leaning over edge of land to water. ▪ Anchor or secure yourself to a permanent and secure structure when working near water.

	1C) Vermin, leaches, Insect/animal born disease	1C) Vermin, leaches, Insect/animal born disease ▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Be aware of your surroundings. ▪ Wear insect netting clothing or apply insect repellant on all exposed skin surfaces as appropriate – consider sample contamination. ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas along shoreline if possible. ▪ Tuck pants leg into boot. ▪ Do not put hand/arm into/under an area that you can not see into/under clearly. ▪ Do not touch any suspected contaminant without appropriate hand PPE. ▪ Wash hands as soon as possible upon completion of task. ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers. ▪ Contract vermin relocation, if applicable. ▪ Remain vigilant and respectful of wildlife. (See JHA for Insects, Stings and Bites, and JHA for Dog – Wildlife Safety. ▪ Wear wind impervious outerwear ▪ During warm months – wear a long sleeve cotton/breathable fabric shirt and pants.
	1D) Bending, pulling, twisting	1D) Bending, pulling, twisting ▪ Balance weight in the boat with other personnel and equipment. ▪ Use a vibrating or wiggling motion on the sample device to break the sediment suction. ▪ Attach recovery line to sample equipment prior to deploying equipment. ▪ Proper lifting technique. ▪ Do not lean outside the boat.

Job Hazard Analysis Form
Identify Hazards and PPE

Complete the checklists for hazard identification and PPE requirements. Information from the RA and applicable permits are included in this section.

Standard Hazards			
□ Falling Objects	X Slips and trips	□ Pinch points	□ Rotating equipment
X Falls	□ Power equipment/tools	□ Elevated work surfaces	□ _____
Eye Hazards			
□ Particulates	□ Liquid splashes	□ Welding Arc	□ _____
Hearing Hazards			
X None (optional motor)	□ Impact noise	□ High frequency noise	□ High ambient noise
Respiratory Hazards			
X None	□ Dust/particulates	□ Organic Vapors	□ Acid Gases
□ Oxygen deficient	□ Welding fumes	□ Aerosols/Particulates	□ Be, Hg, Cr, Pb
□ _____	□ Radon	□ Asbestos	□ _____
Chemical Hazards			
X None	□ Organic solvents	□ Reactive metals	□ PCBs
□ Acids / bases	□ Oxidizers	□ Volatiles / Semi-volatiles	□ _____

Completed by: _____ Date: _____

JOB HAZARD ANALYSIS FORM

Environmental Hazards			
□ None	X Temperature extremes	X Wet location	X Bio hazards (snakes, insects, spiders, bird / mouse droppings, fungus, etc.)
□ Explosive vapors	□ Confined space	□ Engulfment Hazard	□ _____
Electrical Hazards			
X None	□ Energized equipment or circuits	□ Overhead utilities □ Underground utilities □ Hidden utilities	□ Wet location
Fire Hazards			
X None	□ Cutting, welding, or grinding generated sparks or heat sources	□ Flammable materials present (Optional gasoline/diesel fuel)	□ Oxygen enriched location
Ergonomic Hazards			
X Lifting	X Bending	X Twisting	X Pulling/tugging
Computer Use in the: □ Office □ Field	X Repetitive motion	□ _____	□ _____
Radiological Hazards			
X None	□ Loose contamination	□ Fixed Contamination	□ Radiation
□ Airborne contamination	□ Radon	□ EMF	□ Criticality
□ Alpha	□ Beta	□ Gamma/X-rays	□ Neutron
□ Tritium	□ TRU	□ Depleted Uranium	□ Enriched Uranium
Other Hazards			
□			
□			
□			
□			

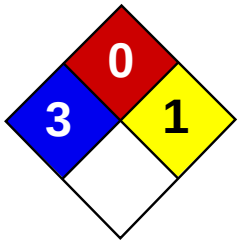
Completed by: Douglas Saigh Date: 10/07/11

Job Hazard Analysis Form

PPE and Monitoring Requirements

Standard PPE			
X Hard Hat	X Safety shoes	X Safety glasses	X Boot Covers
□ Aprons	X Rubber Boots (Optional)	X Other: PFD	X Other: Waders (shoreline)
Eye Protection			
□ Welding glasses □ Welding helmet	□ Face shield	□ Chemical goggles	□ Welding screens
Hearing Protection			
□ Ear plugs	□ Ear Muffs	□ Ear plugs and muffs	□ Other _____
Respiratory Protection			
X None	□ Dust mask	□ Full Face APR □ Half Face APR Cart. Type _____	□ PAPR Cart. Type _____
□ SCBA	□ Airline respirator	□ _____	□ _____
Protective Clothing			
X Tyvek® coveralls (optional)	□ Poly-coated Tyvek® Coveralls	□ Saranex® Coveralls	□ Fully encapsulating suit
□ Cotton coveralls	□ Modesty Clothing	□ Fire resistant clothing	X Other Rain gear
Hand Protection			
□ None	□ Cotton gloves	□ Leather gloves	□ Glove liners
X Nitrile gloves □ Viton® gloves □ Butyl gloves □ Neoprene gloves	Surgical gloves □ Latex □ Non-Latex	□ Cut-resistant gloves	□ Other _____
Monitoring Requirements			
□ Oxygen	□ Flammable gases/vapors	□ Toxic Gas/vapors	□ Hydrogen Sulfide/Carbon Monoxide
□ Asbestos	□ Full time IH coverage	□ Part time IH coverage	□ Be, Hg, Cr, Pb
□ Metals Specify: _____			
□ Organic vapors Specify: _____			
□ Radioactive air particulates	□ TLD required	□ CAM	□ Radon
□ Full time RCT coverage	□ Part time RCT coverage	□ Radioactive air particulates	□ Other _____
□ Other _____		□ Other _____	

PPE and monitoring requirements completed by: _____ Date: _____



Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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Last Updated: 11/01/2010 12:00 PM

MSDS Number: N3660 * * * * * *Effective Date: 11/18/09* * * * * *Supercedes: 11/07/08*

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670, 9761
Mallinckrodt: 1409, 2704, 2705, 2706, 2707, 2716, 6623, H862, H988, H993, H998, V077, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:

Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial*

Ventilation, A Manual of Recommended Practices, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II

Information reported for product/size:

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the

CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 14.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

LIQUINOX MSDS

Section 1 : MANUFACTURER INFORMATION

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/02/24

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Liquid.

Appearance & odor: Odourless.
Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F).
17

Vapour density (air=1): >1

Volatiles (%)

By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C):	100 (212F)
Freezing point (°C):	Not available.
pH:	8.5
Specific gravity @ 20 °C:	(water = 1). 1.083
Solubility in water (%):	Complete.
Coefficient of water\oil dist.:	Not available.
VOC:	None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability:	Not flammable.
Conditions of flammability:	Surrounding fire.
Extinguishing media:	Carbon dioxide, dry chemical, foam. Water Water fog.
Special procedures:	Self-contained breathing apparatus required. Firefighters should wear the usual protective gear. Use water spray to cool fire exposed containers.
Auto-ignition temperature:	Not available.
Flash point (°C), method:	None
Lower flammability limit (% vol):	Not applicable.
Upper flammability limit (% vol):	Not applicable.

Not available.

Sensitivity to mechanical impact:	Not available.
Hazardous combustion products:	Oxides of carbon (COx). Hydrocarbons.
Rate of burning:	Not available.
Explosive power:	Containers may rupture if exposed to heat or fire.

Section 5 : REACTIVITY DATA

Chemical stability:	Product is stable under normal handling and storage conditions.
Conditions of instability:	Extreme temperatures.
Hazardous polymerization:	Will not occur.
Incompatible substances:	Strong acids. Strong oxidizing agents.
Hazardous decomposition products:	See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry:	Skin contact, eye contact, inhalation and ingestion.
Effects of Acute Exposure	
Eye contact:	May cause irritation.
Skin contact:	Prolonged and repeated contact may cause irritation.
Inhalation:	May cause headache and nausea.
Ingestion:	May cause vomiting and diarrhea. May cause gastric distress.
Effects of chronic exposure:	See effects of acute exposure.
LD50 of product, species & route:	> 5000 mg/kg rat oral.
LC50 of product, species & route:	Not available.
Exposure limit of material:	Not available.
Sensitization to product:	Not available.
Carcinogenic effects:	Not listed as a carcinogen.
Reproductive effects:	Not available.
Teratogenicity:	Not available.
Mutagenicity:	Not available.
Synergistic materials:	Not available.
Medical conditions aggravated by exposure:	Not available.
First Aid	
Skin contact:	Remove contaminated clothing. Wash thoroughly with soap and water. Seek medical attention if irritation persists.
Eye contact:	Check for and remove contact lenses. Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.
Inhalation:	Remove victim to fresh air. If irritation persists, seek medical attention.
Ingestion:	Do not induce vomiting, seek medical attention. Dilute with two glasses of water. Never give anything by mouth to an unconscious person.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak / Spill:	Contain the spill. Prevent entry into drains, sewers, and other waterways. Wear appropriate protective equipment. Small amounts may be flushed to sewer with water. Soak up with an absorbent material. Place in appropriate container for disposal. Notify the appropriate authorities as required.
Waste disposal:	In accordance with local and federal regulations.
Handling procedures and equipment:	Protect against physical damage. Avoid breathing vapors/mists. Wear personal protective equipment appropriate to task.

Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Avoid extreme temperatures.
Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials.
Keep containers closed when not in use.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves / Type:

Wear appropriate gloves.

Respiratory / Type: None required under normal use.

Eye / Type:

Safety glasses recommended.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

PID ANALYZERS

hnu

Instrumentation for Environmental, Process & Industrial Hygiene Monitoring

Isobutylene in Air MSDS

Home

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS/**ISOBUTYLENE** IN AIR

PRODUCT NAME: 100 PPM ISOBUTYLENE/AIR (**100 PPM ISOBUTYLENE**/AIR) **MSDS**
Version:4 Date: January, 2004

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1. Chemical Product and Company Identification **PID ANALYZERS, LLC** 25 Walpole Park Drive South Walpole, MA 02081 TELEPHONE NUMBER: (508) 660-5001 **24-HOUR EMERGENCY NUMBER: 1-617-699-4307** FAX NUMBER: (508) 660-5040 E-MAIL: sales@hnu.com

PRODUCT NAME: ISOBUTYLENE (**100 PPM** – 0.9%) IN AIR
CHEMICAL NAME: Isobutylene in air

COMMON NAMES/ SYNONYMS: Calibration Gas

CLASSIFICATION: 2.2 WHIMIS CLASSIFICTATION: A, D2A, D2B

---

2. COMPOSITION/ INFORMATION ON INGREDIENTS
INGREDIENT %: **Isobutylene** 0.0001-0.9/Air 99-99.9999
VOLUME:17L
PEL-OSHA: N/A
TLV-ACGIH: N/A
LD50or LC50Route/Species:N/A
FORMULA: C4H8/Air 99.0

---

3. HAZARDS IDENTIFICATIONEMERGENCY OVERVIEW Release of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly ventilated environments); individuals in such atmospheres may be asphyxiated. **Isobutylene** may cause drowsiness and other central nervous system effects in high concentrations; however, due to the low concentration of this gas mixture, this is unlikely to occur.

ROUTE OF ENTRY:
Skin: No
Contact Skin: No
Absorption: No
Eye Contact: No
Inhalation: Yes
Ingestion:No

HEALTH EFFECTS:
Exposure Limits: Yes
Irritant: No
Sensitization: No
Reproductive Hazard: No
Mutagen: No
Carcinogenicity: No
NTP: No
IARC: No
OSHA: No

EYE EFFECTS: N/A.
SKIN EFFECTS: N/A.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS
PRODUCT NAME: **ISOBUTYLENE** (1 **PPM** – 0.9%) IN AIR
INGESTION EFFECTS: Ingestion unlikely. Gas at room temperature.
INHALATION EFFECTS: Due to the small size of this cylinder, no unusual health effects from over-exposure are anticipated under normal routine use.

NFPA HAZARD CODES HMIS HAZARD CODES RATING SYSTEM
Health: **1**
Flammability: **0**
Flammability: **0**
Reactivity: **0**

***0= No Hazard, 1= Slight Hazard, 2= Moderate Hazard, 3= Serious Hazard, 4= Severe Hazard**

---

4. FIRST AID MEASURES EYES: N/A

SKIN: N/A

INGESTION: Not required

INHALATION: PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASED OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

---

5. FIRE-FIGHTING MEASURES These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be

projected considerable distances - thereby hampering fire fighting efforts.

---

6. ACCIDENTAL RELEASE MEASURES In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

---

7. HANDLING AND STORAGE Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130oF (54oC).

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION Use adequate ventilation for extended use of gas.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS PRODUCT NAME: ISOBUTYLENE (1 **PPM** – 0.9%) IN AIR

---

9. PHYSICAL AND CHEMICAL PROPERTIES PARAMETER: VALUE: Physical state : Gas Evaporation point : N/A pH : N/A Odor and appearance : Colorless, odorless gas

---

10. STABILITY AND REACTIVITY Stable under normal conditions. Expected shelf life 24 months.

---

11. TOXICOLOGICAL INFORMATION No toxicological damage caused by this product.

---

12. ECOLOGICAL INFORMATION No ecological damage caused by this product.

---

13. DISPOSAL INFORMATION Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured.

---

14. TRANSPORT INFORMATION
United States DOT/Canada TDG PROPER SHIPPING NAME:
Compressed Gas N.O.S. Compressed Gas N.O.S. (**Isobutylene** in Air)
HAZARD CLASS: 2.2
IDENTIFICATION NUMBER: UN1956
SHIPPING LABEL: NONFLAMMABLE GAS

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15. REGULATORY INFORMATION Isobutylene is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

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16. OTHER INFORMATION This **MSDS** has been prepared in accordance with the Chemicals

(Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of PID Analyzers, LLC , and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.
MSDS/S010/248/January, 2004

Top

HANNA® instruments

HI 70004
Buffer Solution pH 4.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70004 Buffer Solution pH 4.01
Application: pH Buffer Solution, ± 0.01 @ 25°C/77°F

Additional Product Codes: HI 70004C
HI 70004P
HI 7004P/5

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)
International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)
E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	4.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA® instruments

HI 70007
Buffer Solution pH 7.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70007 Buffer Solution pH 7.01
Application: pH Buffer Solution

Additional Product Codes: HI 70007C
HI 70007P
HI 7007P/5

Company Information (USA):

Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:

1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information:

1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information:

+1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address:

tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:

Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	7.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:
Not subject to transport regulations

Sea:
Not subject to transport regulations

Air:
Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

MATERIAL SAFETY DATA SHEET

OAKTON®

Section 1. Chemical Product and Company Identification

Catalog Number(s) 00653-00	
Product Identity ZERO OXYGEN SOLUTION	
Manufacturer's Name RICCA CHEMICAL COMPANY	Emergency Telephone Number (24 hr) CHEMTREC®: 800-424-9300
Address (Number, Street, City, State, and ZIP Code) P.O. Box 13090	Telephone Number For Information 817-461-5601
Arlington, Texas 76094	Date Prepared 4-18-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits ACGIH TLV	OSHA PEL
Sodium Sulfite	7757-83-7	4.5 – 5.5	N/A	N/A
Cobalt Chloride Hexahydrate	7791-13-1	< 0.01	0.02 mg/m^3 (as Co)	0.1 mg/m^3 (Dust as Co)
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆

EMERGENCY OVERVIEW

May cause irritation to the eyes, skin and respiratory tract. Contains Cobalt Chloride, a possible carcinogen according to International Agency for Research on Cancer (IARC). Wash areas of contact with water for at least 15 minutes. If ingested, dilute with water and call a physician. Although moderately toxic in large amounts, sulfites can pose risk to some asthmatics producing central nervous system depression, broncho constriction and anaphylaxis.

☆☆

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin, respiratory tract.

EYE CONTACT: May cause irritation, redness, pain, and tearing.

INHALATION: May cause irritation. This solution is not expected to be harmful via inhalation.

SKIN CONTACT: May cause mild irritation.

INGESTION: May cause gastric irritation by the liberation of sulfurous acid. Large doses may result in circulatory disturbances, diarrhea, and central nervous system depression.

CHRONIC EFFECTS / CARCINOGENICITY: Chronic exposure may affect thyroid, heart, lungs and kidneys due to the Cobalt.
IARC – Not classifiable as to carcinogenicity to humans (Sodium Sulfite), Possible carcinogen, limited evidence in humans (Cobalt)
NTP – No
OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

Mutation data cited in "Registry of Toxic Effects of Chemical Substances" for Cobalt Chloride and Sodium Sulfite.

REPRODUCTION INFORMATION:

Reproductive effects cited in "Registry of Toxic Effects of Chemical Substances" for Cobalt Chloride.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary.

SKIN CONTACT: Wash areas of contact with soap and water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Do not induce vomiting. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire (water, dry chemical, chemical foam).

FIRE & EXPLOSION HAZARDS: Not considered to be an explosion hazard. May emit irritating and corrosive gases in fire.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions. Poisonous gases may be produced in fire.

FIRE FIGHTING EQUIPMENT: Use protective clothing and NIOSH-approved self-contained breathing apparatus appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (vermiculite, etc.) and dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves, Nitrile Rubber or Neoprene.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, colorless liquid	**pH:**	N/A
ODOR:	odorless	**BOILING POINT (^{o}C):**	Approximately 100
SOLUBILITY IN WATER:	infinite	**MELTING POINT (^{o}C):**	Approximately 0
SPECIFIC GRAVITY:	Approximately 1	**VAPOR PRESSURE:**	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage. This product absorbs Oxygen from the air.

INCOMPATIBILITY: Strong oxidizing agents, Acids (liberates Sulfur Dioxide), high temperatures.

HAZARDOUS DECOMPOSITION PRODUCTS: Emits toxic and irritating fumes, including Sulfur Oxides, when heated to decomposition.
HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Mouse: (Sodium Sulfite) 820 mg/kg, details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Whatever cannot be saved for recycling or recovery should be managed in an appropriate and approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME:	Not regulated
D.O.T. HAZARD CLASS:	None
U.N. / N.A. NUMBER:	None
PACKING GROUP:	None
D.O.T. LABEL:	None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: This item meets the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.
CERCLA REPORTABLE QUANTITY: Cobalt Chloride RQ 1 pound
SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No
SECTION 311/312 HAZARDOUS CATEGORIES: Acute, Chronic: Yes Fire, Pressure, Reactivity: No
SECTION 313 TOXIC CHEMICALS: No
RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed

Section 16. Other Information

NFPA Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Special Notice Key: None**
HMIS® Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Protective Equipment: B (Protective eyewear, gloves)**

Rev 1, 03-25-2003: Reviewed and approved.
Rev 2, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

HI 7021
ORP Solution for Platinum and Gold Electrodes

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7021 ORP Solution

Application: ORP Solution for Platinum and Gold Electrodes.
240 mV @ 25°C/77°F

Additional Product Codes: HI 7021L
HI 7021M
HI 7021/G

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air.

After Skin Contact: Wash effected area with plenty of water.

After Eye Contact: Rinse out with water.

After Swallowing: Wash out mouth thoroughly with water and give plenty of water to drink. In severe cases obtain medical attention.

General Information: Remove contaminated, soaked clothing immediately and dispose of safely.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water spray, Carbon Dioxide, Dry Chemical Powder, Appropriate Foam.

Special Risks:

Non-combustible.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

NA

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Avoid formation of dusts. Do not inhale dusts. Avoid substance contact.

Environmental Precautions:

Do not discharge into the drains/surface waters/groundwater.

Additional Notes:

Take up dry. Clean up affected area and dispose according to local regulation. Avoid generation of dusts.

SECTION 7: HANDLING AND STORAGE

Handling:

Cannot be stored indefinitely.

Storage:

Tightly closed. Store at room temperature (+15 to +25 °C recommended). Protect from light.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled.

Respiratory Protection:	***Protective Gloves:***	***Eye Protection:***
Required when vapors/aerosols are generated. Work under hood.	Rubber or plastic	Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Yellow liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	ND	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating

Hazardous Decomposition Products:

None

Hazardous Polymerization:

Will not occur.

Substances to be Avoided:

The generally known reaction partners of water

Further Information:

Not available

SECTION 11: TOXICOLOGICAL INFORMATION

No toxic effects are to be expected when the product is handled appropriately.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data:

SECTION 12: ECOLOGICAL INFORMATION

No environmental hazard.

Further Data: Can be safely disposed off as an ordinary refuse.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal:

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA® instruments

HI 7031

Conductivity Calibration Solution, 1413 µS/cm @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7031 Conductivity Calibration Solution

Application: For calibrating electrodes. 1413 µS/cm @ 25°C/77°F

Additional Product Codes: HI 7031/1G HI 7031L HI 7031L/C HI 7031M HI 7031/120ML

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating (above boiling point). Stable in the recommended storage conditions.

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	*Sea:*	*Air:*
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

Material Safety Data Sheet
Methanol

ACC# 14280

Section 1 - Chemical Product and Company Identification

MSDS Name: Methanol
Catalog Numbers: AC167830000, AC167830025, AC167835000, AC176840000, AC176840010, AC176840025, AC176840250, AC176845000, AC177150000, AC177150010, AC177150025, AC177150050, AC177150051, AC177150250, AC177150251, AC268280000, AC268280010, AC268280025, AC325740000, AC325740010, AC325740025, AC326630000, AC326630010, AC326630025, AC326950000, AC326950010, AC326951000, AC326952500, AC327900000, AC327900010, AC364390000, AC364390010, AC364391000, AC413770000, AC413770040, AC413775000, AC423950000, AC423950010, AC423950040, AC423950200, AC423955000, AC610090040, AC610200040, AC610400010, AC61040019, AC61040019, AC61040050, AC61040050, AC610401000, AC61040115, AC61040115, AC61040200, AC610981000, AC611070040, AC615130025, S75162, S75163, S75959, S75965, S75965A, S75965HPLC, S93301, S93301A, S93302, S93302A, 19123467, A408-1, A408-4, A408-4LC, A408SK-4, A411-20, A411-4, A412-1, A412-20, A412-200, A412-200LC, A412-4, A412-4LC, A412-500, A412200001, A412CU-1300, A412FB-200, A412FB115, A412FB19, A412FB50, A412J500, A412P-4, A412P-4LC, A412POP19, A412POPB-200, A412RB-200, A412RB-50, A412RB115, A412RS-200, A412RS115, A412RS19, A412RS28, A412RS50, A412SK-4, A412SS-115, A412SS-200, A412SS-50, A413-20, A413-200, A413-4, A413-500, A433F-1GAL, A433P-1GAL, A433P-4, A433P1GAL, A433S-20, A433S-200, A433S-4, A434-20, A450-4, A452-1, A452-212, A452-4, A452-4LC, A452J1, A452N1-19, A452N2-19, A452POP-200, A452POP50, A452RS-115, A452RS-19, A452RS-200, A452RS-28, A452RS-50, A452SK-1, A452SK-4, A452SS-115, A452SS-19, A452SS-200, A452SS-28, A452SS-50, A453-1, A453-1LC, A453-4, A453-500, A453J1, A454-1, A454-4, A454-4LC, A454J1, A454RS-115, A454RS-200, A454RS-28, A454SS-19, A454SS-200, A454SS-28, A454SS-50, A455-1, A455RS19, A456-1, A456-4, A457-4, A4574LC, A935-4, A935RB-200, A935RB200, A947-4, A947-4LC, A947POP-200, A947POP200, A947RS-115, A947RS-200, A947RS-28, A947SS-115, A947SS-200, A947SS-28, A947SS-50, BP1105-1, BP1105-4, BP1105SS19, BP1105SS28, BP2618100, HC400 1GAL, NC9105104, NC9134255, NC9173853, NC9283877, NC9360649, NC9386568, NC9419923, NC9433033, NC9433739, NC9541632, NC9942270, NC9964975, SC95-1, SW2-1, TIA947-4, TIA947P-200, TIA947P-200L
Synonyms: Carbinol; Methyl alcohol; Methyl hydroxide; Monohydroxymethane; Wood alcohol; Wood naptha; Wood spirits; Columbian spirits; Methanol.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-56-1	Methanol	> 99	200-659-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 10 max clear liquid. Flash Point: 12 deg C.
Danger! Poison! May be fatal or cause blindness if swallowed. Vapor harmful. **Flammable liquid and vapor.** Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. May cause central nervous system depression. Cannot be made non-poisonous.
Target Organs: Eyes, nervous system, optic nerve.

Potential Health Effects

Eye: May cause painful sensitization to light. Methanol is a mild to moderate eye irritant. Inhalation, ingestion or skin absorption of methanol can cause significant disturbances in vision, including blindness.
Skin: Causes moderate skin irritation. May be absorbed through the skin in harmful amounts. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. Methanol can be absorbed through the skin, producing systemic effects that include visual disturbances.
Ingestion: May be fatal or cause blindness if swallowed. Aspiration hazard. Cannot be made non-poisonous. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause cardiopulmonary system effects.
Inhalation: Methanol is toxic and can very readily form extremely high vapor concentrations at room temperature. Inhalation is the most common route of occupational exposure. At first, methanol causes CNS depression with nausea, headache, vomiting, dizziness and incoordination. A time period with no obvious symptoms follows (typically 8-24 hrs). This latent period is followed by metabolic acidosis and severe visual effects which may include reduced reactivity and/or increased sensitivity to light, blurred, doubl and/or snowy vision, and blindness. Depending on the severity of exposure and the promptness of treatment, survivors may recover completely or may have permanent blindness, vision disturbances and/or nervous system effects.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic exposure may cause effects similar to those of acute exposure. Methanol is only very slowly eliminated from the body. Because of this slow elimination, methanol should be regarded as a cumulative poison. Though a single exposure may cause no effect, daily exposures may result in the accumulation of a harmful amount. Methanol has produced fetotoxicity in rats and teratogenicity in mice exposed by inhalation to high concentrations that did not produce significant maternal toxicity.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Effects may be delayed.
Antidote: Ethanol may inhibit methanol metabolism.

Section 5 - Fire Fighting Measures

General Information: Ethanol may inhibit methanol metabolism. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than

water and a fire may be spread by the use of water. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Do NOT use straight streams of water.
Flash Point: 12 deg C (53.60 deg F)
Autoignition Temperature: 455 deg C (851.00 deg F)
Explosion Limits, Lower:6.0 vol %
Upper: 31.00 vol %
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid use in confined spaces.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methanol	200 ppm TWA; 250 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	200 ppm TWA; 260 mg/m3 TWA 6000 ppm IDLH	200 ppm TWA; 260 mg/m3 TWA

OSHA Vacated PELs: Methanol: 200 ppm TWA; 260 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: clear, colorless - APHA: 10 max
Odor: alcohol-like - weak odor
pH: Not available.
Vapor Pressure: 128 mm Hg @ 20 deg C
Vapor Density: 1.11 (Air=1)
Evaporation Rate:5.2 (Ether=1)
Viscosity: 0.55 cP 20 deg C
Boiling Point: 64.7 deg C @ 760 mmHg
Freezing/Melting Point:-98 deg C
Decomposition Temperature: Not available.
Solubility: miscible
Specific Gravity/Density:.7910 g/cm3 @ 20°C
Molecular Formula:CH4O
Molecular Weight:32.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, ignition sources, confined spaces.
Incompatibilities with Other Materials: Oxidizing agents, reducing agents, acids, alkali metals, potassium, sodium, metals as powders (e.g. hafnium, raney nickel), acid anhydrides, acid chlorides, powdered aluminum, powdered magnesium.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 67-56-1: PC1400000
LD50/LC50:
CAS# 67-56-1:
Draize test, rabbit, eye: 40 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rabbit: LC50 = 81000 mg/m3/14H;
Inhalation, rat: LC50 = 64000 ppm/4H;
Oral, mouse: LD50 = 7300 mg/kg;
Oral, rabbit: LD50 = 14200 mg/kg;
Oral, rat: LD50 = 5600 mg/kg;
Skin, rabbit: LD50 = 15800 mg/kg;
.
Human LDLo Oral: 143 mg/kg; Human LDLo Oral: 428 mg/kg; Human TCLo Inhalation; 300 ppm caused visual field changes & headache; Monkey LDLo Skin: 393 mg/kg. Methanol is significantly less toxic to

most experimental animals than humans, because most animal species metabolize methanol differently. Non-primate species do not ordinarily show symptoms of metabolic acidosis or the visual effects which have been observed in primates and humans.
Carcinogenicity:
CAS# 67-56-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: There is no human information available. Methanol is considered to be a potential developmental hazard based on animal data. In animal experiments, methanol has caused fetotoxic or teratogenic effects without maternal toxicity.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: ACGIH cites neuropathy, vision and CNS under TLV basis.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: 29.4 g/L; 96 Hr; LC50 (unspecified)Fish: Goldfish: 250 ppm; 11 Hr; resulted in deathFish: Rainbow trout: 8000 mg/L; 48 Hr; LC50 (unspecified)Fish: Rainbow trout: LC50 = 13-68 mg/L; 96 Hr.; 12 degrees CFish: Fathead Minnow: LC50 = 29400 mg/L; 96 Hr.; 25 degrees C, pH 7.63Fish: Rainbow trout: LC50 = 8000 mg/L; 48 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 51,000-320,000 mg/L; 30 minutes; Microtox test No data available.
Environmental: Dangerous to aquatic life in high concentrations. Aquatic toxicity rating: TLm 96>1000 ppm. May be dangerous if it enters water intakes. Methyl alcohol is expected to biodegrade in soil and water very rapidly. This product will show high soil mobility and will be degraded from the ambient atmosphere by the reaction with photochemically produced hyroxyl radicals with an estimated half-life of 17.8 days. Bioconcentration factor for fish (golden ide) < 10. Based on a log Kow of -0.77, the BCF value for methanol can be estimated to be 0.2.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 67-56-1: waste number U154 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	METHANOL	METHANOL
Hazard Class:	3	3
UN Number:	UN1230	UN1230
Packing Group:	II	II
Additional Info:		FLASHPOINT 11 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 67-56-1 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 67-56-1: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 67-56-1: immediate, fire.
Section 313
This material contains Methanol (CAS# 67-56-1, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 67-56-1 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 67-56-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T F
Risk Phrases:
R 11 Highly flammable.
R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
R 39/23/24/25 Toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 36/37 Wear suitable protective clothing and gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 67-56-1: 1

Canada - DSL/NDSL

CAS# 67-56-1 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D1B, D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 67-56-1 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/21/1999
Revision #14 Date: 9/05/2006

MSDS Number: **S8234** * * * * * *Effective Date:* ***02/04/05*** * * * * * *Supercedes:* ***11/04/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SULFURIC ACID, 52 - 100 %

1. Product Identification

Synonyms: Oil of vitriol; Babcock acid; sulphuric acid
CAS No.: 7664-93-9
Molecular Weight: 98.08
Chemical Formula: H2SO4 in H2O
Product Codes:
J.T. Baker: 5030, 5137, 5374, 5802, 5815, 5858, 5859, 5868, 5889, 5897, 5961, 5971, 5997, 6902, 9671, 9673, 9674, 9675, 9676, 9679, 9680, 9681, 9682, 9684, 9687, 9691, 9693, 9694
Mallinckrodt: 21201, 2468, 2876, 2878, 2900, 2904, 3780, 4222, 5524, 5557, H644, H850, H976, H996, V651, XL003

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	52 - 100%	Yes
Water	7732-18-5	0 - 48%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician immediately.
Eye Contact:
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

5. Fire Fighting Measures

Fire:
Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.
Explosion:
Contact with most metals causes formation of flammable and explosive hydrogen gas.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m3(T) (TWA) for sulfuric acid - A2 Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear oily liquid.
Odor:
Odorless.
Solubility:
Miscible with water, liberates much heat.
Specific Gravity:
1.84 (98%), 1.40 (50%), 1.07 (10%)
pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
ca. 290C (ca. 554F) (decomposes at 340C)
Melting Point:
3C (100%), -32C (93%), -38C (78%), -64C (65%).
Vapor Density (Air=1):
3.4
Vapor Pressure (mm Hg):
1 @ 145.8C (295F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sulfuric Acid (7664-93-9)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

International (Water, I.M.O.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                    TSCA  EC   Japan  Australia
-----------------------------------------------  ----  ---  -----  ---------
Sulfuric Acid (7664-93-9)                      Yes  Yes   Yes      Yes
Water (7732-18-5)                              Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                      --Canada--
Ingredient                                    Korea  DSL   NDSL  Phil.
-----------------------------------------------  -----  ---   ----  -----
Sulfuric Acid (7664-93-9)                      Yes   Yes   No     Yes
Water (7732-18-5)                              Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Sulfuric Acid (7664-93-9)                 1000  1000    Yes        No
Water (7732-18-5)                         No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                 -RCRA-    -TSCA-
Ingredient                                CERCLA     261.33     8(d)
----------------------------------------  ------     ------    ------
Sulfuric Acid (7664-93-9)                 1000       No         No
Water (7732-18-5)                         No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  Yes
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: Yes         (Pure / Liquid)
```

Australian Hazchem Code: 2P
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
Label First Aid:
In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****
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****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

APPENDIX C

FWIA PROCESS

Multi Step Process (Carrying to Step II, A. for the Saranac Lake Site)

Step I – Site Description

A. Site Maps

1) Topographic Map: (GIS-office, Letter to NYSDEC Natural Heritage Program requesting information on Rare, Threatened & Endangered Species)

- Include area within 2 miles of the Site, showing the location and boundary
- Include documented Fish and Wildlife Resources
- NYSDEC Significant Wildlife Habitats
- Rare, Threatened and Endangered Species
- Regulated Wetlands & NWI Wetlands
- Wild, Scenic and Recreational Rivers
- Streams and Lakes

2) Cover Type Map: (GIS-office, create maps using readily available data (i.e., aerial photographs, existing cover type maps…etc.) which will be verified in the field)

- Include area within 0.5 miles of the site (1"=500' typical scale)
- Include the following:
    - Major Vegetative Communities – Using NYSDEC Natural Heritage Program descriptions and classifications of natural communities
    - Reference: "Ecological Communities of New York State", NYSDEC, 1990)
    - Field verification of ecological communities

3) Drainage Map (GIS-office, created based on existing data readily available data (i.e., topography, USGS stream flows, etc.)

- Site map showing surface flows after hydrological events.

B. Description of Fish and Wildlife Resources: (Review of existing published data, augmented with field data and observations collected from the Site)

1) Fish and Wildlife Resources and Cover types

- Describe Fish and Wildlife Resources
- Aquatic resources should include chemical and physical parameters such as water chemistry, temperature, dissolved oxygen, depth, substrate composition, discharge, flow rates, gradients, streambed morphology, etc.

- Submergent Aquatic vegetation Identification and Distribution.
- Wetland and Stream classification
- Describe Abundance, Distribution and Density of Fish and Wildlife Resources

2) Fauna Expected Within Each Cover type and Aquatic Habitat

- Identify typical fish and wildlife species
- Identify R, T, &E species

3) Observations of Stress

- Identify and describe obviously contaminated areas
- Identify and describe atypical biotic conditions

C. Description of Fish and Wildlife Resource Value (Research existing published data, review of field data collected in "B. Description of Fish and Wildlife Resources")

1) Value of Habitat Associated with Fauna

- Qualitative Assessment of the ability of area within 0.5 miles of the site to support fish and wildlife (i.e., food, cover, bedding areas, brooding and nesting areas
- Qualitative Assessment of Fish and Wildlife population densities and diversities

2) Value of Resources to Humans

- Identify current and potential use of Fish and Wildlife Resources by humans (i.e., hunting, fishing, wildlife observation, scientific research, and other recreational or economic values

D. Identification of Applicable Fish and Wildlife Regulatory Criteria (Compilation of existing published data)

1) Contaminant Specific Water Quality Criteria Standards and Guidance Values for the protection of aquatic life and Sediment Criteria

2) Identification of Site-specific criteria should describe performance standards for permit issuance cited in the Freshwater wetland regulations, Environmental Conservation Law and laws and regulations governing streams and navigable water bodies

3) Include and describe criteria for fish and wildlife resources for human use/consumption

Step II – Contaminant-Specific Impact Assessment – Objective of Step II is to determine the impacts of Site Related contaminants on Fish and Wildlife Resources

A. Pathway Analysis (Review data collected in Step I to determine if contaminants have the potential to affect fish and wildlife resources…Are fish and wildlife receptors present… Are fish and wildlife receptors exposed to contaminants from the Site…)

1) Identify Fish and Wildlife Resources, Contaminants of Concern, Sources of Contamination, and potential pathways of contaminant migration and exposure.

APPENDIX D

SOIL GRID AND SEDIMENT TRACKING LOGS

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
Z-1	*15.5*	*2*	*4*	*3*	*4*	*direct push*	*7/24/2013*	*Sample number 516008-SSZ1-03*
Z-2	*20*	*na*	*na*	*na*	*na*	*hand auger*	*7/24/2013*	*no waste encounterd, no sample collected*
A-1								
A-2								
A-3								
B-1								
B-2								
B-3								
B-4								
B-5								
C-1								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
C-2								
C-3								
C-4								
C-5								
C-6								
C-7								
C-8								
D-1								
D-2								
D-3								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
D-4								
D-5								
D-6								
D-7								
D-8								
D-9								
D-10								
E-1								
E-2								
E-3								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
E-4								
E-5								
E-6								
E-7								
E-8								
E-9								
E-10								
E-11								
E-12								
E-13								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
F-1								
F-2								
F-3								
F-4								
F-5								
F-6								
F-7								
F-8								
F-9								
F-10								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
F-11								
F-12								
F-13								
F-14								
G-2								
G-3								
G-4								
G-5								
G-6								
G-7								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
G-8								
G-9								
G-10								
G-11								
G-12								
G-13								
G-14								
H-2								
H-3								
H-4								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
H-5								
H-6								
H-7								
H-8								
H-9								
H-10								
H-11								
H-12								
H-13								
H-14								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
I-2								
I-3								
I-6								
I-7								
I-8								
I-9								
I-10								
I-11								
I-12								
I-13								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake Gas Co., North Elba, New York
MACTEC Project No. 3612132271

Grid Location	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
I-14								
J-2								
J-3								
K-2								
K-3								
L-2								
L-3								
M-3								

Sample numbering = NYSDEC site number-sample type and sample location id- top of sample interval (e.g. 516008-SSA1-02)
ft.= feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Transect Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
SD-300A	*2*	*0.5*	*1.8*	*0.5*	*1*	*direct push*	*7/24/2013*	*Sample number 516008-SD300A-02*
SD-300D	*4*	*na*	*na*	*na*	*na*	*hand auger*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-101A								
SD-101B								
SD-101C								
SD-101D								
SD-101E								
SD-101F								

Sample ID= NYSDEC Site ID-Media type and transect ID and location- top depth of sample= 516008-SD101A-02
ft.- feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Transect Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
SD-300A	*2*	*0.5*	*1.8*	*0.5*	*1*	*direct push*	*7/24/2013*	*Sample number 516008-SD300A-02*
SD-300D	*4*	*na*	*na*	*na*	*na*	*hand auger*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-102A								
SD-102B								
SD-102C								
SD-102D								
SD-102E								
SD-102F								

Sample ID= NYSDEC Site ID-Media type and transect ID and location- top depth of sample= 516008-SD101A-02
ft.- feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Transect Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
SD-300A	*2*	*0.5*	*1.8*	*0.5*	*1*	*direct push*	*7/24/2013*	*Sample number 516008-SD300A-02*
SD-300D	*4*	*na*	*na*	*na*	*na*	*hand auger*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-103A								
SD-103B								
SD-103C								
SD-103D								
SD-103E								
SD-103F								

Sample ID= NYSDEC Site ID-Media type and transect ID and location- top depth of sample= 516008-SD101A-02
ft.- feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Transect Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
SD-300A	*2*	*0.5*	*1.8*	*0.5*	*1*	*direct push*	*7/24/2013*	*Sample number 516008-SD300A-02*
SD-300D	*4*	*na*	*na*	*na*	*na*	*hand auger*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-104A								
SD-104B								
SD-104C								
SD-104D								
SD-104E								
SD-104F								

Sample ID= NYSDEC Site ID-Media type and transect ID and location- top depth of sample= 516008-SD101A-02
ft.- feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Transect Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Sample method	Date	Comment
SD-300A	*2*	*0.5*	*1.8*	*0.5*	*1*	*direct push*	*7/24/2013*	*Sample number 516008-SD300A-02*
SD-300D	*4*	*na*	*na*	*na*	*na*	*hand auger*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-105A								
SD-105B								
SD-105C								
SD-105D								
SD-105E								
SD-105F								

Sample ID= NYSDEC Site ID-Media type and transect ID and location- top depth of sample= 516008-SD101A-02
ft.- feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Sample Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Date	Comment
SD-300	*15.5*	*2*	*4*	*3*	*4*	*7/24/2013*	*Sample number 516008-SD300-03*
SD-400	*20*	*na*	*na*	*na*	*na*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-106							
SD-107							
SD-108							
SD-109							
SD-110							
SD-111							
SD-112							

Sample ID= NYSDEC Site No- Media Type and loacation ID- depth = 516008-SD106-02
ft.= feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Sample Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Date	Comment
SD-300	*15.5*	*2*	*4*	*3*	*4*	*7/24/2013*	*Sample number 516008-SD300-03*
SD-400	*20*	*na*	*na*	*na*	*na*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-113							
SD-114							
SD-115							
SD-116							
SD-117							
SD-118							
SD-119							

Sample ID= NYSDEC Site No- Media Type and loacation ID- depth = 516008-SD106-02
ft.= feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Sample Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Date	Comment
SD-300	*15.5*	*2*	*4*	*3*	*4*	*7/24/2013*	*Sample number 516008-SD300-03*
SD-400	*20*	*na*	*na*	*na*	*na*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-120							
SD-121							
SD-122							
SD-123							
SD-124							
SD-125							
SD-126							

Sample ID= NYSDEC Site No- Media Type and loacation ID- depth = 516008-SD106-02
ft.= feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Sample Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Date	Comment
SD-300	*15.5*	*2*	*4*	*3*	*4*	*7/24/2013*	*Sample number 516008-SD300-03*
SD-400	*20*	*na*	*na*	*na*	*na*	*7/24/2013*	*no waste encounterd, no sample collected*
SD-127							
SD-128							
SD-129							
SD-130							
SD-131							
SD-132							

Sample ID= NYSDEC Site No- Media Type and loacation ID- depth = 516008-SD106-02
ft.= feet

Saranac Lake, North Elba, New York
MACTEC Project No. 3612132271

Sample Location ID	Depth of boring (ft.)	Waste top depth (ft.)	Waste bottom depth (ft.)	Sample top depth (ft.)	Sample bottom depth (ft.)	Date	Comment
SD-300	*15.5*	*2*	*4*	*3*	*4*	*7/24/2013*	*Sample number 516008-SD300-03*
SD-400	*20*	*na*	*na*	*na*	*na*	*7/24/2013*	*no waste encounterd, no sample collected*

Sample ID= NYSDEC Site No- Media Type and loacation ID- depth = 516008-SD106-02
ft.= feet