Intended for
ITT LLC

Document type
Remedial Action Work Plan

Date
October 2020

REMEDIAL ACTION WORK PLAN
ITT AUTOMOTIVE FLUID HANDLING SYSTEM

RAMBOLL Bright ideas. Sustainable change.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Region 8
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November 20, 2020

Jeff Stanek
ITT Corporation
56 Technology Drive
Irvine, CA 92618

Dear Mr. Stanek:

Re: Remedial Action Work Plan; October 2020
ITT Automotive Fluid Handling System
Site No. 828112
Town of Gates, Monroe County

The New York State Departments of Environmental Conservation and Health (the Departments) have completed their review of the document entitled *Remedial Action Work Plan* dated October 2020 (the Work Plan) prepared by O'Brien & Gere Engineers, Inc. part of Ramboll, for the ITT Automotive Fluid Handling System site located in the Town of Gates. In accordance with 6 NYCRR Part 375-1.6, the Departments have determined that the Work Plan substantially addresses the requirements of the Order-on-Consent and the Work Plan is hereby approved.

Please attach this letter to the Work Plan and distribute the Work Plan as follows:

- Frank Sowers, NYSDEC Region 8 (1 hardcopy); and
- Gates Public Library, 902 Elmgrove Road, Rochester, NY 14624 (1 hardcopy).

Thank you for your cooperation and please contact me via email at frank.sowers@dec.ny.gov if you have any questions.

Sincerely,

Frank Sowers

Frank Sowers, P.E.
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REMEDIAL ACTION WORK PLAN

Project name	**ITT Automotive Fluid Handling System**
Site #	**8-28-112**
Location	**Town of Gates, New York**
Project no.	**3356/75832**
Recipient	**ITT LLC**
Document type	**Remedial Action Work Plan**
Version	**2**
Date	**October 7, 2020**
Prepared by	**Mr. Paul Freyer**
Checked by	**Mr. Scott Tucker**
Approved by	**Mr. Douglas Crawford, P.E.**

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

Douglas M Crawford

Douglas M. Crawford, P.E., Vice President
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List of Acronyms

AOC	Administrative Order on Consent
AHA	Activity Hazard Analysis
AMSL	above mean sea level
ASTM	American Society for Testing and Materials
BGS	below ground surface
CAMP	Community Air Monitoring Program
CFR	Code of Federal Regulations
COC	constituents of concern
DER	Division of Environmental Remediation
EC	Engineering Controls
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
FER	Final Engineering Report
FS	Feasibility Study
HASP	Health and Safety Plan
IC	Institutional Controls
JSA	Job Safety Analysis
MFP	Maguire Family Properties, Inc.
NYSDEC	New York State Department of Environmental Conservation
NYCRR	New York Code, Rules, and Regulations
OBG	O’Brien and Gere Engineers, Inc.
OM&M	operation maintenance and monitoring
PDB	passive diffusion bag
PPE	personal protective equipment
PRAP	Proposed Remedial Action Plan
QAPP	Quality Assurance Project Plan
QC	quality control
RAWP	Remedial Action Work Plan
RFM	Rochester Form Machine
RI	Remedial Investigation
RIR	Remedial Investigation Report
ROD	Record of Decision

SBW	shallow bedrock wells
SCGs	standards, criteria, and guidance
SCO	soil cleanup objectives
SMP	Site Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TCA	1,1,1-trichloroethane
TCE	trichloroethene
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

1. INTRODUCTION

1.1 General

This Remedial Action Work Plan (RAWP) has been developed by O'Brien & Gere Engineers, Inc., a Ramboll company (Ramboll) on behalf of the ITT LLC (ITT) for the ITT Automotive Fluid Handling System (a.k.a Former Rochester Form Machine [RFM] Facility Site) (Site # 8-28-112) located at 30 Pixley Industrial Parkway in the Town of Gates, New York (former RFM Site). The former RFM Site is currently listed in the New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site (Site No. 8-28-112) requiring development and implementation of a remedial program. A Remedial Investigation (RI) Report (O'Brien & Gere Engineers, Inc. (OBG), 2014) and Feasibility Study (FS) Report (OBG, 2015) were completed by ITT pursuant to an Administrative Order on Consent (AOC) executed with the New York State Department of Environmental Conservation (NYSDEC). A Proposed Remedial Action Plan (PRAP) was released for public comment by NYSDEC on February 12, 2020. After holding a public meeting on March 4, 2020 and accepting public comments, NYSDEC issued a Record of Decision (ROD) on March 30, 2020. This RAWP has been prepared for the remedy selected by NYSDEC and will be implemented under the AOC executed between NYSDEC and ITT. The RAWP was prepared based on the ROD and NYSDEC's regulations and guidance, including Chapter 6, Part 375 of the New York Codes, Rules and Regulations (NYCRR), Technical Guidance for Site Investigation and Remediation (DER-10), and Green Remediation (DER-31).

1.2 Purpose

The objective of the RAWP is to provide one document that presents the processes and components necessary to complete the remedial activities required by the AOC agreed to August 19, 2003 and amended on November 2, 2006 and the ROD signed March 23, 2020.

The RAWP has been developed to provide sufficient detail for a contractor to implement the remedial actions. The details include design, permitting, implementation, documentation sampling, site restoration, schedule as per DER-31, and implementation of a health and safety program for workers and the community consistent with **Appendix 2** of this RAWP. The major remedial components are as follows;

- Excavation and restoration of polynuclear aromatic hydrocarbon (PAH) contaminated soil from the south lawn area
- Cover System repairs
- Recharge Well Decommissioning

As requested by the NYSDEC during a call with ITT on April 23, 2020, the RAWP will also include a groundwater monitoring program that will be completed during the period between the development of the RAWP and the approval of the Site Management Plan (SMP).

1.3 Site Description and History

1.3.1 Site Location

The former RFM Site is located at 30 Pixley Industrial Parkway in the Town of Gates, New York. The Site is approximately three acres of land (**Figure 1-2**) and is covered by an asphalt parking lot and a concrete slab from the former 45,500 square foot one-story building that was razed in

December 2015. The former RFM Site is located approximately ¾-mile north of the Little Black Creek and 2 ¼-miles to the southwest of the Erie Canal.

1.3.2 Site History

The former RFM Site was dedicated to agricultural activities until approximately 1973 when the facility was constructed. Building additions were completed in 1979 and 1984 resulting in the former building footprint. Operations at the former RFM Site included the manufacture of aluminum components for automotive air conditioning and various general applications. This work involved drilling and machining, alkali cleaning, tube forming, aluminum brazing and welding (Golder Associates, Inc. [Golder], 2000a), and included the use of 1,1,1-trichloroethane (TCA) as a degreaser; 1,4-dioxane was a stabilizing agent for TCA (NYSDEC, 2001). RFM conducted operations at the former RFM Site until its purchase by ITT-Higbie Baylock in 1979. The plant was closed and building vacated in 2003.

The Site is surrounded by commercial, industrial, and mixed land use properties (Figure 1-2). To the north of the Site is Cinemark at 2291 Buffalo Road. To the immediate west is the Batesville property at 40 Pixley Industrial Parkway (Figure 1-2). Pixley Industrial Parkway is to the immediate south of the Site. Across the parkway there are vacant lots and several properties zoned for light industrial and/or manufacturing use, including the Erdle Perforating Company (Erdle) property at 100 Pixley Industrial Parkway, which is a State Superfund project (Site Number 828072) and is listed as a Class 2 Site in the Registry of Inactive Hazardous Waste Disposal Sites. Reportedly, as part of the manufacturing process, numerous degreasing agents including trichloroethene (TCE) were used at the Erdle site (NYSDEC 2001).

The former AMSF building is located immediately to the east of the former RFM Site and covers approximately 125,000 square feet (**Figure 1-2**) of the approximately 7-acre former AMSF Site. The original building was constructed in 1967 (NYSDEC, 2001) and expanded in several phases to its current layout in 1972, 1979, and 1988 (GeoServices, 1992) (**Figure 1-2**). During its operation, the AMSF Site conducted stamping, forming, cleaning, grinding, painting, and deburring of metals. The exact date AMSF ceased operations was not reported, but the air permits for the site were surrendered with the sale of the former AMSF Site in 1995. The former AMSF Site is currently owned by Maguire Family Properties, Inc. (MFP) and subdivided to accommodate commercial businesses. Site operations at the former AMSF Site used TCA as a cleaning product. To date, there are no known records available regarding the manufacturer/supplier of TCA used at the former AMSF Site.

1.3.3 Site Geology and Hydrogeology

This section presents a summary of the RI Study Area geology and hydrogeology. A detailed description of the geology and hydrogeology is presented in Section 4 of the RFM RIR.

1.3.3.1 Geologic Conditions

In the RI Study Area (**Figure 1-1**), unconsolidated overburden deposits include topsoil, surficial fill, glaciolacustrine silt and clay, and sand and gravel. The total thickness of the unconsolidated materials overlying the bedrock ranges from 4 feet (ft) to 20 ft. The top of bedrock surface is likely an irregular surface due to the erosion and subsequent weathering of bedrock with varying rock hardness. The surface of the top of the competent bedrock slopes downward from the former AMSF Site (east) to the former RFM Site (west).

The bedrock units in the surrounding area are subdivided into several groups, formations and members. The stratigraphic groups include the middle Silurian Lockport Group and underlying Clinton Group. The Lockport Group is subdivided into the Eramosa Dolomite (Formation) and Penfield Formation. The stratigraphically lower Clinton Group is subdivided into the Decew Dolomite and the underlying Gates Member of the Rochester Shale.

These bedrock units, as observed during the RI, consist of sub-horizontally bedded and fractured dolostone, arenaceous dolostone, and shaley dolostone. The stratification of the bedrock units is nearly flat lying with an east-northeast strike and a dip of less than 1% to the southeast. The strike and dip are generally consistent with the regional geologic structure.

The Eramosa directly underlies the overburden. The Eramosa is a medium gray, fossiliferous dolostone with an average thickness of approximately 45 ft. Within the Eramosa, individual fractures or groups of fractures were often separated by sections of competent unfractured rock. Three elevation zones of solution enlarged fractures were observed. The first and uppermost zone (upper Eramosa) included fractures, aperture up to 4.4 inches, between the top of the bedrock and an average elevation of 540 ft above mean sea level (amsl) (approximately 20 to 34 ft below ground surface [bgs] across the RI Study Area). The second zone (middle portion of the Eramosa) spans from 537 to 532 ft amsl (approximately 23 to 42 ft bgs) with an aperture up to 1 inch. The third, and stratigraphically lowest fracture zone (lower Eramosa), spans from 528 to 519 ft amsl (approximately 32 to 55 ft bgs) with an aperture up 1.6 inches. Throughout the bedrock cores completed during the RI, the greatest frequency of solution enlarged fractures was observed in the Eramosa strata.

The Penfield Formation was encountered below the Eramosa. This formation was observed as a medium gray, fossiliferous dolostone to arenaceous dolostone with an average thickness of 52 ft. Fewer bedding fractures were observed in the Penfield Formation than the Eramosa and solution modification of the bedding planes and fractures in the Penfield Formation was less common than in the Eramosa. A prominent solution enlarged fracture was observed in the upper portion of the Penfield Formation between 504 to 499 ft amsl (approximately 56 to 75 ft bgs). Within the Penfield Formation, few solution enlarged fractures were observed below 495 ft amsl (approximately 65 to 79 ft bgs).

The Decew Dolomite occurs below the Penfield Formation. The Decew Dolomite consists of a medium gray, fine grained, sparsely stylolitic, dolostone. The thickness of the Decew Dolomite ranged from 9 to 17 ft. The Decew Dolomite exhibited fewer solution enlarged fractures than the Eramosa and Penfield Formation.

The deepest bedrock unit encountered during the RI, the maximum investigation depth was 159 ft bgs (404 ft amsl), was the Gates Member of the Rochester Shale. The Gates Member is a medium dark gray, fine grained, argillaceous dolostone with naturally occurring petroleum. Horizontal bedding fractures and shale partings were common in the Gates Member. Solution modification of the fractures was less common than in the overlying formations. Natural gas was encountered in this formation during RI drilling. Because of the presence of the natural gas and associated risks, characterization of the deep bedrock was limited during the RI.

1.3.3.2 Hydrogeologic Conditions

Groundwater was intermittently observed in the overburden in certain areas on the former RFM Site. The RI data suggest that the overburden is generally unsaturated except for those locations and times when the groundwater elevations extend above the elevation of the top of bedrock. The estimated hydraulic conductivity from overburden monitoring well (ITT-MW-1) is 8.1x10-4 centimeters per second (cm/sec).

The water table was observed in the Eramosa across the RI Study Area. Bedrock groundwater primarily flows through the sub-horizontal, solution enlarged, and bedding plane fractures. Based on the distribution of observed fractures, the bedrock can be subdivided into three general hydrogeologic units: the Eramosa, the upper Penfield, and the Deep Bedrock. The Deep Bedrock includes the lower Penfield, Decew Dolomite, and Rochester Shale formations.

The Eramosa is monitored by 30 monitoring wells across the former RFM, former AMSF and Cinemark properties. The upper Penfield is monitored by three monitoring wells on the former AMSF property only. The Deep Bedrock is monitored by three monitoring wells on the former RFM property and one monitoring well on the former AMSF property (**Figure 3-4**).

The primary focus of this section and the RI characterization is the Eramosa and upper Penfield Formations, because natural gas was encountered in the deep bedrock during the installation of deep bedrock borings in 2008 and 2010. With NYSDEC approval, subsequent RI activities and characterization were constrained to the upper 80 ft of bedrock, specifically focusing on the Eramosa and upper Penfield.

Hydraulic conductivity estimates for the Eramosa ranged from >5.4x10^{-3} to >6.4x10^{-1} cm/sec. The estimated Eramosa hydraulic conductivities are up to three orders of magnitude greater than the overburden zone. The upper Penfield hydraulic conductivity estimates range from 3.7x10^{-5} to 3.8x10^{-2} cm/sec, which are similar to, but lower than, hydraulic conductivity estimates for the Eramosa. The hydraulic conductivity estimates for the Deep Bedrock varied by orders of magnitude ranging from 5.4x10^{-8} to 1.5x10^{-4} cm/sec. Relative to the Eramosa and upper Penfield units the hydraulic conductivity of the Deep Bedrock was 2 to 5 orders of magnitude lower.

Groundwater elevation data indicate that the groundwater horizontal hydraulic gradient in the Eramosa generally slopes down toward northeast and east, with the exception of the northern portion of the Cinemark property where the horizontal hydraulic gradient generally slopes down to the southeast. The magnitude of the horizontal hydraulic gradient varies between areas across the RI Study Area. The hydraulic potential likely reflects overall site-wide horizontal groundwater flow patterns in the Eramosa across the RI Study Area. While the hydraulic gradients represent overall groundwater flow patterns, smaller scale groundwater flow is expected to be more complex due to variations in fracture aperture and interconnectivity. The horizontal hydraulic gradient in the Eramosa ranged from 0.0004 to 0.0061 feet per foot (ft/ft). The estimated horizontal groundwater velocity under non-recharge conditions in the Eramosa ranges from 3.5x10^{-4} to greater than 1.4x10^{-1} cm/sec (approximately 1 to greater than 390 feet per day [ft/day]).Calculation of the horizontal hydraulic gradients based on the groundwater elevation data from the upper Penfield and the Deep Bedrock wells was not conducted because of the limited number of wells and spatial distribution of the wells in these formations.

As part of the storm water management program, recharge wells are present on both the former RFM and former AMSF Sites. The recharge wells are present in the bedrock to depths as deep as 149 ft bgs and provide a mechanism for the vertical flow of water and the transport of COCs. Five recharge wells are present on the former AMSF Site and one is present on the former RFM Site. Recharge well AMSF-RW-2, a 149 ft deep open borehole recharge well located in the northwestern portion of the former AMSF Site, receives runoff from the northwestern roof of the former AMSF building and portions of nearby paved and non-paved surfaces. AMSF-RW-2 is located in the area where the highest TCA and related degradation product concentrations were observed in groundwater and bedrock matrix samples during the RI. The recharge well rapidly transmits tens to hundreds of thousands of gallons of water from precipitation events into the bedrock system. This very large runoff flux into the bedrock system through transmissive solution-enlarged fractures results in variable groundwater COC concentrations. In addition, the deep recharge wells provide vertical conduits for vertical groundwater flow between the Eramosa, Penfield and Deep Bedrock groundwater units.

Groundwater elevation monitoring of Eramosa and Penfield monitoring wells documented groundwater elevation responses to precipitation runoff recharge events in the Site and off-Site recharge wells. The groundwater elevation responses showed that semi-radial hydraulic gradients and groundwater flow develop around the recharge wells during groundwater recharge events. In addition, the recharge wells provide vertical conduits for vertical groundwater flow between the Eramosa, upper Penfield and Deep Bedrock groundwater units. Groundwater elevations in the Deep Bedrock monitoring wells showed limited to no response to the recharge events in the recharge wells.

1.3.3.3 Surface Water Hydrology

This section presents a summary of the RI Study Area surface water hydrology. A detailed description of surface water hydrology is presented in Section 2.4 of the RFM RIR.

Surface Water Bodies

There are no surface water bodies in the RI study area. Little Black Creek, which flows to the east through the Town of Gates, New York, is located approximately ¾ miles south of the former RFM Site and is the closest surface water body to the Site. The Erie Canal, a man-made water way connecting Lake Erie to the Hudson River in Albany, New York, is located approximately 2¼ miles northeast of the Site. In addition, the Site is located south of Lake Ontario in New York. No federal or state wetlands are located on or adjacent to the Site.

Stormwater Recharge Well ITT-W-1

Before the former RFM building was demolished in December 2015, roof drainage from the southwestern two-thirds of the former RFM building roof was transported by gravity through subsurface drain lines to recharge well ITT-W-1, which has a depth of 137 ft bgs. It is our understanding that the Town of Gates purportedly allowed the installation of the recharge wells for stormwater management, but documentation of this is not available. The NYSDEC did not regulate these types of injection wells at the time they were installed. As of April 5, 2000, stormwater management wells in New York State are considered Class V Injection Wells and are defined and regulated by the EPA under 40 CFR 147.1651.

2. REMEDIAL GOALS AND OBJECTIVES

2.1 Remedial Goals

NYSDEC issued a ROD on March 30, 2020, which included these final remedy elements:

2.1.1 Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development

2.1.2 Excavation

Exposed soils (soils not covered by pavement, concrete, paved surface parking areas, sidewalks, building foundations and building slabs) in the upper foot which exceed the commercial SCOs will be excavated and transported off-site for disposal. Approximately 14 cubic yards of SVOC contaminated soil will be removed from the south lawn area of the site.

Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the site.

2.1.3 Cover System

A site cover will be required to allow for commercial use of the site in areas where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where a soil cover is to be used it will be a minimum of one foot of soil placed over a demarcation layer, with the upper six inches of soil of sufficient quality to maintain a vegetative layer. Soil cover material, including any fill material brought to the site, will meet the SCOs for cover material for the use of the site as set forth in 6 NYCRR Part 375-6.7(d). Substitution of other materials and components may be allowed where such components already exist or are a component of the tangible property to be placed as part of site redevelopment. Such components may include, but are not necessarily limited to: pavement, concrete, paved surface parking areas, sidewalks, building foundations and building slabs

2.1.4 Recharge Well Decommissioning

Stormwater recharge well ITT-W-1 located near the southwest corner of the ITT property will be decommissioned to eliminate the pathway for vertical contaminant migration. The decommissioning method will be specified in the Remedial Design

2.1.5 Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

- require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allow the use and development of the controlled property for commercial use or industrial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and
- require compliance with the Department approved Site Management Plan.

2.1.6 Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

   Institutional Controls: The Environmental Easement discussed in Paragraph 5 above.
   Engineering Controls: The cover system discussed in Paragraph 3 above.

   This plan includes, but may not be limited to:

   - an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
   - a provision should redevelopment occur to ensure no soil exceeding protection of groundwater concentrations will remain below storm water retention basin or infiltration structures.
   - descriptions of the provisions of the environmental easement including any land use and/or groundwater water use restrictions;
   - a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described in Paragraph 2 above will be placed in any areas where the upper one foot of exposed surface soil exceed the applicable soil cleanup objectives (SCOs);
   - a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed on the site and in off-site areas of contamination, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;

  - provisions for the management and inspection of the identified engineering controls;
  - maintaining site access controls and Department notification; and
  - the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.
- b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
  - monitoring (on-site and off-site) of groundwater, soil vapor, sub-slab soil vapor, and indoor air to assess the performance and effectiveness of the remedy;
  - a schedule of monitoring and frequency of submittals to the Department; and
  - monitoring for vapor intrusion for any buildings as may be required by the Institutional and Engineering Control Plan discussed above.
- c. Provisions for a contingency remedy that will be implemented if data indicates that the groundwater contaminant plume is expanding

As requested by the NYSDEC during a call with ITT and NYSDEC on April 23, 2020, a groundwater monitoring program will be implemented between the development of the RAWP and the acceptance of the Site Management Plan (SMP).

2.2 Remedial Action Objectives

The following remedial action objectives (RAOs) for the former RFM Site were introduced in Section 6.5 of the ROD.

2.2.1 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with soil.
- Prevent inhalation of or exposure to COCs potentially volatilizing from soil.

RAOs for Environmental Protection

- Prevent migration of COCs in groundwater or surface water.

2.2.2 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with COC levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from groundwater.

RAOs for Environmental Protection

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water COCs.

2.2.3 Soil Vapor

RAOs for Public Health Protection

Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

3. SELECTED REMEDY

The selected remedy for the former RFM Site includes the following activities:

- Remedial Actions
  - Excavation and restoration of PAH contaminated soil from the south lawn area
  - Recharge well decommissioning
- Engineering Controls
  - Cover System repairs

As requested by the NYSDEC, the RAWP will also include a groundwater monitoring program that will be completed during the period between the development of the RAWP and the acceptance of the FER.

The selected remedy assumes the existing fence around the site will be maintained during remedy implementation. The remedy also includes other components that will be developed later. These components include:

- Institutional Controls (outlined in Section 2.1.5)
- Groundwater Monitoring (outlined in Section 3.1.3)
- Site Management Plan (Outlined in Section 2.1.6)

3.1 Soil Excavation

Exposed soils (soils not covered by pavement, concrete, paved surface parking areas, sidewalks, building foundations and building slabs) in the upper foot which exceed the commercial SCOs will be excavated and transported off-site for disposal. Approximately 14.8 cubic yards of PAH contaminated soil will be removed from the south lawn area of the site to address this. As indicated in the excavation design shown in **Figure 3-1**, an area approximately 20-feet long, 20-feet wide, and 1 foot deep will be excavated. Prior to initiating the excavation activities, silt fencing will be installed around the perimeter of the excavation and a roll-off container or 55-gallon drums will be staged on plastic sheeting adjacent to the excavation area. The soils will be excavated using earth moving equipment and or hand tools and placed directly into the roll-off or drums. Drums and roll-offs will be covered at the end of each workday and during transportation. Roll-offs and drums will also be secured at the end of each workday.

<u>Confirmation Sampling</u>

Once the 20 feet long by 20 feet wide area has been excavated to a depth of 1 foot, confirmation soil samples will be collected from the approximate midpoint of each side wall and the center of the excavation base. Each grab sample will be collected in certified clean, laboratory bottleware using disposable equipment. The collected samples will be analyzed for PAHs by USEPA method 8270D. Quality assurance (QA)/ quality control (QC) samples, consisting of one blind duplicate sample and one MS/MSD sample pair. Each analytical sample will be labelled and placed in a cooler containing wet ice.

<u>Sample Analyses</u>

The confirmation soil samples and required QA/QC samples will be submitted to an ELAP-certified laboratory under the chain-of-custody guidance provided in the QAPP (**Appendix 1**). A complete

Category B analytical data package and EQuIS four-file electronic data deliverable will be obtained from the laboratory, which would allow for validation of the results in a manner consistent with the QAPP (**Appendix 1**). The data validation will be summarized in a data usability summary report and submitted to NYSDEC with a NYSDEC-compliant EDD.

Data Evaluation

Upon receipt, the confirmation analytical results will be compared to the 6 NYCRR Part 375 Commercial Use SCOs. If detected PAH concentrations exceed the Commercial Use SCOs the excavation will be expanded by at least 1 foot in the direction of the exceeding sample and the freshly excavated surface will be resampled until the PAH concentration are below the Commercial Use SCOs.

Survey

The limits of the excavation and location of final confirmation samples will be surveyed and presented in an "as-built" drawing bearing a NYS professional engineer's stamp and signature. The "as-built" drawing, which will be included in the FER, is discussed further in **Section 11** of this RAWP.

Surface Restoration

When results of the confirmation samples indicate that PAH concentrations of the four side walls and base of the excavation are below Commercial Use SCOs, backfilling will begin. If the confirmation samples indicate PAH concentrations are above the Commercial Use SCOs and further excavation is impractical, the excavation will be lined with orange snow fence to serve as a demarcation layer prior to backfilling. If a side wall sample exceeds Commercial Use SCOs and backfilling occurs, ITT will develop an appropriate plan in consultation with NYSDEC that may include placement of 1-foot of cover material.

Backfilling will be completed with clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) or commercially available bagged soil to establish the design grades at the site. A vibratory compactor will be utilized for every 12-inches of backfill material. The backfilled area will be reseeded with commercially available grass seed and covered with straw. The area will be watered with sufficient frequency to support vegetation growth.

If imported backfill (other than commercially available bagged soil) is used, a "Request to Import/Reuse Fill or Soil" form will be completed and submitted to NYSDEC for review. The backfill material must be approved by NYSDEC before it is brought to the site.

Documentation

For imported backfill (other than commercially available bagged soil), copies of the bill of lading to document the volume of backfill and source of the material will be provided in the FER.

If commercially available bagged soil is used, copies of the sales receipt(s) showing the number of bags purchased and photographs of the material being used at the site and the number of bags used will be included in the FER.

The management of soil and used personal protective equipment (PPE) wastes produced during the soil excavation remedial action is described in **Section 7** of this RAWP.

3.1.1 Cover System Repairs

As indicated in the ROD, to allow for commercial use of the former RFM Site, areas where the upper one foot of exposed surface soil may exceed the applicable soil cleanup objectives (SCOs) should have a cover material that will meet the commercial uses SCOs, as set forth in 6 NYCRR Part 375-6.7(d) or utilize cover materials types already at the RFM Site such as the existing asphalt parking surface and concrete slab of the former RFM building (**Figure 3-2**).

Areas where the existing asphalt or concrete cover has been damaged or degraded such that there could be potential contact with the soil will be patched during the remedial implementation. A visual inspection of the asphalt and concrete covers will be completed to document damaged or degraded portions of the existing cover systems. Each area identified will be photographed and digitally mapped (*e.g*. using a high-resolution handheld global positioning system or a high-resolution drone aerial photography). Notes from the visual inspection will be reviewed to estimate the repair materials needed to maintain the integrity of the existing cover.

Loose debris will be cleared from each degraded asphalt or concrete cover areas before each is covered by commercially available bagged asphalt cold patch or other suitable material. Cold patch repairs will be compressed manually or by use of a small mechanical roller or tamper. Upon completion of the cover system repairs each final repair will be photographed.

The cover system repair implementation and a photolog documenting each repair will be incorporated into the FER.

3.1.2 Recharge Well Decommissioning

Recharge well ITT-W-1 (**Figure 3-3**) will be properly decommissioned in accordance with NYSDEC's CP-43 *Commissioner's Policy on Groundwater Monitoring Well Decommissioning* (NYSDEC, 2009) to reduce the potential for surface runoff to recharge the shallow, intermediate, and deep bedrock groundwater. A USEPA Underground Injection Control (UIC) Program inventory form for Class V Wells for Injection of Non-Hazardous Fluids will be prepared and submitted to USEPA. The inventory form will also document closure of the well. The decommissioning activities will include:

- Review of available well construction, borehole, and borehole video logs
- Placement of a cement-bentonite grout within the borehole to a depth above the former subsurface roof lateral
- Excavation and removal of the well cover and permanent steel casing to a depth of approximately five feet below ground surface
- Placement of a ferrous marker
- Placement of clean back fill materials and restoration of the surrounding asphalt surface.

Prior to mobilizing for the well decommissioning task, available borehole logs will be reviewed to identify potential transmissive fractures or fracture zones that intersect the uncased borehole. Depths of open fractures that could result in grout loss to the formation will be noted.

The grout material will consist of Type I Portland cement mixed with either a powdered or granular bentonite and will be prepared in accordance with American Society for Testing and Materials (ASTM) Method D5092, such that a ratio of approximately 3 to 5 pounds of bentonite will be mixed with 6½ to 7 gallons of water per 94-pound sack of cement. The grout will be pumped into the borehole through a tremie pipe such that the grout is injected within the lowest five feet of the borehole displacing the water column as the grout is injected. The well casing will be fitted with a diverter to redirect groundwater that is displaced out of the top of the recharge well to secondary containment.

If open fractures were noted in borehole log review, the approximate volume of grout needed to fill the borehole annulus to approximately five feet above the open fracture will be calculated and injected. A depth tape will be used to check the grout level; if the grout level recedes to the open fracture depth, the open fracture interval will be sealed with bentonite chips or pellets before applying additional grout to minimize the potential for grout loss to the formation. After ITT-W-1 has been grouted above the subsurface roof drain lateral and within 5 feet of the ground surface the grout will be allowed to cure overnight.

After the grout has cured, community air monitoring will be initiated before the current well cover and upper 5 feet of steel casing will be excavated and removed. A ferrous marker will be placed on top of the cut casing before the upper 5 feet of the borehole is backfilled with bagged, commercially available, sand or a clean fill as defined in 6 NYCRR Part 375-6.7(d). Asphalt cold patch will be used to repair the surface cover disturbed during the abandonment of the recharge well.

The management of groundwater, soil, debris, and PPE wastes produced during the decommissioning of recharge well ITT-W-1 is described in **Section 7** of this RAWP.

3.1.3 Groundwater Sampling and Analysis

Groundwater sampling and analysis, as requested by NYSDEC, will be conducted annually until the remedial component of this RAWP have been completed and the SMP has been approved. Before mobilizing, the meteorological forecast should be reviewed to select a period for the groundwater sampling event with little or no precipitation before or during the sampling event if possible. At the start of each Pre-SMP Groundwater Sampling event, a round of synoptic Site-wide water level measurements will be collected from the former RFM Site and Cinemark property and recorded on a field form.

The groundwater samples will be collected from each well in a manner consistent with the low flow groundwater sampling guidance or passive diffusion bag (PDB) guidance provided in the QAPP (**Appendix 1**), which includes the specific depth interval for positioning of the sampling pump. The Pre-SMP groundwater samples will be collected from the wells listed below and highlighted in **Figure 3-4**.

	On-Site Wells	Downgradient Wells
Shallow	ITT-SBW-2, ITT-SBW-4, ITT-SBW-5A, ITT-SBW-7, ITT-SBW-8, and ITT-SBW-23,	ITT-SBW-13, ITT-SBW-14, and ITT-SBW-16
Intermediate	ITT-IBW-20	ITT-IBW-19

Well total depth, depth to water and intake depth of the pump or tubing will be recorded on a field log. Additionally, water quality parameters including pH, temperature, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP) and turbidity will be recorded on a field log until the stabilization criteria provided in the QAPP (**Appendix 1**) have been observed.

Upon stabilization, groundwater samples will be collected in clean, laboratory-provided bottleware, labelled, and placed in a cooler containing wet ice.

When possible dedicated or disposable sampling equipment will be used. Non-dedicated, non-disposable equipment that could potentially come in contact with the groundwater samples will be decontaminated before and after each use in a manner consistent with the equipment decontamination field guidance document provided in the QAPP (**Appendix 1)**.

Sample Analyses

The collected groundwater samples will be submitted to an ELAP-certified laboratory under the chain-of-custody procedures described in the QAPP (**Appendix 1**) for VOC analysis by USEPA Method 8260C and 1,4-Dioxane analysis by selective ion monitoring for USEPA Method 8270D. QC samples will be collected at a frequency of one set per 20 environmental samples and will include blind duplicates, equipment blanks (if non-disposable equipment is used), and MS/MSD sample pairs. Additionally, trip blanks for VOC analysis will be included with each sample cooler containing VOC samples.

The analytical results will be reported by the laboratory in a Category B analytical data package and EQuIS-compatible four-file EDD. The data will be submitted to NYSDEC in a NYSDEC-compliant EDD.

Data Evaluation and Reporting

Upon receipt, the groundwater analytical results will be tabulated and compared to the 6 NYCRR Part 703 Water Quality Standards and the New York State Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (NYSDEC, 1998). The analytical results, field logs, and primary constituent trend graphs will be summarized in a letter report that will be submitted to the NYSDEC. Letter reports or information contained in the reports will be submitted in the FER.

The management of groundwater, decontamination water, and used PPE wastes for each groundwater sampling event is described in **Section 7** of this Work Plan.

3.1.4 Decontamination

A temporary truck wash and decontamination pad will be built at the site. Decontamination of excavators or other loading equipment shall consist of washing the bucket with a pressure washer over the decontamination pad. Tires and tracks of all machinery shall be inspected and washed with pressure washer prior to leaving the construction area. The pad will accommodate a sump for collection of water generated. Generated water will be containerized and managed as outlined in **Section 7**.

Should soil or dust accumulate on facility or public roadways as a result of traffic associated with this construction activity, the roadways will be swept with a street sweeper and sweepings will be containerized and managed as outlined in **Section 7**.

4. EROSION AND SEDIMENT CONTROL

Erosion and sediment control (ESC) for the project will be completed in accordance with the latest editions of *New York Standards and Specifications for Erosion and Sediment Control* prepared by NYS Department of Environmental Conservation (NYSDEC, 2005), and *New York State Stormwater Management Design Manual* prepared by the Center for Watershed Protection for the NYSDEC (NYSDEC, 2010b). In addition, ESC measures will comply with any other applicable NYSDEC requirements.

Less than 1 acre of the former RFM Site will be disturbed by the soil excavation and recharge well decommissioning. Therefore, a stormwater pollution prevention plan (SWPPP) is not required for the project. Erosion and sediment control measures (*e.g.* silt fencing, wattles, or an approved equivalent) will be installed around excavation areas during the implementation of the remedial actions if the excavation activity will last more than one day or precipitation is forecasted during the period that the excavation will be completed. Installed erosion control measures will be inspected at the end of each day until the surface covers are in place. Once the remedial measure is completed, the ESC measures will be removed.

5. QUALITY CONTROL

A QAPP has been prepared for the activities associated with this RAWP and is provided as **Appendix 1**. The purpose of the QAPP is to assist in generating analytical data of a known and acceptable level of precision and accuracy. The QAPP provides direction to the field team and laboratory regarding efforts associated with environmental samples and field quality control (QC) sample collection, management, analysis and reporting. The QAPP includes information regarding the data quality objectives and sets forth specific procedures to be used during field sample collection activities, laboratory analyses and, if required, data validation.

The QAPP in **Appendix 1** was prepared with guidance from the following documents:

- United States Environmental Protection Agency (USEPA). 2006a. *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*, EPA QA/R-5. Washington, D.C.
- New York State Department of Environmental Conservation (NYSDEC). 2010. *DER-10 Technical Guidance for Site Investigation and Remediation*. Albany, NY.

The QAPP in **Appendix 1** of this RAWP will be updated and expanded as necessary for sampling and analyses required by the SMP.

6. HEALTH AND SAFETY

The existing RI/FS Work Plan HASP (OBG, 2004), 2007, and 2008 HASP addenda for the former RFM Site are provided in **Appendix 2** of this Work Plan. The existing HASP will be amended by Job Safety Analysis (JSA) or Activity Hazard Analysis (AHA) to cover activities and specific hazards associated with the soil excavation, recharge well abandonment, and surface cover repairs.

6.1 Community Air Monitoring Program

A Community Air Monitoring Plan (CAMP) is included as Section 5.4 in the RI/FS Work Plan HASP (OBG, 2004) for completion of intrusive work. During the implementation of the remedy, CAMP monitoring will be performed during the soil excavation and grouting and decommissioning of the recharge well. The CAMP will be performed in a manner consistent with the requirements of NYSDEC DER-10 guidance, and in the format outlined in Section 1.9 and Appendix 1A of DER-10 (NYSDEC, 2010).

7. WASTE MANAGEMENT

Site remediation activities will generate wastes which will require appropriate management in accordance with state and federal regulations (Title 40 of the Code of Federal Regulations [CFR] Parts 239 through 279 and Title 6 of New York Codes, Rules and Regulations [6 NYCRR] Chapter IV, Subchapter B Parts 360 through 376). The anticipated media and wastes include the following:

- Excavated soils;
- Groundwater purged during well abandonment and groundwater sampling tasks;
- Decontamination fluids resulting from decontamination of sampling and construction equipment; and
- Personal protective equipment (PPE) and associated debris resulting from completion of the proposed work activities.

The management of these wastes at the Site is discussed below.

7.1 Excavated Soils

Excavated soils will be placed in drums or roll-offs pending disposal. Samples will be characterized as appropriate to provide documentation for the disposal facility. Materials will be disposed off-site at a facility permitted to accept the material.

7.2 Groundwater

Groundwater generated during the implementation of this RAWP will be containerized in 55-gallon drums and temporarily staged at the Site pending characterization. At the conclusion of field activities, these materials will be appropriately characterized and transported off Site for treatment and/or disposal at a permitted facility.

7.3 Decontamination Fluids

Decontamination fluids will be containerized in 55-gallon drums and temporarily staged at the Site pending characterization. At the conclusion of field activities, these materials will be appropriately characterized and transported off Site for treatment and/or disposal at a permitted facility.

7.4 Personal Protective Equipment

Used PPE and other associated debris (*e.g.*, ground plastic/polyethylene) will be containerized in 55-gallon drums or other on-Site solid waste receptacle and temporarily staged at the Site. These materials will be transported off-Site for disposal at a permitted solid waste disposal facility.

7.5 Documentation

Consistent with the requirement of DER-10, disposal documentation (e.g. approvals, permits, contained-in determinations, etc.) and waste characterization sample results will be included in the FER.

8. RECORDKEEPING

During implementation of the selected remedy, field activities will be documented in weekly reports. Photographs of the field activities will be taken and compiled in a photo log. Documentation of material types, sources and quantities will be recorded. Construction of the selected remedial elements will be documented in the FER for the former RFM Site.

9. COST ESTIMATE

A cost estimate for the selected remedy prepared during development of the FS (OBG, 2015) is provided in **Appendix 3** of this report. The total anticipated 30-year present worth cost for the selected remedy from the FS is approximately $794,000 accounting for the completion of the former RFM building abatement and demolition prior to the development of the RAWP.

10. SCHEDULE

A schedule for implementing the RAWP activities is provided in **Figure 10-1**. This schedule begins with the effective date of the NYSDEC ROD and progresses through the Final Engineering Report to NYSDEC. Assumptions associated with the schedule provided in **Figure 10-1** include 60 business days for review of the RAWP and Final Engineering Report by NYSDEC, and 20 business days for review and approval of the resubmittal.

11. REPORTING

Following completion of the remediation activities, a Final Engineering Report (FER) will be developed.

11.1 Final Engineering Report

The FER will be prepared consistent with the requirements of DER-10 and will include, but not be limited to, the following:

- A description of the remedial activities completed
- A description of the site and site boundaries
- Documentation that remediation requirements have been or will be achieved in accordance with approved timeframes
- A description of institutional/engineering controls (IC/ECs) to be used, including mechanisms to implement, maintain, monitor, and enforce them
- Documentation that any land use restrictions, IC/ECs, and/or any requirements for remedy operation, maintenance, and monitoring (OM&M) are contained in a duly recorded Environmental Easement and that local governments are notified
- Documentation that an OM&M Plan for engineering controls employed at the RFM Site has been approved by DEC
- A description that required financial assurance mechanisms have been executed.

REFERENCES

GeoServices Ltd. 1992a. *Baseline Environmental Characterization of the Alliance Metal Stamping and Fabricating Property*, Pixley Industrial Park, Gates, NY. February 26, 1992.

Golder Associates, Inc. 2000a. *Report on Groundwater Investigation*, ITT Industries, Fluid Handling System. March 2000.

NYSDEC. 2001. *Site Investigation Report ITT Automotive Fluid Handling Systems and Former Alliance Metal Stamping and Fabricating, Town of Gates, Monroe County*. December 2001.

NYSDEC, 2005. *New York State Standards and Specifications for Erosion and Sediment Control*, NYS Soil and Water Conservation Committee for NYSDEC, August 2005.

NYSDEC. 2010a. *Technical Guidance for Site Investigation and Remediation (DER-10).* Division of Environmental Remediation. May 3, 2010.

NYSDEC. 2010b. *Division of Environmental Remediation Green Remediation (DER-31).* NYSDEC Program Policy. August 11, 2010.

O'Brien & Gere. 2014. *Remedial Investigation Report*. Former ITT Rochester Form Machine Facility, Site # 8-28-112, Town of Gates, NY 3356 / 35273, October 20, 2014.

O'Brien & Gere. 2015. *Feasibility Study*. Former ITT Rochester Form Machine Facility, Site # 8-28-112, Town of Gates, NY 3356 / 35273, April 24, 2015.

FIGURES

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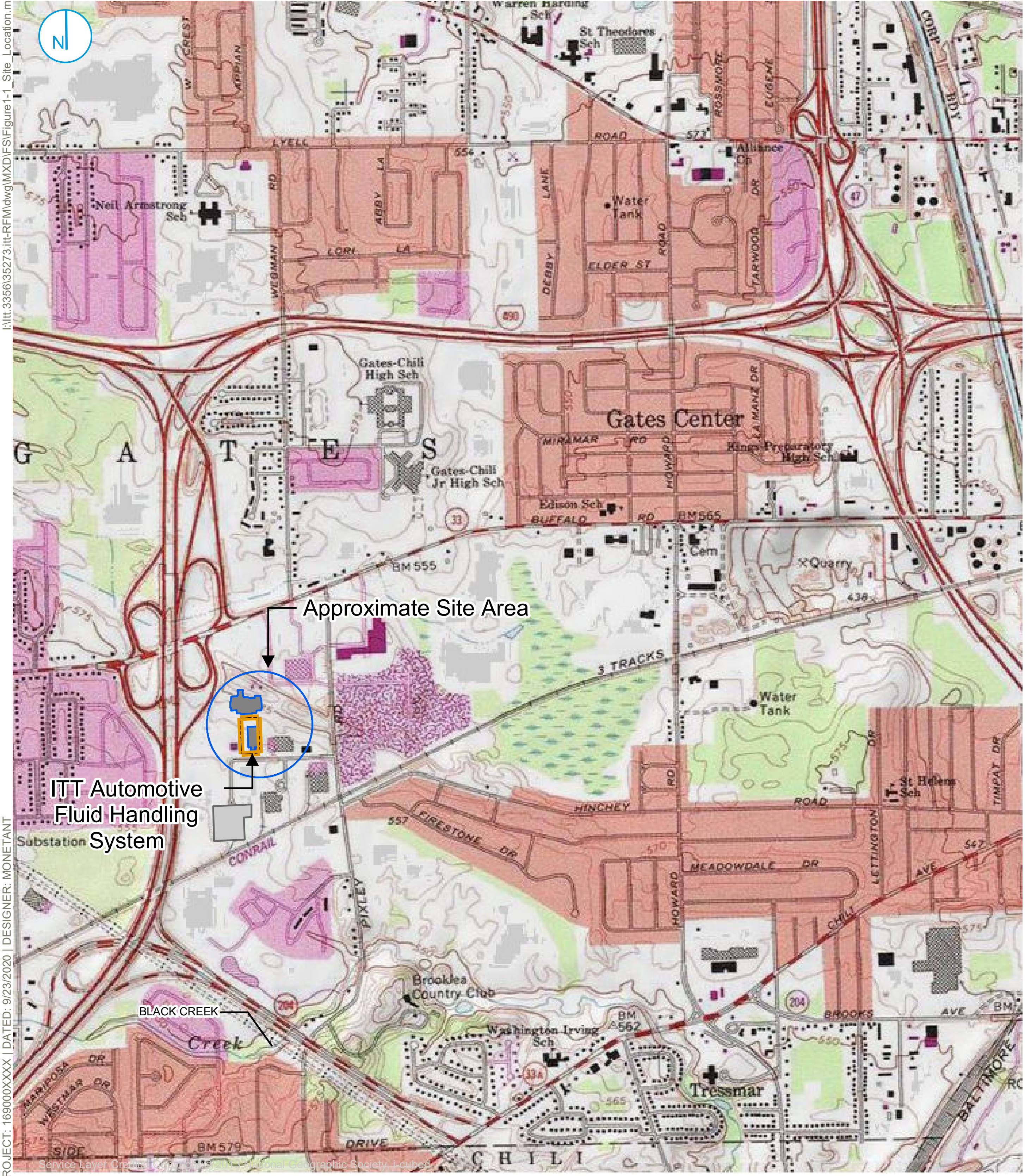

KEY MAP

Map Scale: 1:1:22,934;
Map Center: 77°41'57"W 43°8'51"N

▬ PROPERTY LINE

▨ BUILDING

0 1,000 2,000 Feet

ITT AUTOMOTIVE FLUID HANDLING SYSTEM

SITE LOCATION

SITE #8-28-122
Town of Gates,
New York

FIGURE 1-1

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

RAMBOLL

▬ PROPERTY LINE

▨ CONCRETE SLAB (FORMER RFM BUILDING)

■ ASPHALT COVER

0 100 200 Feet

ITT AUTOMOTIVE FLUID HANDLING SYSTEM
SITE PLAN

SITE #8-28-122
Town of Gates,
New York

FIGURE 1-2

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

RAMBOLL

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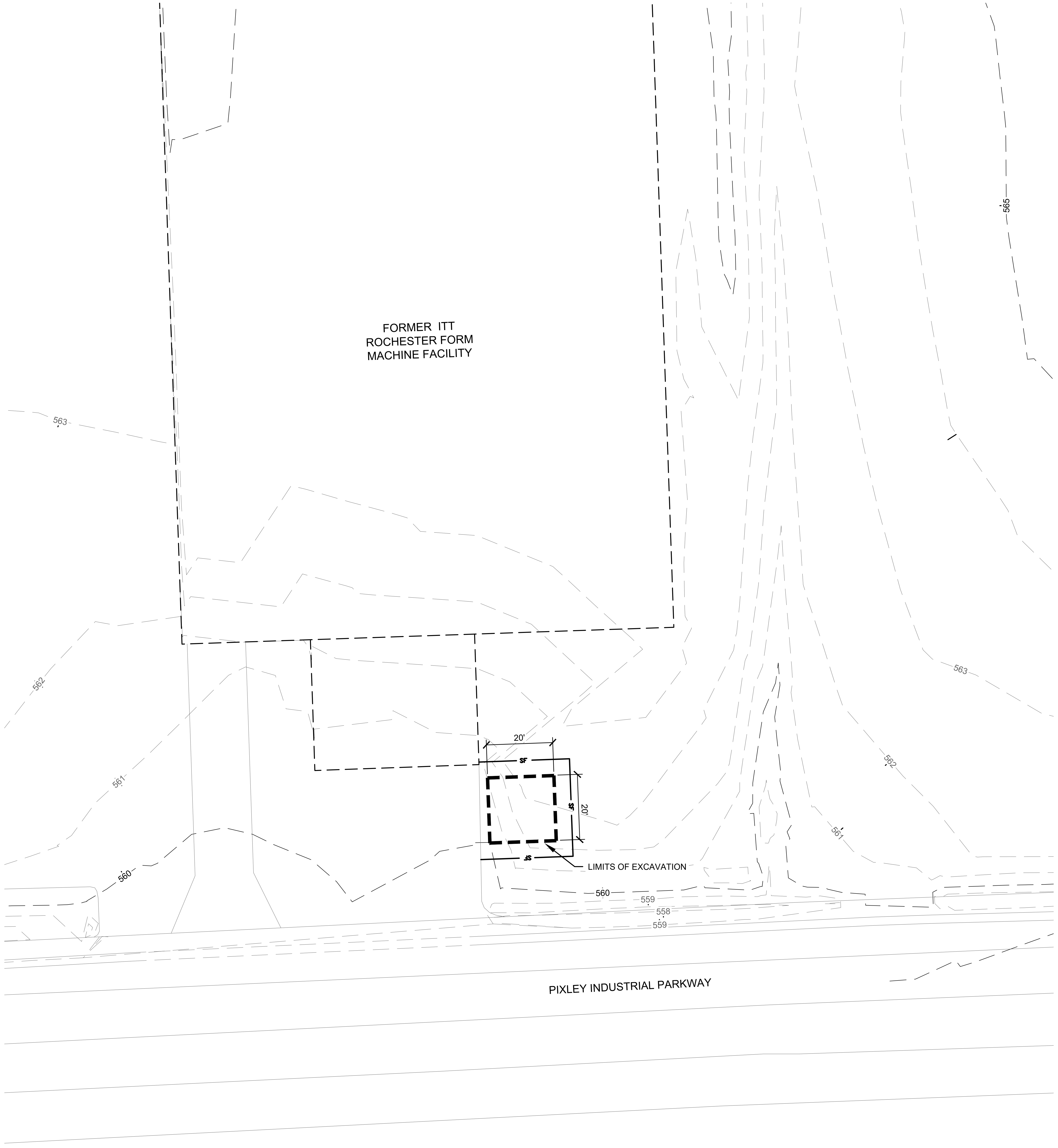


EXCAVATION PLAN

SCALE: 1"=30'

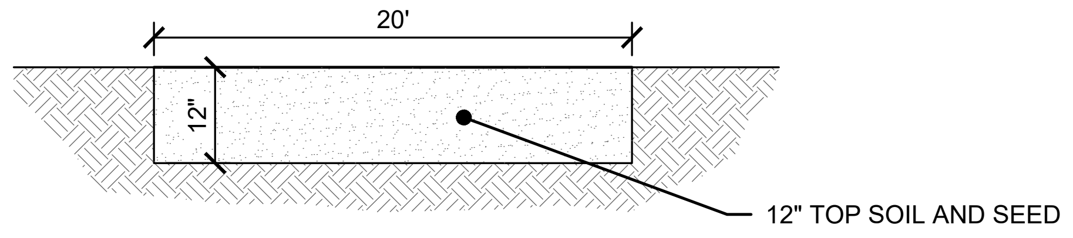
30' 0 30'

EROSION CONTROL NOTES:

1. ALL SILT FENCE LOCATIONS SHOWN HERE ARE APPROXIMATE ONLY AND SHALL BE PROVIDED AT A MINIMUM.
2. THE CONTRACTOR SHALL MAINTAIN OR PROVIDE BYPASS OF FLOW FROM EXISTING DRAINAGE CHANNELS AND CATCH BASINS AT ALL TIMES. PROPER EROSION CONTROL TECHNIQUES SHALL BE IMPLEMENTED AS REQUIRED.
3. THE CONTRACTOR SHALL INSTALL EROSION AND CONTROL MEASURES PRIOR TO DISTURBING EXISTING SITE SOILS AND VEGETATION.

DRAWING NOTES:

1. EXISTING SITE INFORMATION PRESENTED SHOULD BE CONSIDERED APPROXIMATE ONLY.
2. EXACT DIMENSIONS AND LOCATIONS OF ALL STRUCTURES AND UTILITIES ARE CONSIDERED APPROXIMATE ONLY AND SHALL BE VERIFIED AS REQUIRED IN THE FIELD BY THE CONTRACTOR.
3. OTHER UNDERGROUND UTILITIES MAY EXIST, THE LOCATIONS, DEPTHS AND EXTENT OF WHICH ARE UNKNOWN. THE CONTRACTOR SHALL DETERMINE THE LOCATION AND ELEVATION OF ALL UTILITIES IN THE FIELD AS IT MAY PERTAIN TO THE CONTRACTORS WORK PRIOR TO CONSTRUCTION.
4. DURING CONSTRUCTION THE CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION AND SUPPORT OF ALL UNDER AND ABOVE GROUND UTILITIES, AND STRUCTURES AFFECTED BY THE CONTRACTOR'S WORK.
5. THE CONTRACTOR SHALL CONTACT "DIG SAFELY NY" WITHIN 72 HOURS PRIOR TO THE COMMENCEMENT OF THE WORK. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UTILITIES AND IF NECESSARY NOTIFY THE AFFECTED UTILITY DEPARTMENTS ONE WEEK PRIOR TO DIGGING IN ANY PORTION OF THE SITE. DIG SAFELY NEW YORK PHONE NUMBER: 1-800-962-7962. WEBSITE: WWW.DIGSAFELYNEWYORK.COM
6. THE CONTRACTOR SHALL BE AWARE THAT PORTIONS OF THE INSTALLATION MAY BE PERFORMED PROXIMATE TO OVERHEAD POWER LINES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN APPROPRIATE MINIMUM REQUIRED CLEARANCE FROM OVERHEAD ELECTRICAL LINES AND UTILITY POLES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH APPROPRIATE UTILITY COMPANY TO HAVE OVERHEAD ELECTRICAL LINES SHIELDED/PROTECTED AND FLAGGED (AS APPROPRIATE) PRIOR TO THE INITIATION OF THE WORK EFFORTS. THE CONTRACTOR IS ALSO REQUIRED TO GROUND EQUIPMENT (AS NECESSARY) AND PERFORM ALL WORK EFFORTS..
7. THE CONTRACTOR SHALL RESTORE TO PRECONSTRUCTION CONDITIONS OR BETTER ALL SUPPORT AREAS THAT ARE IMPACTED BY REMEDIAL ACTIVITIES, INCLUDING BUT NOT LIMITED TO, EQUIPMENT AND MATERIAL STORAGE AREAS, MATERIAL LOADING AND STAGING AREAS, PARKING AREAS, AND LOCATIONS OF OFFICE TRAILERS.
8. ALL SURFACES DAMAGED OR DESTROYED AS A RESULT OF WORK PERFORMED BY THE CONTRACTOR SHALL BE RESTORED TO PRE-CONSTRUCTION CONDITIONS OR BETTER IN A TIMELY MANNER AND PRIOR TO CONTRACTOR DEMOBILIZATION.
9. EQUIPMENT USED FOR EXCAVATION OF POTENTIALLY IMPACTED SOIL/FILL SHALL BE DECONTAMINATED PRIOR TO TRANSPORT OFF-SITE AND/OR TRANSPORTING/HANDLING CLEAN BACKFILL MATERIALS. THE CONTRACTOR SHALL PROVIDE 6 MIL POLYETHYLENE SHEETING TO COVER THE GROUND IN ALL AREAS BEING USED TO LOAD EXCAVATED MATERIAL INTO TRUCKS WHETHER IN OR OUT OF THE LIMITS OF WORK.
10. LIMITS OF EXCAVATION SHOWN HERE SHALL BE EXCAVATED TO A DEPTH OF 12 INCHES BELOW GRADE.
11. THE CONTRACTOR SHALL PROPERLY TRANSPORT AND DISPOSE OF ALL EXCAVATED MATERIAL FROM THE SITE TO AN APPROPRIATE DISPOSAL FACILITY.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ASSURING THAT ALL SAMPLING ANALYSIS, TRANSPORTATION, AND DISPOSAL REQUIREMENTS OF THE DISPOSAL FACILITY ARE COMPLIED WITH AS APPLICABLE AND THAT FEDERAL, STATE, AND LOCAL GOVERNMENT REQUIREMENTS ARE COMPLIED WITH.



RESTORATION DETAIL

NOT TO SCALE

NORTH

LEGEND

— 560 —	GROUND CONTOUR
— — — —	FORMER BUILDING OUTLINE
━ ━ ━	LIMITS OF EXCAVATION
—— SF ——	LIMITS OF EXCAVATION

EXCAVATION PLAN

ITT
AUTOMOTIVE
FLUID HANDLING
SYSTEM

TOWN OF GEDDES, NEW YORK

FIGURE 3-1

O'BRIEN & GERE ENGINEERS
A RAMBOLL COMPANY

RAMBOLL

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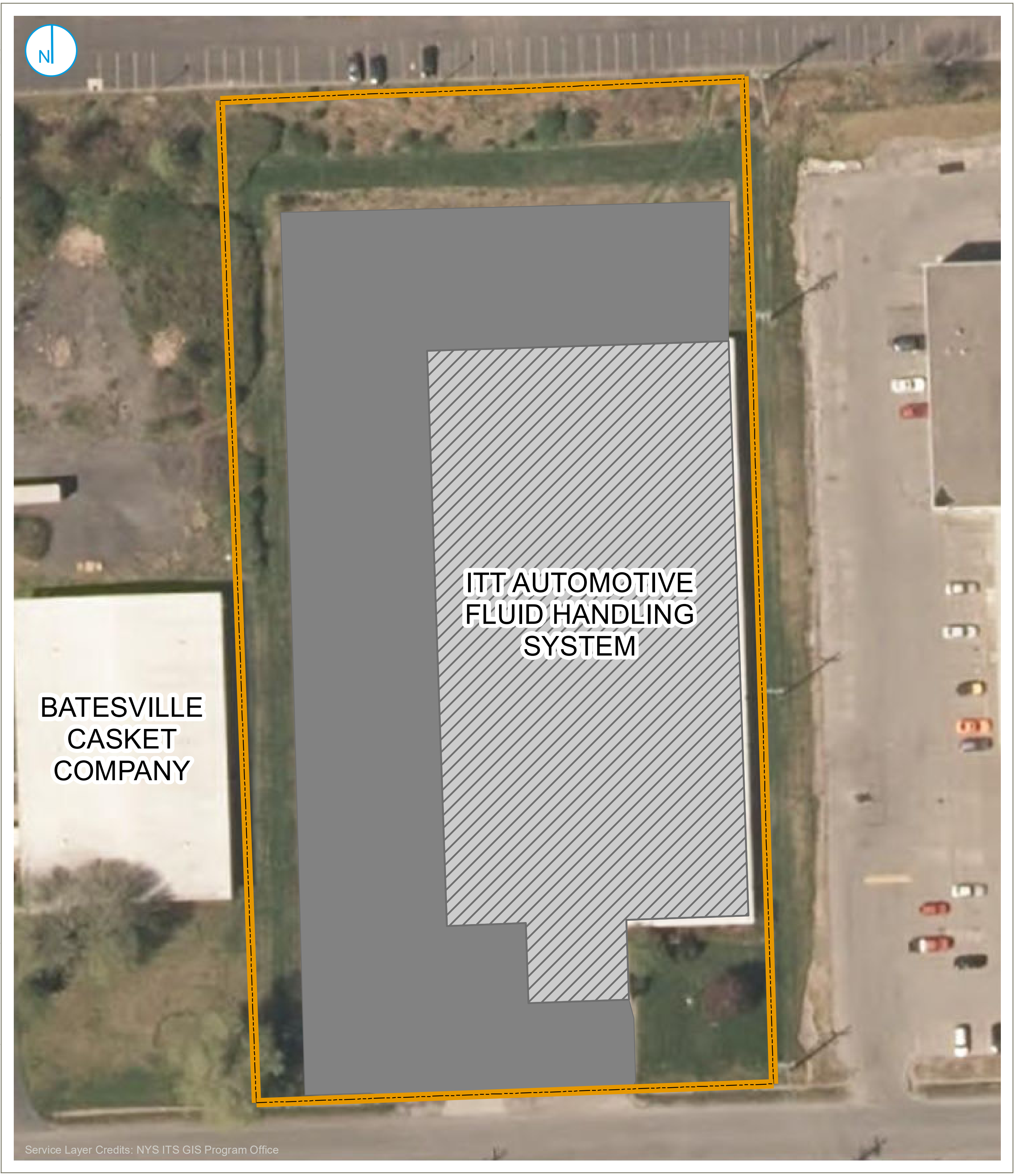

▬ PROPERTY LINE

▨ CONCRETE SLAB (FORMER RFM BUILDING)

■ ASPHALT COVER

0 50 100 Feet

ITT AUTOMOTIVE FLUID HANDLING SYSTEM

COVER TYPES

SITE #8-28-122
Town of Gates,
New York

FIGURE 3-2

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

I:\Itt.3356\35273.itt-RFM\dwg\MXD\FS\Figure3-2_Recharge_Well_ITT_W_1.mxd

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Service Layer Credits: NYS ITS GIS Program Office

━ PROPERTY LINE

▨ CONCRETE SLAB (FORMER RFM BUILDING)

■ ASPHALT COVER

◉ RECHARGE WELL

0 50 100
Feet

ITT AUTOMOTIVE FLUID HANDLING SYSTEM

RECHARGE WELL ITT-W-1

SITE #8-28-122
Town of Gates,
New York

FIGURE 3-3

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

RAMBOLL

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PROJECT: 169000XXXX | DATED: 9/24/2020 | DESIGNER: MONETANT

EXISTING WELLS

- UPPER ERAMOSA DOLOMITE WELL
- LOWER ERAMOSA DOLOMITE WELL
- OTHER WELLS

DAMAGED / DESTROYED WELLS

- PRE-RI MISSING WELL
- PRE-RI ABANDONED
- PRE-RI DAMAGED WELL

Notes

Colored symbols represent wells identified for groundwater sampling and analysis as outlined in Section 3.1.3 of the RAWP.

0 125 250 Feet

ITT AUTOMOTIVE FLUID HANDLING SYSTEM

MONITORING WELL LOCATIONS

SITE #8-28-122
Town of Gates,
New York

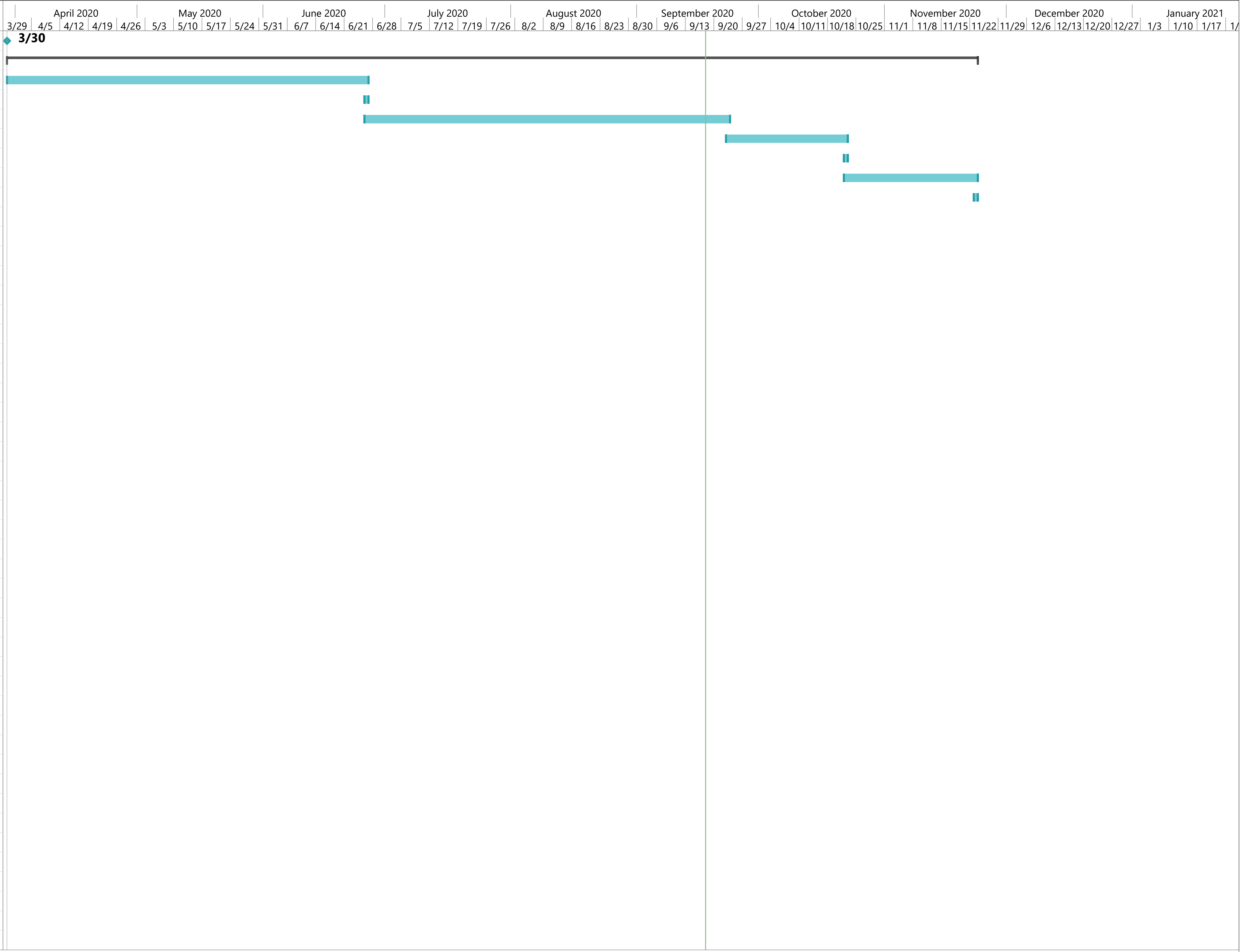
FIGURE 3-4

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

RAMBOLL

Figure 10
ITT Automotive Fluid Handling System
Schedule

ID	Task Name	Start	Finish
1	**Record of Decision Issued**	**Mon 3/30/20**	**Mon 3/30/20**
2	**Remedial Action Work Plan**	**Mon 3/30/20**	**Mon 11/23/20**
3	Development	Mon 3/30/20	Fri 6/26/20
4	Submittal to NYSDEC	Fri 6/26/20	Fri 6/26/20
5	NYSDEC Review	Fri 6/26/20	Wed 9/23/20
6	Review of NYSDEC Comments	Wed 9/23/20	Thu 10/22/20
7	Submit Revised RAWP and Response to Comments	Thu 10/22/20	Thu 10/22/20
8	NYSDEC Review of Revised RAWP	Thu 10/22/20	Mon 11/23/20
9	Anticipated Approval	Mon 11/23/20	Mon 11/23/20
10			
11	**Remedial Action Implementation**	**Mon 4/26/21**	**Wed 8/4/21**
12	**Soil Excavation**	**Mon 4/26/21**	**Wed 8/4/21**
13	Mobilization	Mon 4/26/21	Mon 5/3/21
14	Excavation	Mon 5/3/21	Wed 5/5/21
15	Backfilling and Surface Restoration	Thu 5/6/21	Fri 5/7/21
16	Waste Management and Disposal	Fri 5/7/21	Wed 8/4/21
17			
18	**Recharge Well Decommissioning**	**Mon 5/3/21**	**Wed 8/11/21**
19	Mobilization	Mon 5/3/21	Fri 5/7/21
20	Well Decommissioning	Mon 5/10/21	Wed 5/12/21
21	Backfilling and Surface Restoration	Thu 5/13/21	Fri 5/14/21
22	Waste Handling	Fri 5/14/21	Wed 8/11/21
23			
24	**Cover System Repair**	**Mon 5/10/21**	**Thu 12/2/21**
25	Mobilization	Mon 5/10/21	Fri 5/14/21
26	Asphalt Cover Patching	Mon 5/17/21	Fri 5/21/21
27			
28	**Site Management Plan (SMP)**	**Mon 5/24/21**	**Thu 12/2/21**
29	Development (includes Environmental Easement)	Mon 5/24/21	Fri 7/30/21
30	Submittal to NYSDEC	Fri 7/30/21	Fri 7/30/21
31	NYSDEC Review	Mon 8/2/21	Tue 11/2/21
32	Review of NYSDEC Comments	Tue 11/2/21	Thu 12/2/21
33	Submit Revised SMP and Response to Comments	Thu 12/2/21	Thu 12/2/21
34			
35	**Final Engineering Report (FER)**	**Mon 5/24/21**	**Tue 12/21/21**
36	Development	Mon 5/24/21	Mon 8/23/21
37	Submittal to NYSDEC	Mon 8/23/21	Mon 8/23/21
38	NYSDEC Review	Mon 8/23/21	Mon 11/22/21
39	Review of NYSDEC Comments	Mon 11/22/21	Tue 12/21/21
40	Submit Revised FER and Response to Comments	Tue 12/21/21	Tue 12/21/21
41			
42	**Pre-SMP Groundwater Sampling**	**Wed 4/14/21**	**Thu 7/1/21**
43	Mobilization	Wed 4/14/21	Fri 4/16/21
44	Sampling	Mon 4/19/21	Wed 4/21/21
45	Analytical Analysis	Thu 4/22/21	Tue 6/1/21
46	Letter Report Preparation	Tue 6/1/21	Thu 7/1/21
47	Letter Report Submittal	Thu 7/1/21	Thu 7/1/21



Project: RAWP Project Schedule
Date: Fri 9/18/20

Task	▬	Summary	⊓	Inactive Milestone	◇	Duration-only	▬	Start-only	[	External Milestone	◆	Manual Progress	▬
Split	┅	Project Summary	⊓	Inactive Summary	⊓	Manual Summary Rollup	▬	Finish-only	]	Deadline	⬇		
Milestone	◆	Inactive Task	▭	Manual Task	▬	Manual Summary	⊓	External Tasks	▬	Progress	▬		

Figure 10
ITT Automotive Fluid Handling System
Schedule

ID	Task Name
1	**Record of Decision Issued**
2	**Remedial Action Work Plan**
3	Development
4	Submittal to NYSDEC
5	NYSDEC Review
6	Review of NYSDEC Comments
7	Submit Revised RAWP and Response to Comments
8	NYSDEC Review of Revised RAWP
9	Anticipated Approval
10	
11	**Remedial Action Implementation**
12	**Soil Excavation**
13	Mobilization
14	Excavation
15	Backfilling and Surface Restoration
16	Waste Management and Disposal
17	
18	**Recharge Well Decommissioning**
19	Mobilization
20	Well Decommissioning
21	Backfilling and Surface Restoration
22	Waste Handling
23	
24	**Cover System Repair**
25	Mobilization
26	Asphalt Cover Patching
27	
28	**Site Management Plan (SMP)**
29	Development (includes Environmental Easement)
30	Submittal to NYSDEC
31	NYSDEC Review
32	Review of NYSDEC Comments
33	Submit Revised SMP and Response to Comments
34	
35	**Final Engineering Report (FER)**
36	Development
37	Submittal to NYSDEC
38	NYSDEC Review
39	Review of NYSDEC Comments
40	Submit Revised FER and Response to Comments
41	
42	**Pre-SMP Groundwater Sampling**
43	Mobilization
44	Sampling
45	Analytical Analysis
46	Letter Report Preparation
47	Letter Report Submittal

Project: RAWP Project Schedule
Date: Fri 9/18/20

Task		Summary		Inactive Milestone	◇	Duration-only		Start-only	[	External Milestone	◆	Manual Progress			
Split		Project Summary		Inactive Summary		Manual Summary Rollup		Finish-only	]	Deadline	⬇				
Milestone	◆	Inactive Task		Manual Task		Manual Summary		External Tasks		Progress					

APPENDICES

APPENDIX 1
QUALITY ASSURANCE PROJECT PLAN

Intended for
ITT LLC

Document type
Quality Assurance Project Plan

Date
October 2020

QUALITY ASSURANCE PROJECT PLAN
ITT AUTOMOTIVE FLUID HANDLING SYSTEM

RAMBOLL Bright ideas. Sustainable change.

QUALITY ASSURANCE PROJECT PLAN
ITT AUTOMOTIVE FLUID HANDLING SYSTEM

Project name	**ITT Automotive Fluid Handling System**
Site #	**8-28-112**
Location	**Town of Gates, New York**
Project no.	**3356/75832**
Recipient	**ITT LLC**
Document type	**Quality Assurance Project Plan**
Version	**2**
Date	**October 7, 2020**
Prepared by	**Mrs. Karen Storne, QAO**
Checked by	**Mr. Scott Tucker**
Approved by	**Mr. Doug Crawford, P.E.**

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List of Acronyms

ºC	Degrees Celsius
ASP	Analytical Services Protocols
COCs	constituents of concern
%D	Percent difference
DBMS	data base management system
DO	Dissolved oxygen
DQO	Data Quality Objective
DUSR	Data Usability Summary Report
EB	Equipment/field rinsate blank
EDD	Electronic Data Deliverable
FD	Field duplicate
FS	Feasibility Study
HASP	Health and Safety Plan
IDM	investigation-derived material
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MDL	Method detection limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NYSDEC	New York State Department of Environmental Conservation
Ramboll	O’Brien & Gere Engineers, Inc., a Ramboll company
ORP	oxidation-reduction potential
PAH	polynuclear aromatic hydrocarbons
PCE	tetrachloroethene
PID	photoionization detector
PPE	personal protective equipment
PRAP	Proposed Remedial Action Plan
QA	Quality Assurance
QAM	Quality Assurance Manual
QA/QC	Quality Assurance/Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Remedial Action
RAWP	Remedial Action Work Plan
RFM	Former Rochester Form Machine Facility
RI	Remedial Investigation
RL	Reporting limit
ROD	Record of Decision
%R	Percent recovery
%RPD	Relative Percent Difference
SIM	selected ion monitoring
SOP	Standard Operating Procedure

SVOC	Semivolatile organic compound
TB	Trip blank
TCA	1,1,1-trichloroethane
TOGS	Technical & Operational Guidance Series
USEPA	Unites States Environmental Protection Agency
VOCs	Volatile Organic Compounds

1. INTRODUCTION

This Quality Assurance Project Plan (QAPP), has been developed O'Brien & Gere Engineers, Inc., a Ramboll company (Ramboll) on behalf of ITT LLC for the ITT Automotive Fluid Handling System (a.k.a Former Rochester Form Machine [RFM] Facility Site) (former RFM Site). This QAPP was prepared for work efforts associated with the sampling of environmental media as part of the Remedial Action (RA) at the Former RFM Site (Site #8-28-112) located at 130 Pixley Industrial Parkway in the Town of Gates, New York and is in support of the Remedial Action Work Plan (RAWP) (Ramboll 2020).

This QAPP and the RAWP address the selected remedy as outlined as Alternative 2 in the Revised Feasibility Study (FS) Report (O'Brien & Gere Engineers, Inc. 2016), further defined in the Record of Decision (ROD) (New York State Department of Environmental Conservation (NYSDEC), 2020) and discussed with NYSDEC during an April 23, 2020 conference call.

This QAPP presents the organization, objectives, functional activities and specific quality assurance/quality control (QA/QC) activities associated with the sample collection and laboratory analysis of environmental samples during implementation of the RAWP. Laboratory QA/QC is a comprehensive program used to define and document the quality of analytical data. QA involves planning, implementation, assessment, reporting and quality improvement to establish the reliability of laboratory data. QC procedures are the tools used to achieve this reliability. This QAPP defines how QA and QC will be applied to the environmental activities at this Site during implementation of the RAWP to assure that the type and quality of data generated are sufficient to meet the project objectives.

This QAPP has been prepared using the guidance provided in the following documents:

- United States Environmental Protection Agency (USEPA). 2006. *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations,* EPA QA/R-5. Washington, D.C.
- NYSDEC. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation.* Albany, NY.

QA/QC procedures described in this QAPP are in accordance with applicable professional technical standards, NYSDEC and Unites States Environmental Protection Agency (USEPA) requirements and specific project goals and requirements.

The following topics are addressed in this document:

- Project background and description
- Data quality objectives and criteria
- Project organization and responsibilities
- Sampling design and method requirements
- Field instrumentation
- Sample handing and custody procedures
- Analytical methods requirements
- Laboratory and field QA/QC procedures

- Data assessment procedures
- Data review
- Data deliverables and data management
- Data validation and usability

2. PROJECT DESCRIPTION AND BACKGROUND

This section provides information on the general site description, project background, and scope of activities to be performed at the Site associated with the RAWP.

2.1 Overall Site Description and Background

The former ITT RFM Facility is located at 30 Pixley Industrial Parkway in the Town of Gates, New York.

The primary constituents of concern (COCs) associated with the Site include 1,1,1-trichloroethane (TCA), its associated degradation products, and the TCA constituent compound, 1,4-dioxane. Other compounds including tetrachloroethene (PCE) and its associated degradation products have been historically detected but are not related to activities at the Site.

Between 2004 and 2011, ITT implemented Remedial Investigation (RI) activities in several phases at the Site and off-Site properties. Investigation activities included the evaluation of soil, bedrock, groundwater, soil vapor, and the potential for vapor intrusion. The RI was implemented under, and consistent with, the Consent Order between NYSDEC and ITT (Index #B8-0614-02-05), NYSDEC requirements, and the approved work plans, addenda, and modifications. In 2014 the final RI Report (O'Brien & Gere Engineers, Inc. 2014) was submitted to the NYSDEC. A FS (O'Brien & Gere Engineers, Inc. 2015) was completed to identify and screen remedial technologies, and evaluate remedial alternatives for compounds of concern (COCs) that exceed remedial action objectives (RAOs) in soil, bedrock groundwater and indoor air/sub-slab vapor at the Site; the FS was submitted to the NYSDEC in April 2015. A Proposed Remedial Action Plan (PRAP) was released for public comment by NYSDEC on February 12, 2020. After holding a public meeting on March 4, 2020 and accepting public comments, NYSDEC issued a Record of Decision (ROD) on March 30, 2020.

Additional project background is presented in the RAWP.

2.2 Project Scope

This QAPP addresses the sample collection and analysis activities which include the following:

<u>Polynuclear aromatic hydrocarbons (PAHs) soil removal/disposal and sampling</u>
- Soil excavation with sampling and analysis of soil samples for PAHs by USEPA Method 8270D.
- Waste characterization and disposal in accordance with local, state and federal laws, rules and regulations.

<u>Groundwater sampling and analysis</u>
- Groundwater sampling and analysis will be performed annually prior to development of a Site Management Plan (SMP) and will consist of sampling of the following wells and analysis for volatile organic compounds (VOCs) by 8260C and 1,4-dioxane by semivolatile organic compound (SVOC) USEPA Method 8270D/selected ion monitoring (SIM):
  - Upgradient wells
    - ITT-SBW-4, ITT-SBW-8

- On-site wells
  - ITT-IBW-20, ITT-SBW-2, ITT-SBW-5A, ITT-SBW-7, ITT-SBW-23
- Downgradient wells
  - ITT-IBW-19, ITT-SBW-13, ITT-SBW-14, ITT-SBW-16

Sampling locations are presented in the RAWP.

2.3 Laboratory Analysis

Groundwater and soil samples will be submitted to ALS Rochester of Rochester, New York, NELAC-certified laboratory, to perform analyses for the samples, as listed in **Table 1**. Samples will be shipped from the field location directly to the laboratory.

Table 1 presents the analytical methods, sample collection containers/canisters and volumes, preservation, holding times and associated quality control sample frequency. Target analytes are listed in **Tables 2-1** and **2-2**. QA/QC requirements and corrective actions listed in **Tables 3-1** and **3-2,** which supplement the method requirements, are to be followed by the laboratory.

ALS Rochester will be responsible for the quality control of the data reported for this project. The laboratory will evaluate non-detected results to the method detection limits (MDLs) and report the non-detected results referencing the RL. The RL concentration is established by the lowest standard in the instrument calibration. For the remaining data, results that are less than the RLs but greater than or equal to the MDLs will be reported using the "J" flag. For example, for a target analyte with a RL of 10 micrograms per liter (µg/L) and an MDL of 2 µg/L, a non-detected result is reported as 10 µg/L "U", indicating that a concentration greater than or equal to the MDL was not detected by the laboratory. A detected concentration of 6 µg/L is reported as 6 "J" and a detected concentration of 23 µg/L is reported without a laboratory flag. The laboratory must include both RLs and MDLs on the sample result sheet that is reported to the data user. The RLs and MDLs listed in **Tables 2-1** and **2-1**, or the most recent MDLs and RLs, will be reported by the laboratory. The laboratory will provide sample containers/canisters for the investigation, prepared in accordance with method and laboratory requirements.

The analytical data will be reported in NYSDEC Analytical Services Protocols (ASP) Category B-like full deliverable format in both hardcopy and electronic format and EQuIS four-file Electronic Data Deliverables (EDDs).

2.4 Data Validation

Data validation will be completed on as needed basis. If validation is requested, it will be performed in accordance with the QAPP upon receipt of final laboratory data packages. Data will be evaluated using the QA/QC criteria established in the methods utilized by the laboratory for analysis, the quality control requirements, corrective actions listed in Tables 3-1 and 3-2 and laboratory established criteria, where applicable. If data validation is not requested, matrix spike/matrix spike duplicate (MS/MSD) and equipment blank (EB) samples will not be collected.

Data affected by excursions will be qualified using the approach to applying data validation qualifiers listed in the most recent USEPA Region II data validation guidelines and professional judgment.

Upon request of the data validator, the laboratory will provide additional or supplemental information within three working days of the request during the validation process.
The specific data quality requirements including precision, accuracy, representativeness, completeness, comparability, and sensitivity will be assessed during data validation. Data usability with respect to the data quality objectives (DQO) and data uses will be compared to the project requirements. In the event that the completeness objective of 95 percent is not achieved, samples will be recollected at the discretion of the Ramboll Project Manager.

2.5 Documentation

Data generated during implementation of the RAWP will be submitted to NYSDEC in an EDD format that complies with the NYSDEC's Electronic Data Submission EDD format. Data will be managed in a relational data base management system (DBMS). Laboratory analytical data will be provided in EDD format for direct upload into the DBMS. Data validation qualifiers will be entered into the DBMS and checked independently.

Records will be incorporated into the final project files for the samples. The field logs, data packages, and records will be included in the project files, which will be archived by the Ramboll Project Manager for a period of ten years.

3. DATA QUALITY OBJECTIVES AND CRITERIA

DQO process associated with implementation of the RAWP comprises the following steps, consistent with guidance presented in the USEPA Guidance for the Data Quality Objectives Process (EPA QA/G-4), February 2006. The DQO process establishes the acceptance criteria, which serve as the basis for collecting data of sufficient quality and quantity to support the goals of the project activities.

3.1 DQO Process

The DQO process consists of the following seven iterative steps:

1) **Step 1** – State the Problem –
   - PAH soil removal/disposal sampling – To collect and analyze soil samples for PAHs to define the lateral and vertical extent of the soil removal/excavation.
   - Pre-Site Management Plan Groundwater Monitoring – To monitor VOC and 1,4-Dioxane concentrations in the shallow and intermediate bedrock groundwater on the Site and down gradient across the Cinemark property to the north.
2) **Step 2** – Identify the Goal of the Study – Sampling activities under the RAWP will be utilized to:
   - Monitor for changes in distribution and concentrations of dissolved Site constituents in groundwater.
   - Obtain soil results that indicate that the PAH impacted soil has been removed.
3) **Step 3** – Identify Information Inputs (the data types that will be required before project decisions can be made) – The primary required data types will be analytical results from groundwater and soil samples associated with the following sampling tasks:

   PAH soil removal/disposal and sampling:
   - Soil excavation and backfill soil importation (in the vicinity of SS-8) with sampling and analysis of soil samples for PAHs by USEPA Method 8270D.

   Pre-Site management groundwater sampling and analysis:
   - Pre-site management groundwater sampling and analysis will be performed annually and will consist of sampling of the following wells and analysis for volatile organic compounds (VOCs) by 8260C and 1,4-dioxane by semivolatile organic compound (SVOC) USEPA Method 8270D/selected ion monitoring (SIM):
     - Upgradient wells - ITT-SBW-4, ITT-SBW-8
     - On-site wells -ITT-IBW-20, ITT-SBW-2, ITT-SBW-5A, ITT-SBW-7, ITT-SBW-23
     - Downgradient wells - ITT-IBW-19, ITT-SBW-13, ITT-SBW-14, ITT-SBW-16
4) **Step 4** – Define the Boundaries of the Study (the spatial and temporal features pertinent for decision making) – Sampling associated with the RAWP will take place on the Site and down gradient across the Cinemark property to the north.
5) **Step 5** – Develop the Analytic Approach (how will the study results be analyzed and conclusions made from the data) – If analytical data results do not produce sufficient data to evaluate the contaminants, then additional sample collection may be warranted. The analytical results will be compared to the NYSDEC groundwater and soil standards.

6) **Step 6** - Specify Performance or Acceptance Criteria (performance or acceptance criteria that the collected data will need to achieve) – Data must be of known quality relative to its intended purpose. Completeness is the measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under normal conditions. If the completeness objective of 95 percent is not met, additional sampling may be justified.

   - PAH soil removal/disposal sampling – Confirmation soil sampling will continue until samples collected from each sidewall and bottom of the excavation indicate that PAH concentrations are below Part 375 Restricted Commercial Use and Protection of Groundwater criteria.
   - Pre-Site Management Plan Groundwater Monitoring – Anticipated to be on-going until analytical results from each well has decreased below the applicable Part 703 Ambient Water Quality Standards, TOGS 1.1.1 criteria.

7) **Step 7** – Develop the Plan for Obtaining Data – The groundwater and soil samples will be collected and analyzed as described in this QAPP.

To meet the DQOs for this project, the analytical results will be compared to the following criteria:

For groundwater samples:

- NYS Class GA standards in 6 NYCRR Part 703 and guidance values in NYSDEC's Technical & Operational Guidance Series (TOGS) 1.1.1.

For soil samples:

- NYS Part 375 Unrestricted Use, Restricted Use (Commercial), and Protection of Groundwater Criteria.

3.2 Analytical Levels

Analytical levels as defined by USEPA as follows:

- Screening Data – Screening data are generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data provide analyte identification and quantitation, although the quantitation may be relatively imprecise. At least 10% of the screening data should be confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data. Screening data without associated confirmation data are not considered to be data of known quality. During the Site activities, VOCs by photoionization detector (PID) and water quality parameters (including temperature, pH, conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity) by field probes may be measured in the field. As required by the Health and Safety Plan (HASP), explosive gases and breathable atmosphere by multi-gas monitor may also be measured in the field during certain tasks,

- Definitive Data – Definitive data are generated using rigorous analytical methods, such as USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data in the form of paper printouts or computer-generated electronic files. Data may be generated at the Site or at an off-site location, as long as the QA/QC requirements are satisfied. The level of QC that will be performed for the definitive data involves the QC efforts described in **Section 11**, calibration procedures described in **Section 11**, analytical methods listed in **Table 1**, and QC requirements and corrective actions listed in Tables 3-1 and 3-2. Laboratory control limits for accuracy and precision, will be used to evaluate the sample data.

The QA/QC program described in this QAPP was developed in order to assess adherence to the DQOs described previously. The remainder of this QAPP describes the specific approaches that will be taken to achieve the required DQOs.

Precision describes the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements that have been made in an identical manner, compared to their average value. Precision can be expressed in a variety of manners that include absolute methods such as deviation from the mean or median values, standard deviation and variance, or relative methods (e.g., relative deviation from the mean or median). The overall precision will be determined through the analysis of field duplicates and MS/MSD samples.

Accuracy is defined as the degree of difference between measured or calculated values and the true value. The closer the numerical value of the measurement comes to the true value, or actual concentration, the more accurate the measurement is. Accuracy is expressed in terms of absolute or relative error. Accuracy will be determined through analysis of spiked samples and the analysis of standards with known concentrations.

Representativeness refers to the degree to which a sample collected and analyzed from a Site accurately reflects the matrix at the Site. It is a qualitative parameter that is most concerned with the design of the sampling program. Factors that should be considered in the determination of representativeness include appropriateness of sampling and analytical methodologies, representativeness of the selected media, and representativeness of the selected analytical procedures. Representativeness will be achieved by the use of procedures for the collection and preservation of samples as described in the RAWP and the methods in this QAPP.

Comparability refers to the use of consistent procedures, second source reference standards, reporting units, and standardized data format with document control. Adherence to standard procedures and the analysis of external source standard materials maximizes the probability that data generated from a particular method at a given laboratory can be validly compared to the data of another. This QAPP has been written to provide data that will be comparable to other data collected, as standard methods will be utilized for the RAWP implementation activities.

Completeness refers to the process of obtaining the required data as outlined in the relevant work plan. Completeness is also defined as the percentage of measurements judged to be useable. Samples for which the critical data points fail completeness objectives will require reanalysis of samples (within the specified holding times) until the DQOs are met. The completeness goal has been specified at 95% for the RAWP activities.

Sensitivity refers to a measurable concentration of an analyte that has an acceptable level of confidence. MDLs are the lowest concentration of an analyte that can be measured with 99% confidence that the analyte concentration is greater than zero. RLs are levels above the MDLs at which the laboratory has demonstrated the quantitation of analytes.

3.3 Field Sampling Objectives

The objective of the field sampling program is to obtain samples that represent the environmental matrix being investigated. This will be accomplished through the use of proper sampling techniques and equipment as presented in the RAWP.

Field screening activities may not require sample collection but, nonetheless, involve measurements for which QA concerns are appropriate. The primary QA objective of field screening is to obtain reproducible measurements to a degree of accuracy consistent with the intended use of the measurements and to document measurement procedures.

3.4 Laboratory Objectives

To obtain data of a quality sufficient to meet the project DQOs, the laboratory will adhere to the specific analyses and QA/QC requirements in the analytical methods listed in **Table 1**. The methods cited in this QAPP will provide data of sufficient quality for comparisons to regulatory criteria and project action levels. The laboratories' Standard Operating Procedures (SOPs) and Quality Assurance Manuals (QAM) are available upon request.

4. PROJECT ORGANIZATION AND RESPONSIBILITY

Ramboll will be responsible for project management, sample collection, data review, data validation and data reporting. The laboratories listed in Table 1 will perform analyses for the samples, Responsibilities for key project team members are summarized below.

4.1 Client Personnel

4.1.1 ITT LLC Project Manager

Mr. Jeff Stanek is the primary contact at ITT LLC and is responsible for the execution of each phase of the project, including correspondence and coordinating activities with NYSDEC.

ITT's contact information is as follows:
Mr. Jeff Stanek – ITT Project Manager
1054 N. Tustin Avenue, Anaheim, CA 92807
(914)-304-1672
jeffrey.stanek@itt.com

4.2 Ramboll Key Personnel

4.2.1 Ramboll Project Officer

Mr. Doug Crawford, P.E., is the Ramboll Project Officer and has overall responsibility for meeting the stated project objectives. In addition, he is responsible for providing the Ramboll Project Manager with access to Ramboll corporate resources.

4.2.2 Ramboll Project Manager

Mr. Scott Tucker is the Ramboll Project Manager and is responsible for implementing the project and has the authority to commit the resources necessary to meet project objectives and requirements. His primary function is to meet the technical, financial, and scheduling objectives and will provide direction to the Ramboll project team.

4.2.3 Ramboll QA Officer

Ms. Karen Storne is the Ramboll Quality Assurance Officer (QAO) for this project. She will manage and be responsible for QA/QC review of data generated during the sample collection activities. Data processing and validation will be overseen and reviewed by the Ramboll QAO. The QAO may perform data validation activities or designate additional data validators to work under her direction.

4.2.4 Field Sampling Personnel

Ramboll field sampling personnel will be responsible for collection, packaging, preservation, and shipping of environmental samples in accordance with the QAPP and applicable NYSDEC requirements. Field sampling personnel will also collect field data and monitor health and safety.

4.2.5 Health and Safety Coordinator

Mr. Drew Walier, CIH is the Ramboll Health & Safety Coordinator and will be responsible for the enforcement of HASP requirements and communication of non-conformances and emergencies through e-mail communications.

4.3 Laboratory Management

The following laboratory will analyze samples collected during the RAWP sampling activities. The Laboratory Project Manager, shipping address and National Environmental Laboratory Accreditation Conference (NELAC) certification number are as follows:
Ms. Janice Jaeger
ALS Rochester
1565 Jefferson Road, Bldg 300, Suite 360
Rochester, NY 14623
Phone: (585) 288-5380
NELAC Certification Number: 10145

The current NELAC certificate is provided in **Appendix 1**.

4.3.1 Laboratory Project Manager Responsibilities

The Laboratory Project Manager will be responsible for:

- Coordinating laboratory analysis
- Supervising in-house chain-of-custody
- Scheduling sample analysis
- Overseeing data review
- Overseeing preparation of analytical reports.

It will be the responsibility of the Laboratory Project Manager to approve final analytical reports prior to submission to Ramboll.

5. SPECIAL TRAINING REQUIREMENTS

Field personnel must comply with the training requirements for hazardous waste operations, codified in 29 CFR 1910.120(e). Each individual must have successfully completed a 40-hour (or 24-hour) course appropriate to the level of work that is performed. In addition, each individual must have completed an 8-hour refresher course within the last 12 months if the initial training was more than 12 months ago. Personnel acting in the capacity of an on-site supervisor, directly responsible for supervising employees engaged in hazardous waste operations, shall also have successfully completed an 8-hour supervisor training course. Field personnel must have documentation (copies of certificates, or identification cards) available at the Site as proof of compliance with the training requirements.

6. SAMPLING DESIGN AND METHOD REQUIREMENTS

6.1 Sampling Network

The types of methods, sample matrices, and numbers of samples to be collected during implementation of the RAWP are presented in **Table 1** and also in the RAWP. The specific parameters for each method and the associated laboratory RLs and MDLs are listed in Tables 2-1 and 2-2.

6.2 Sample Locations and Designations

Proposed sample locations are identified and spatially depicted in the RAWP.

Each sample that is collected will be designated by a unique sample identification number. The following information will be utilized to identify samples for the RA:

1) Sample identification (ID) with the following standard format:

Sample Location-Location Type-##-Date

- Example Sample location – ITT for the former RFM Site.
- Example location type - SBW for shallow bedrock well, IBW for intermediate bedrock well, CS for confirmation soil, etc.
- ## - Specific Location ID per sample type.
- Date – six-digit sample collection date (listed on the chain-of-custody. The sample times are not recorded for field duplicates and trip blanks.

2) Sample Type QC Samples–field duplicates (FD), matrix spike (MS), matrix spike duplicate (MSD), trip blank (TB), and EBs.

3) Sample Purpose:

N = normal environmental sample
FD = field duplicate
MS = matrix spike
MSD = matrix spike duplicate
TB = trip blank
EB = equipment blank

4) Grab/Composite – Identifies samples collected as a grab sample or a composite sample.

Field duplicates will be identified with a unique sample identification number, such that the laboratory will not be aware of the sample location utilized as the blind duplicate. The field sampling personnel will note the duplicate sample in the logbook or on the field sampling form so that this information will be available when the laboratory data is reviewed.

6.3 Sampling Procedures

Guidance documents for the anticipated field methods are included in **Appendix 2** and are listed below:

- Analytical Soil Sampling
- Field Equipment Decontamination
- Analytical Sample Handling
- Overburden Logging
- Low Flow Groundwater Sampling
- Groundwater Sampling with Passive Diffusion Bags
- Photoionization Detector Monitoring
- Water Level Measurement

Example field forms for anticipated field activities are included in **Appendix 3** and are listed below:

- Low Flow Sampling Log
- Test Pit/Excavation Log
- Groundwater Sampling with Passive Diffusion Bags
- Water Level Measurement Log

In addition to the guidance documents referenced above, the following sections discuss sample collection methods.

6.3.1 Groundwater Sampling Methods

Groundwater samples will be collected in accordance with the Low Flow Groundwater Sampling guidance and will be analyzed using the analytical methods listed in **Table 1**. The scope of each groundwater sampling task is provided in the RAWP. QA/QC samples will consist of field duplicate, MS/MSD, and field blank at the frequency indicated in **Table 1**. Each sample cooler containing samples to be analyzed for VOCs will contain a trip blank. Each trip blank submitted will be analyzed for VOCs.

6.3.2 Soil Sampling Methods

Subsurface soil samples for laboratory analysis will be collected in accordance with the Analytical Soil Sampling guidance and will be analyzed using the analytical methods listed in **Table 1**. The scope of each subsurface soil sampling task is provided in the RAWP, as applicable. QA/QC samples will consist of field duplicate, MS/MSD, and field blank at the frequency indicated in **Table 1**.

6.3.3 Field Duplicate Sampling Procedure

Field duplicate samples will be collected from the same location as the parent sample and will be analyzed for the same parameters as the parent sample. The associated parent sample identification of the duplicate QC sample will be recorded in the field logbook. Field duplicate QC samples will be collected as indicated on **Table 1**.

6.3.4 Matrix Spike/Matrix Spike Duplicate Sampling Procedure

For soil and aqueous samples, the MS/MSD samples will be collected from the same location as the parent sample and will be analyzed for the same parameters as the parent sample. Each sample will be labeled with the same number as the original sample, designated as MS or MSD, and submitted to the laboratory for the appropriate analyses. MS/MSD sample pairs will be collected as indicated on **Table 1**.

6.3.5 Field Blank Sampling Procedure

For soil and aqueous samples, a field blank will be collected for sampling when non-disposable, non-dedicated sampling equipment is used for sample collection and subsequently decontaminated in the field for use for additional sampling. The blank water used to generate the field blank will be provided by the laboratory using the same source of water as that used to prepare method blanks. Each field blank will consist of laboratory-provided, analyte-free water that is poured over or through non-disposable, non-dedicated sampling equipment that has been fully decontaminated in accordance with Equipment Decontamination guidance. If necessary, preservatives or additives will be added to the field blank. Field blanks will be collected as indicated on **Table 1**.

6.3.6 Trip Blank Procedure

A trip blank will be included in the cooler used to ship aqueous samples for VOC analysis. The trip blank will be used to evaluate possible sample contamination from transportation between the Site and the laboratory. A trip blank will be prepared by the laboratory using the same preservation technique as that used to prepare the sample containers from the same source as the method blank water and sent to the Site in the cooler with the other sample containers. Trip blanks are not opened in the field but travel with the sample containers. One trip blank will be sent to the laboratory for analysis in each cooler that contains aqueous samples that have been collected for VOCs.

6.4 Decontamination of Sampling Equipment

The sampling methods have been developed to minimize the possibility of cross-contamination. When possible dedicated or disposable sampling equipment will be used. Non-disposable/non-dedicated sampling equipment will be decontaminated in accordance with the Field Equipment Decontamination guidance.

7. FIELD INSTRUMENTATION AND INSPECTION OF SUPPLIES

The following field equipment is expected to be used:

- PID – Used for the breathing and work zone monitoring, well head screening, and soil sample screening during water level monitoring, direct sensing logging, borehole advancement, soil sampling, well installation, well development, groundwater sampling, and investigation-derived material (IDM) handling.
- Submersible Pump – May be used during well development, conventional groundwater sampling, and low-flow groundwater sampling activities. Acceptable pumps include centrifugal or bladder pumps constructed of stainless steel or Teflon®.
- Electronic Water Level Indicator - May be used measure groundwater levels during borehole advancement, water level monitoring, monitoring well installation, well development, in situ hydraulic conductivity testing and groundwater sampling activities.
- Electronic Oil/Water Interface Probe – May be used to screen for the presence of non-aqueous phase liquids in boreholes and wells during borehole advancement, water level monitoring, well development, and groundwater sampling activities.
- Water Quality Meter – May be used for the measurement of groundwater field indicator parameters (such as pH, temperature, specific conductivity, dissolved oxygen, oxidation-reduction potential, turbidity, etc.) during well development and groundwater sampling activities.
- Portable Turbidity Meter – May be used for the measurement of groundwater turbidity during well development and groundwater sampling activities.

7.1 Field Equipment Calibration

Field instruments will be calibrated in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. Equipment to be used for the field sampling will be examined to confirm that it is in good operating condition. This includes checking the manufacturer's operating manual and the instructions for each instrument to confirm that the maintenance requirements are being observed.

In general, instruments will be calibrated daily prior to use and will be recalibrated as required. All calibration procedures performed will be documented in the field logbook. Calibration checks will be performed at the intervals specified by the manufacturer. In the event that an internally calibrated field instrument fails to meet calibration procedures, it will be returned to the manufacturer for service.

7.2 Field Equipment Preventative Maintenance

Preventative maintenance procedures will be carried out on field equipment by Ramboll personnel in accordance with the procedures outlined in the manufacturers' specifications and/or equipment manuals.

Maintenance activities involving field equipment will be recorded in the field logbook. Field equipment will be checked by field representatives prior to being used in the field. Problems encountered while operating the instrument will be documented in the field logbook. If an equipment problem is detected, or should require service, the equipment will be returned to the rental vendor, or manufacturer for maintenance.

7.3 Inspection Requirements for Supplies

The use of standard materials of a known purity and quality is necessary for the generation of reproducible data. The laboratory will monitor the use of laboratory consumable materials including solutions, standards, and reagents as described in this QAPP.
Solvent materials are also verified prior to use. Each new lot of solvent is analyzed to verify the absence of interfering constituents. Reagent and method blanks are routinely analyzed to evaluate possible laboratory-based contamination of samples.

The sample containers used to collect aqueous and soil samples for this project will be supplied by ALS Rochester. The containers will be pre-cleaned sample containers that will be purchased from a USEPA-certified manufacturer (I-Chem 200 or equivalent container) or are cleaned using USEPA protocols.

The Laboratory Project Manager and the field representatives will be ultimately responsible for checking supplies for potential contamination.

Chemical reagents/solvents used by the field personnel will be provided by the laboratory.

8. SAMPLE HANDLING AND CUSTODY PROCEDURES

8.1 Field and Laboratory Custody Procedures

Chain-of-custody procedures will be instituted and followed throughout implementation of the RAWP. These procedures include field custody, laboratory custody, and evidence files. Samples are physical evidence and will be handled according to strict chain-of-custody protocols. The Ramboll Project Manager must be prepared to produce documentation that traces the samples from the field to the laboratory and through analysis.

USEPA has defined custody of evidence as follows:

- In actual possession
- In view after being in physical possession
- In a locked laboratory
- In a secure, restricted area.

8.2 Sample Containers and Field Storage

Table 1 lists the proper sample containers, sample collection information and holding times. If field storage is required, the samples will be stored in a secured storage facility.
The laboratory will supply appropriate sample containers for solid and aqueous samples in coolers as well as preservatives (as presented in **Table 1**). Pre-cleaned containers supplied by the laboratory will be purchased from a USEPA-certified manufacturer (i.e. I-Chem 200 or equivalent).

Immediately after collection, samples will be transferred to properly labeled sample containers, and properly preserved. Table 1 lists the proper sample container, sample volumes, preservation, and holding times.

Samples requiring refrigeration for preservation will be promptly transferred to coolers packed with wet ice and/or ice packs. If field storage is required, the samples will be stored in a secured storage facility and a cooler temperature of ≤6°C will be maintained.

8.3 Field Documentation

The field sampler is personally responsible for the care and custody of the sample until transferred.

The field logbook will be used to note information regarding collection of samples and any observations. All entries will be signed and dated. Field logbooks will be waterproof and bound. The logbook will be dedicated to the project and pages will not be removed. Corrections will be made by drawing a single line through the incorrect data and initialing and dating the correction that was made to the side of the error. An initialed diagonal line will be used to indicate the end of an entry or the end of the day’s activities.

The following information will be recorded on the field logbook by the field sampling team:

- Name and title of author, date, and time of site entry, and physical/environmental conditions during the field activity
- Meteorological data
- Project number, client name, and Site name
- Name and title of field crew members
- Sample media
- Sample collection method, including equipment utilized
- Number and volume of samples collected
- Description of sample locations
- Date and start and end time of sample collection
- Diagrams of sampling process
- Sample and QA/QC identification numbers
- Sample distribution
- Field observations
- Field measurements made and equipment used
- Calculations, results, and calibration data for field sampling and measurements
- References for maps and photographs of the sample location
- Dates and method of sample shipments.

A completed sample identification label or tag that will be sequentially numbered will be attached to each investigative sample and the sample placed in a shipping container. The identification on the label/tag must be sufficient to enable cross-reference with the logbook. The sample label/tag will be recorded using waterproof, non-erasable ink and will be attached to the sample container using adhesive. Permanent marker will not be used on sample tags.

The sample labels/tags will contain the following information:

- Sample location/number identification
- Site/Project name
- Date and time of sample collection
- Designation of the sample as a grab or composite
- Type of sample matrix
- Name/initials of the sampler
- Whether the sample is preserved or unpreserved
- Space for laboratory sample number (only on the sample tag)
- General types of analysis to be performed.

8.4 Field Custody Procedures and Documentation

For the aqueous and solid samples, chain-of-custody records will be kept starting at the time that sample containers are placed in the coolers for transportation to the laboratory. One completed chain-of-custody record must be kept with each sample cooler at all times.

An example chain-of-custody form is provided in **Appendix 3**.

The following measures will be taken when completing a chain-of-custody record:

- The chain-of-custody forms will be completed in waterproof, non-erasable ink.
- The chain-of-custody forms will be completed neatly using printed text. If a simple mistake is made, the error will be lined out with a single line and initialed and dated.
- Each separate sample entry will be sequentially numbered.
- The use of "ditto" or quotation marks to indicate repetitive information in columnar entries should be avoided. If numerous repetitive entries must be made in the same column, a continuous vertical arrow will be used between the first entry and the next different entry.
- When more than one chain-of-custody form is used for a single shipment, each form will be consecutively numbered using the "page ___ of ___" format.
- If necessary, additional instructions will be placed directly onto the chain-of-custody form.
- Acronyms used on a chain-of-custody form will be defined.

The chain-of-custody form will contain the following information, where applicable:

- Laboratory name and address
- Project identification and number
- Sample description/location
- Date and time of sample collection
- Type and matrix of sample
- Number of sample containers
- Analysis requested/comments
- Sampler signature/date/time
- Date and signature of the field representative
- Date and signature of the laboratory representative
- Carrier used to ship coolers
- Air bill number (if shipped by a commercial carrier).

In the case that high concentrations are suspected to be present in the samples, a note to that effect will be included on the chain-of-custody form.

In the field logbook, samplers will note the information previously presented.

Samples will be packed prior to shipment using the following procedures (where applicable):

- Select a sturdy cooler/container/box in good repair and clean. Secure and tape the cooler drain plug with fiber or duct tape.
- Be sure the lids on all bottles are tight (will not leak) and baggies are sealed.
- Where applicable, add ice that has been placed in heavy-duty polyethylene bags and properly sealed on top of or between the samples. Pack samples securely to eliminate breakage during shipment with ice packs to maintain the inside temperature of less than or equal to 6 °C.
- Sampling containers will be packed with packing materials. When possible, sample container preparation and packing for shipment will be completed in a well-organized and clean area. Sample containers will be prepared for shipment by wiping containers clean of debris/water using paper towels. Paper towels will be disposed with the personal protective equipment (PPE).

- Place chain-of-custody record into a Ziploc plastic bag, tape the bag to the inner side of the cooler lid, and close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. Two custody seals will be affixed to the latch and lid of the cooler. The number of the security seal will be recorded on the chain-of-custody form. The custody seals will consist of adhesive-backed tape that easily rips if it is disturbed. The field sampler will initial and date the seal. The seals must be broken to open the cooler and will indicate tampering if the seal is broken before receipt at the laboratory.
- A label containing the name and address of the shipper will be placed on the outside of the container.

8.5 Sample Transportation

The field sampling team will either hand deliver or ship the cooler/container/box via an overnight delivery service or contact the laboratory to send a courier for pick up. Prior to shipment of sample coolers, the field sampling team will contact the laboratory to notify the laboratory of the shipment.

Samples will remain in the custody of the sampler until transfer of custody is completed. Transfer consists of:

- Delivery of samples to the Laboratory Sample Custodian and/or
- Signature of the Laboratory Sample Custodian on the chain-of-custody form as receiving the samples and signature of sampler as relinquishing the samples.

The chain-of-custody document will be completed by the field sampler and provided for each sample cooler/container/box. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the chain-of-custody. Custody of samples must be continuous between parties and time gaps must not be present. Each shipment of samples to the laboratory must have its own chain-of-custody record with the contents of the shipment, method of shipment, name of courier, and other pertinent information written on the record. The original record accompanies the shipment and the copies are kept with the field forms and distributed to the Ramboll Project Manager. A copy of the chain-of-custody will be faxed to the laboratory and to the Ramboll Project Manager on the same day of sample shipment. Freight bills, postal service receipts, and bills of lading will be retained as permanent documentation.

If a carrier is used to take samples between the sampler and the laboratory, the air bill number must be written on the chain-of-custody.

In general, samples will be shipped or transported no later than 48 hours after collection and will arrive at the laboratory no later than 72 hours after sample collection; however, method specific holding time requirements listed on **Table 1** should be reviewed prior to the start of sampling.

8.6 Laboratory Custody Procedures

Laboratory custody procedures continue when the samples are received by the laboratory. When the samples arrive at the laboratory, the Laboratory Sample Custodian will sign the courier's air bill or bill of lading (unless hand-delivered) and will note the cooler temperature on the chain-of-custody form, where applicable. If the cooler temperature is greater than 6°C, the Ramboll Project Manager will be notified. If the samples were shipped, the courier's air bill number will be attached to the chain-of-custody and the air bill number will be written on the chain-of-custody form. If the cooler arrives at the laboratory after hours, an external chain-of-custody will be properly filled out and will accompany the cooler until the laboratory receives the cooler.

The Laboratory Sample Custodian's duties and responsibilities upon sample receipt will be to:

- Document receipt of samples by signing the record with the date and time of sample receipt.
- Note the cooler temperature on the chain-of-custody form.
- Inspect sample shipping cooler for the presence or absence of custody seals (only if shipped via overnight courier) and for container integrity.
- Sign the appropriate forms or documents, verify, and record the agreement or disagreement of information on sample documents and, if there are discrepancies, record the problem and notify the Ramboll Project Manager.
- Assign a number for each sample upon receipt. That sample number will be placed on the sample label which will remain attached to the sample container.
- Log sample information into the laboratory sample tracking system.
- Label sample with a unique, sequential laboratory sample number.
- Place samples in the walk-in cooler or sample storage area that is a secure, limited-access storage.

If QC samples have not been properly identified during sample collection, the Laboratory Project Manager will contact the Ramboll Project Manager to assign QC samples prior to the start of sample analysis.

The laboratory will immediately contact the Ramboll Project Manager if issues pertaining to sample condition or documentation are detected (e.g., broken security seal; compromised sample containers; chain-of-custody information in disagreement with sample labels).

8.7 Final Evidence Files

The final evidence file will be the central repository for documents that constitute evidence relevant to sampling and analysis activities as described in this QAPP. Ramboll is the custodian of the evidence file and maintains the contents of evidence files for the Site, including relevant records, reported, logs, field notebooks, pictures, subcontractor reports, and data reviews. Copies of the laboratory data packages will be stored by the laboratory for incorporation into the sample file. The Laboratory Project Manager will be responsible for laboratory data packages.

Upon completion of the analyses, the Ramboll Project Manager will begin assimilating the field and laboratory data. In this way, the file for the samples will be generated. The final file for the sample will be stored at Ramboll and will consist of the following:

- Laboratory data packages, including summary and raw data from the analysis of environmental and QC samples, chromatograms, mass spectra, calibration data, work sheets, and sample preparation log
- Chain-of-custody records
- Data validation reports

- Field notebooks and data
- Field collection report
- Pictures and drawings, if applicable
- Progress and QA reports
- Contractor and subcontractor reports
- Correspondence.

The final file must be maintained in a secured, limited access area until submittals for the project have been reviewed and approved, and for a minimum of 10 years past the submittal date of the final report.

9. LABORATORY SAMPLE STORAGE AND HANDLING

At the laboratory, the analysts will be required to log samples and extracts in and out of storage as the analysis proceeds.

There must not be a lapse in the custody for the sample containers and exchanges of custody must be documented on the form. Samples will be returned to secure storage at the close of business. Care must be exercised to properly complete, date, and sign records needed to generate the data package.

Procedures to be followed by the laboratory include:

- Samples will be handled by the minimum number of people possible.
- The laboratory will set aside a secured sample storage area consisting of a clean, dry, refrigerated, isolated room.
- A specific person will be designated sample custodian. Incoming samples will be received by the custodian who will indicate receipt by signing the chain-of-custody form.
- The custodian will ensure that samples which are heat-sensitive, light-sensitive, radioactive, or which require special handling in other ways, are properly stored and maintained prior to analysis.
- The analytical area will be restricted to authorized personnel only.
- After sample analyses are complete, the analytical data will be kept secured and released to authorized personnel only.

10. ANALYTICAL METHOD REQUIREMENTS, TARGET ANALYTES AND REGULATORY CRITERIA

The analytical methods, target analytes, detection limits and regulatory limits for the sampling activities are presented in **Tables 2-1** and **2-2**.

10.1 Analytical Methods and Laboratory Analysis

To obtain data of a quality sufficient to meet the project DQOs, the methods listed in **Table 1** will be used for analysis of the environmental samples.

The laboratory will adhere to the specific analyses and QA/QC requirements in the analytical methods listed in **Table 1** and additional requirements listed in this QAPP. The most recent laboratory control limits for accuracy and precision, will be used to evaluate the sample data. In addition, the QC requirements and corrective actions listed in Tables 3-1 and 3-2, which augment the method requirements, will be followed by the laboratory.

In the event of an analytical system failure, the Laboratory Project Manager will identify the situation and provide corrective action guidance. The Ramboll QAO will be notified and the situation will be documented in the data package case narrative.

Matrix interferences will be identified and documented during the analytical process. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument. MDLs and RLs may only be achieved in an undiluted sample free of matrix interferences or of high concentrations of target analytes. If matrix interferences are encountered or if high concentrations of target compounds are present, established MDLs and RLs may not be achievable without impacting the instrument quality. If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the Ramboll QAO will be contacted as soon as the situation is identified. The Laboratory Project Manager will document, in the data package case narrative, how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

Blanks will not be subtracted from target analyte results.

The generated data will be input into the laboratory DBMS.
Laboratories analyzing samples for submittal to the NYSDEC must meet the required National Environmental Laboratory Accreditation Program (NELAP) certification for the associated methods.

Data generated will be submitted to the NYSDEC in an EDD format that complies with the NYSDEC's Environmental Data Submission EDD format. Data will be managed in a relational DBMS. Laboratory analytical data will be provided in EDD format for direct upload into the DBMS. For those data that are validated, the data validation qualifiers will be entered into the DBMS and checked independently.

Complete descriptions of analytical procedures to be used in the laboratory are described in the methods, the QC requirements and corrective actions listed in this QAPP and the laboratory SOPs. The laboratory SOPs and QAM are available upon request.

10.2 Target Analytes and Detection Limits

The MDL is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. The RL is the lowest concentration that can be reliably quantified within specified limits of precision and accuracy during routine laboratory operations.

The laboratory will evaluate non-detected results for aqueous and solid samples to the MDLs and report the non-detected results referencing the RL. The RL concentration is established by the lowest standard in the instrument calibration. Results that are less than the RLs but greater than or equal to the MDLs will be reported using the "J" flag. For example, for a target analyte with a RL of 10 µg/L and an MDL of 2 µg/L, a non-detected result is reported as 10 µg/L "U", indicating that a concentration greater than or equal to the MDL was not detected by the laboratory. A detected concentration of 6 µg/L is reported as 6 "J" and a detected concentration of 23 µg/L is reported without a laboratory flag. The laboratory must include both RLs and MDLs on the sample result sheet that is reported to the data user.

Where applicable, the RLs and MDLs listed in Tables 2-1 and 2-2, or the most recent MDLs and RLs, will be reported by the laboratory.
Laboratories update the MDL and RL values at least annually as part of internal laboratory policy.

10.3 Regulatory Criteria

Tables 2-1 and **2-2**. present the applicable NYSDEC regulatory levels which will be used to evaluate analytical data for the sampling activities.

To meet the DQOs for this project, the analytical results will be sufficient for comparison to the following criteria:

For groundwater samples:

- NYS Class GA standards in 6 NYCRR Part 703 and guidance values in the NYSDEC's Technical and Operational Guidance Series (TOGS) 1.1.1

For soil samples:

- NYS Part 375 Restricted Use (Commercial), and Protection of Groundwater Criteria.

11. LABORATORY AND FIELD QA/QC PROCEDURES

The overall effectiveness of a QA/QC program depends on operating in the field and laboratory according to a program that systematically ensures the precision and accuracy of analyses by detecting errors and preventing their recurrence or measuring the degree of error inherent in the methods applied.

Quality assurance is an integrated system of activities involving planning, quality assessment, reporting and quality improvement to ensure that a program meets defined standards of quality with a stated level of confidence. Quality control involves the technical activities that measure the quality of a program so that it meets the needs of users.

A brief description of laboratory QC analyses is presented in the following sections.

11.1 Laboratory QA/QC Checks

Tables 3-1 and **3-2** summarize the laboratory QC checks, frequency of analysis, control limits, and laboratory corrective actions for the analytical method to be used in this project. A brief description of laboratory QA/QC analyses is presented in the following subsections.

11.1.1 GC/MS Tuning

Tuning and performance criteria are established to verify mass resolution, identification, and to some degree, instrument sensitivity. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria should be met in all circumstances.

11.1.2 Calibration

Compliance requirements for satisfactory instrument calibration are established to verify that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of analysis, and continuing calibration and performance checks document satisfactory maintenance and adjustment of the instrument on a day-to-day basis.

11.1.3 Blanks

Several types of blanks will be analyzed by the laboratory. Corrective action procedures will be implemented for blank analyses if target compounds are detected at concentrations greater than the applicable criteria. The criteria for evaluation of blanks apply to any blank associated with a group of samples collected, prepared and/or analyzed at the same time, where applicable. If problems with a blank exist, data associated with the project must be carefully evaluated to determine whether or not there is an inherent variability in the data for the project, or if the problem is an isolated occurrence not affecting other data.

A method blank is an analyte-free blank that undergoes the preparation procedures applied to a sample. These samples are analyzed to examine whether sample preparation and analysis techniques result in sample contamination. The laboratory will prepare and analyze a method blank with each group of samples that are extracted, digested, or analyzed at the same time.

Field blanks are analyzed to assess contamination introduced during field sampling procedures and sample shipment, respectively. Field blank collection begins with two sets of identical bottles; one set filled with target analyte-free water provided by the laboratory, and one empty set of bottles identical to those provided for aqueous sample collection. At the field location, in an area suspected to be contaminated, the water is passed from the full set of bottles through the dedicated or field decontaminated sampling device(s) and into the empty set of bottles. This will constitute identical bottle to bottle transfer. The field rinsate blank samples will be subject to the same analyses as the environmental samples. When indicated on **Table 1** one field rinsate blank will be collected during each day of the sampling event or one per 20 solid and aqueous samples collected.

Trip blanks will be prepared as other samples submitted for VOC analysis and will contain analyte-free water or preservative, as appropriate. A trip blank will be prepared by the laboratory, using the same preservation technique as that used to prepare the sample containers, from the same source as the method blank water, and sent to the Site in the cooler with the other sample containers. The trip blank will undergo shipment from the sampling site to the laboratory in coolers with the environmental samples to be analyzed for VOCs. Trip blanks will be analyzed for VOCs to determine if contamination has taken place during sample handling and/or shipment. Trip blanks will be included in sample coolers at a frequency of one trip blank per cooler containing samples to be submitted for VOC analysis.

11.1.4 Internal Standards Performance

Internal standards, which are compounds not found in environmental samples, will be spiked into samples, blanks, and laboratory control samples at the time of sample preparation for applicable methods. Internal standards should meet the criteria specified in the corrective action tables.

11.1.5 Surrogate Recovery

Accuracy and matrix biases for individual samples are monitored for organic analyses using surrogate additions. Surrogates are compounds similar in nature to the target analytes; the surrogates are spiked into aqueous and solid samples, blanks, and QC samples prior to sample preparation for organic analyses. The evaluation of the results of these surrogate spikes is not necessarily straightforward. The sample itself may produce effects due to such factors as interferences and high concentrations of analytes. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the review and validation of data based on specific sample results is frequently subjective.

11.1.6 Laboratory Control/Laboratory Control Duplicate Samples

Laboratory control samples (LCSs) and laboratory control duplicate samples (LCSDs) are standard solutions that consist of known concentrations of the complete list of target analytes spiked into laboratory analyte-free matrix. They are prepared or purchased from a certified manufacturer from a source independent from the calibration standards to provide an independent verification of the calibration procedure. These QC samples are then prepared and analyzed following the same procedures employed for environmental sample analysis to assess method accuracy independently of sample matrix effects. Percentage recoveries are evaluated to assess the efficiency of the preparation and analysis method independent of environmental sample matrix effects. If performed by the laboratory, the LCSD is evaluated for laboratory precision.

11.1.7 MS/MSD Samples

MS/MSD data are generated to determine long-term precision and accuracy of the analytical method with respect to sample matrices. Generally, the MS/MSD data alone are not used to evaluate the precision and accuracy for associated organic samples since data may reflect specific matrix effects only present within one sample. As indicated on **Table 1**, one set of MS/MSD samples will be collected for every 20 samples (minimum frequency of 5%) or one per matrix for less than 20 samples. If less than 20 samples are collected, one MS/MSD set will be collected. Whenever possible, MS/MSD samples will be prepared and analyzed within the same batch as the environmental samples. MS/MSD samples will be spiked at the laboratory with the complete list of target analytes.

11.1.8 Analyte Identification and Quantitation

The objective of the qualitative criteria is to minimize the number of erroneous identifications of compounds. An erroneous identification can either be a false positive (reporting a compound present when it is not) or a false negative (not reporting a compound that is present). The identification criteria can be applied much more easily in detecting false positives than false negatives. Negatives, or non-detect compounds on the other hand, represent an absence of data and are therefore much more difficult to assess. The objective for quantitative requirements is to maximize the accuracy of data and sensitivity of the instrument. Unless sample screening indicates the presence of high concentration target analytes, samples will be analyzed undiluted to maximize sensitivity. Samples must be reanalyzed at the appropriate dilution when concentrations exceed the linear calibration range to maximize accuracy. Matrix interferences will be identified and documented. Samples may be diluted only if analytes of concern generate responses in excess of the linear range of the instrument.

11.2 Field QA/QC Checks

In order to evaluate data quality, QA/QC samples will be collected during the sampling activities. **Table 1** lists the environmental samples and corresponding QC samples to be collected by analysis.

11.2.1 Field Duplicate Samples

Collection of field duplicate samples provides for the evaluation of the laboratory's precision performance by comparing analytical results of two samples from the same location. They are also collected to evaluate field sample collection precision procedures. Samples are collected from one location and sent to the laboratory blind (with two different sample identifications). Duplicates for the analyses that require homogenization will be collected by filling a decontaminated stainless steel tray or bowl with the sample and mixing it with a disposable or decontaminated stainless steel instrument. The mixed sample is divided in half and scooped alternatively from each half to fill the sample container. Aqueous samples duplicates submitted for VOC analysis are obtained by alternately filling the containers for the "primary sample" with the containers for the "duplicate sample”.

As indicated on **Table 1** one field duplicate sample will be collected for every 20 environmental samples (minimum frequency of 5%) or one per matrix for less than 20 samples. If less than 20 samples are collected, one field duplicate sample will be collected.

11.2.2 MS/MSDs

MS/MSD samples are duplicate samples that are collected in the field and have spiking solutions added at the laboratory during sample preparation. MS/MSD samples are considered identical to the original sample. The percent recovery of the spiked amount indicates the accuracy of the extraction as well as interferences caused by the matrix. Relative percent differences (%RPDs) between spike sample recoveries or between duplicate samples will indicate the precision of the data. As indicated on **Table 1**, one MS/MSD sample set will be collected for every 20 groundwater and soil samples submitted to the laboratory (minimum frequency of 5%) or one MS/MSD for less than 20 samples.

11.2.3 Field Blanks

As indicated on **Table 1**, one field rinsate blank, as previously discussed in **Section 11**, will be collected per 20 samples or once per day, whichever is more conservative.

11.2.4 Trip Blanks

Trip blanks, as previously discussed in **Section 11**, will be included in sample coolers containing VOC samples at a frequency of either one trip blank per cooler.

11.2.5 Temperature Blanks

Temperature blanks will consist of vials of water that have undergone shipment from the sampling site to the laboratory in coolers with the environmental samples to be analyzed for the sampling program. The temperature of these blanks will be measured at the laboratory upon receipt of the sample cooler to verify compliance with the cooler temperature requirement.

11.3 Corrective Action

Generally, the following corrective actions may be taken by the laboratory. When analytical parameters that are within the control of the laboratory, including calibration, instrument performance, and blank criteria, are not met, the cause of the problem will be located and corrected. The analytical system will then be recalibrated. Sample analysis will not begin until calibration, instrument performance, and blank criteria are met. When matrix spike, standard, or duplicate analyses are out of control, samples analysis will cease. The problem will be investigated. Depending on the results of the overall QC program for the sample set, the data may be accepted, accepted with qualification, or determined to be unusable.

If, through the application of the corrective actions listed in this QAPP, the data is determined to be unusable, the QC analysis will be re-prepared and reanalyzed. If QC criteria are met upon reanalysis, only the new results are reported. If QC criteria are still not met upon reanalysis, both sets of sample results will be reported and the Ramboll QAO will be notified of the situation at the time of sample analysis.

If matrix interferences are suspected, the Ramboll QAO will be contacted. Unless sample screening indicates the presence of high concentration target analytes, samples may be diluted in the analysis only if analytes of concern generate responses in excess of the linear range of the instrument.

If the laboratory has taken appropriate actions and matrix interferences prevent the laboratory from achieving the specified detection limits, the Ramboll QAO will be contacted as soon as the situation is identified. The Laboratory Project Manager will document, in the data package case narrative, how the laboratory demonstrated good analytical practices in order to attempt to achieve the specified reporting detection limits.

11.4 Data assessment procedures

As presented in **Section 3.2**, data for accuracy/bias, precision, representativeness, sensitivity, comparability and completeness will be evaluated.

The definitions and equations used for the assessment of data quality are discussed below.

Accuracy /Bias - A measure of the nearness of an analytical result, or a set of results, to the true value. It is usually expressed in terms of error, bias, or percent recovery (%R).

Normally, the term accuracy is used synonymously with percent recovery. It describes either the recovery of a synthetic standard of known value, or the recovery of known amount of analyte (spike) added to a sample of known value. The %R or accuracy can be calculated by using:

Standards: %R = (observed value/true value) x 100

Spikes: %R = [((conc. spike + sample conc.) - sample conc.)x100)]/conc. spike

Precision - Refers to the agreement or reproducibility of a set of replicate results among themselves without assumption of any prior information as to the true result. It is usually expressed in terms of the percent difference (%D) or RPD.

The %D is calculated by using:

%D = (larger SR - smaller SR x 100)/smaller SR

Where: SR is the sample result.

The RPD is calculated by using:

RPD = (OSR - DSRx 100)/((OSR + DSR)/2)

Where: OSR is the original sample result and DSR is the duplicate sample result.

Average - The average or arithmetic mean (X) of a set of n values (Xi) is calculated by summing the individual values and dividing by n:

$$X = (\sum Xi_{I=1\ to\ n}) \div n$$

Range - The range (R_i) is the difference between the highest and lowest value in a group. For n sets of duplicate values (X2, X1), the range (R_i) of the duplicates and the average range (R) of the n sets are calculated by the following:

R_i = X2 - X1

$$R = \sum Ri_{i=1\,to\,n} \div n$$

Standard deviation and variation - The standard deviation (S) of a sample of n results is the most widely used measure to describe the variability of a data set. It is calculated by using the following equation:

$$S = \sqrt{\frac{\Sigma(Xi - \overline{X})^2}{n-1}}\; n_{\ \mathrm{to}\, i-1}$$

Where: X is the average of the n results and Xi is the value of result. Normally, X ± S will include 68% and X ± 2S includes about 95% of normally distributed data.

The variance is equal to S2. The percent relative standard deviation (%RSD), or coefficient of variation (CV), is the standard deviation divided by the mean and multiplied by 100 as follows:

CV = 100S/X

The Laboratory Project Manager, with individual laboratory group leaders, will identify any data that should be rated as "unacceptable" based on the assessment of the QA/QC criteria.

Bias - Results of sample spiking are used to calculate the quality control parameter for accuracy evaluation, the percent recovery (%R).

%R = 100(S1 - S2)/T1

where: T1 = True concentration of the spike

S1 = Observed spiked sample concentration

S2 = Sample concentration without spike addition

Sensitivity - The measure of sensitivity is made by a comparison of laboratory RLs to the requirements for the DQOs. This comparison will be performed prior to sample analysis, with expected laboratory RLs, and following sample analysis, with actual RLs.

Completeness - Completeness is the fraction of usable data obtained from a measurement system (e.g., sampling and analysis) compared to that which was planned and is calculated as follows:

Completeness = (Usable Laboratory Measurements Made/ Laboratory Measurements Planned) / x 100%

12. DATA REVIEW

For data to be scientifically valid, legally defensible, and comparable, valid procedures must be used to prepare and manage the data.

12.1 Data Reporting Procedures

Specific laboratory procedures and instrumentation can be found in the laboratory SOPs and QAMs. The data production and reporting procedures described below will be employed at the laboratory.

12.1.1 Data Reduction

Data reduction consists of manual and computer data reduction procedures and calculations. Computer data reduction procedures and calculations will be checked manually by the laboratory to verify that compound identification and quantitation adhere to method requirements. The laboratory will be responsible for maintaining a listing of computer-based data reduction programs and SOPs for data reduction. Sample preparation or extraction logs will be used to document sample preparation information (for example, preparation weights, volumes, reagents). Instrument injection logs or bench sheets will also be maintained for each instrument.

12.1.2 Laboratory Data Review

Analytical results are generally entered into the laboratory computer system by the analyst, independently reviewed by another analyst or supervisor experienced in the method, and approved by the Laboratory Project Manager. The following are requirements that are generally examined as part of this review:

- Initial calibration criteria were met. Standards in the calibration curve covered the expected concentration ranges of the samples including the RL.
- Initial and continuing calibrations met the acceptance criteria defined in the method standard procedure.
- Sample results fell within the range of the standard curve.
- Method blanks were processed with each analytical batch and no detectable levels of contamination were identified.
- MS/MSD and duplicate analyses were performed at the required frequency and results were within the control limits.
- LCS analyses were performed with each analytical batch and the results obtained were within control limits.
- Calculations have been accurately performed.
- Reporting units are correct.
- Data for the analysis provide a complete audit trail.
- Reported RLs comply with data quality indicator requirements.

The analyst's supervisor will check a minimum of 10% of the data back to raw data in the secondary review. When required analyses on the samples in a project are complete, entered, and reviewed, a report will be generated. The report will be forwarded to the assigned Laboratory Project Manager or designee for review. The report will then be reviewed for the following items (at a minimum):

- QC data will be reviewed to identify whether or not internal specification and contract requirements have been me.
- Non-conformance reports, if any, will be reviewed for completion of corrective actions and their impact of results. Non-compliance and corrective action procedures will be documented in the case narrative in the final report.

The report requires the signature of the Laboratory Project Manager or designee. Electronic data are copied onto computer tape, inventoried, and stored off-site in a secure facility, or within locked cabinets on-site. This data archive system is maintained for a minimum of ten years. Following final review, one hardcopy of the laboratory data package and a portable document format (PDF) copy will be transmitted to the Ramboll Project Manager.

13. DATA DELIVERABLES AND DATA MANAGEMENT

Definitive data will be generated in the laboratory. The laboratory-generated data will be entered into the laboratory DBMS and presented in data packages. The laboratory will perform the data review process, including a minimum of 10 percent check of the data back to raw data in the secondary review by a laboratory supervisor.

Data validation of the sample data will be performed as described in **Section 14** of this QAPP.

All data generated will be submitted to the NYSDEC in an EDD format that complies with the NYSDEC's Environmental Data Submission EDD format. Data will be managed in a relational DBMS. Laboratory analytical data will be provided in EDD format for direct upload into the DBMS.

The laboratory is responsible for providing an EDD that matches the hardcopy and electronic data package for sample and analysis information. The EDD records must be the same format (i.e., flat file format). Field samples that are not collected from the project site should not be included in the laboratory report or EDD.

The DBMS will be used to provide custom queries and reports to support data analysis and report preparation. For data that are validated, the data validation qualifiers will be entered into the DBMS by hand. The DBMS will be checked independently to minimize data transmittal error and loss.

Generally, the information flow will include the following steps:

- Samples will be collected in the field and transported to the laboratory.
- Samples will be analyzed at the laboratory and data generated.
- The laboratory data will be sent to the data validator for evaluation and to the Ramboll Project Manager for preliminary evaluation.
- Following data validation, qualified data will be sent to data management personnel and entered into the DBMS.
- The final data set from the DBMS will be provided to the Ramboll Project Manager for data evaluation in terms of project goals.
- Project decisions based on results of the data analysis will be reported to ITT.

Records will be incorporated into the final project files for the samples. The field logs, data packages, and records will be included in the project files. The project files will be archived by Ramboll for a period of ten years.

14. DATA VALIDATION AND USABILITY

14.1 Scope of Validation

Following receipt of final laboratory data packages, data validation will be performed in accordance with this QAPP.

Data validation will be completed on an as needed basis.

Validators will utilize current USEPA Region II validation guidance and NYSDEC Data Usability Summary Report (DUSR) guidance (NYSDEC, 2010) as described in the following section. Data will be evaluated using the QA/QC criteria established in the methods utilized by the laboratory for analysis, the quality control requirements, corrective actions listed in **Tables 3-1** and **3-2**, and laboratory established criteria, where applicable.

Upon request by the data validator, the laboratory will provide additional or supplemental information within three working days of the request.

14.2 Validation Procedures

Data Validation is a process of determining the suitability of a measurement system for providing useful analytical data. Data validation is essentially a three-step process in which the analytical data's QA/QC information is first compared to a series of QA/QC criteria. Based on the results of this comparison, the analytical data are then assigned qualifiers, which provide an indication of the data's usability. Finally, an overall evaluation of the data's usability is performed.

Utilizing the DUSR process as guidance, the following questions will be considered during the validation:

1. Is the data package complete as defined under the requirements for the most current USEPA CLP deliverables?
2. Have the holding times been met?
3. Do all the QC data: blanks, instrument tunings, calibration standards, calibration verifications, surrogate recoveries, spike recoveries, duplicate analyses, laboratory controls and sample data fall within the protocol required limits and specifications?
4. Have the data been generated using established and agreed upon analytical protocols?
5. Does an evaluation of the raw data confirm the results provided in the data summary sheets and quality control verification forms?
6. Have the correct data qualifiers been used?
7. Have any exceedances been specifically noted in the report?

The analytical data generated for this investigation will be evaluated by Ramboll using the analytical methods utilized by the laboratories (as presented in this QAPP), the QA/QC requirements listed in **Tables 3-1** and **3-2**, where applicable for each method, and professional judgment.

Data affected by excursions from the QA/QC criteria will be qualified using the current USEPA Region II data validation guidance documents and professional judgment.

Full data validation consists of a review of data summary forms and raw analytical data that are provided in the data packages. During the full validation, data validators will recalculate selected laboratory sample calculations using raw data when verifying sample results. In addition, data validators will review raw data to verify that compound identification was performed correctly and transcription errors are not present.

The following QA/QC information will be included in the full and partial validation, where applicable:

- QAPP compliance
- Chain-of-custody record
- Sample collection
- Sample preservation
- Percent solids
- Holding times
- Calibrations
- Blank analysis
- MS/MSD analysis
- LCS analysis
- Field duplicate analysis
- Surrogate recovery
- Internal standards performance
- GC/MS instrument performance check
- Sample dilutions
- Target analyte quantitation, identification, and quantitation limits (RLs)
- Documentation completeness.

14.3 Assignment of Qualifiers

Data affected by excursions from the previously described QA/QC criteria will be qualified using the current USEPA Region II data validation guidance documents and professional judgment.

The application of these validation guidelines will be modified, where applicable, to reflect method and QAPP requirements.

In accordance with the USEPA guidance, and utilizing professional judgment, the following qualifiers may be used in the data validation:

"R" Indicates that the RL or sample result is determined to be unusable due to a major deficiency in the data generation process. The data should not be used for any qualitative or quantitative purposes.

"U" Indicates that the analyte was analyzed for, but a concentration was not detected. The sample RL is reported. This qualifier is also used in the validation process to signify that the detection limit of an analyte was revised due to blank contamination.

"J"	Indicates that the concentration should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process. This qualifier is also applied by the laboratory when the analyte concentration is greater than the MDL but less than the RL. In the latter case, the identification of the analyte is not in question but the quantitation of the analyte concentration may be uncertain.
"J+"	The result is an approximate quantity, but the result may be biased high.
"J-"	The result is an approximate quantity, but the result may be biased low.
"UJ"	Indicates that the analyte was analyzed for, but a concentration was not detected. The sample RL is reported and should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process.
"JN "	Indicates that there is presumptive evidence that the analyte is present, but it has not been confirmed due to confirmation excursions.

The following guidelines will be used regarding the assignment of qualifiers and the evaluation of data:

- The data quality evaluation results in only one type of qualifier ("U", "J", "UJ," or "R") for each analyte; in a case when several qualifiers are applicable to the same analyte, the cumulative effect of the various QA/QC excursions is employed in assigning the final data qualifiers. For example, if a sample result is affected by low surrogate recoveries, for which the "UJ" qualifier is applied, but low MS/MSD recoveries result in the rejection of the sample result (application of the "R" qualifier), the final data qualifier is the "R" qualifier.

14.4 Data Usability Evaluation

The specific data quality requirements including precision, accuracy, representativeness, comparability, sensitivity, and completeness will be assessed during data validation. Data usability with respect to the DQOs and data uses will be compared to the project requirements. In the event that the completeness objective of 95 percent is not achieved, samples may be recollected at the discretion of the Ramboll Project Manager.

Based on the QA/QC information review and the qualifiers assigned to the analytical data, an overall evaluation of the data's usability will be performed. Data usability is defined as the percentage of data that remains unqualified or is qualified as approximate or non-detected due to blank contamination, divided by the data reported by the laboratory times 100. The percent usability excludes the data qualified as rejected due to major QA/QC excursions. The non-usable data is defined as the percentage of the data qualified as rejected divided by the data reported by the laboratory times 100. The data usability will be provided for each type of analysis performed.

The data usability evaluation considers the data parameters of precision, sensitivity, accuracy, representativeness, comparability, and completeness which are described as follows:

- Precision is evaluated through the review of field duplicate samples and MS/MSD samples.
- Sensitivity is evaluated through the review of RLs, blank analyses and holding time results.
- Accuracy is evaluated through the review of MS recoveries, LCS recoveries, internal standard recoveries, calibration, instrument performance checks, target analyte identification and quantitation and sample preservation.
- Representativeness is evaluated through the review of sample preservation and sampling containers.
- Comparability is evaluated through the review of the analytical methods and reporting procedures for consistency.
- Completeness is defined as the overall percentage of sample results that are determined to be usable.

14.5 Data Validation Report

A data validation report will be prepared for those data that are validated. The validation report will contain separate QA sections in which data quality information collected during the investigation is summarized. The data validation report will include the following:

- Guidelines used to evaluate the data
- Data qualifiers applied to sample results
- Summary of samples collected and analyses performed
- Narrative that identifies major and minor analysis excursions detected for each parameter evaluated for each analysis
- Additional issues and information that may be beneficial to the data user
- Data summary forms.

The data validation report will be prepared under the direction of the QAO and will include the report on the usability of the data.

15. DATA ASSESSMENT

15.1 Data QC Review

Data assessment is a systematic process of reviewing data against a set of criteria to identify outliers or errors and to delete suspect values or to flag them for the user. Laboratory data review starts with the laboratory quality control procedures discussed in **Section 11** of this QAPP.

Sample results obtained from the laboratory will be qualitatively and quantitatively assessed by the project team. Factors to be considered in the data assessment will include, but are not necessarily limited to, the following:

- Were all samples collected and handled using the custody procedures, and methodologies proposed in the QAPP?
- Were samples obtained from all proposed sampling locations?
- Do any analytical results exhibit elevated laboratory RLs?
- Were any reported analytes not expected to be present?
- Which data points were found to be unusable based on the data validation results?
- Have sufficient data of appropriate quality been generated to meet the key objectives of the project as identified in this QAPP?

15.2 Data Review

The internal laboratory data review process will be used to evaluate data. If data is submitted for data validation, data validation will be used to determine the quality and quantity of usable analytical data generated based upon the project specific QAPP requirements.

15.3 Reconciliation with DQOs

The RAWP Report will include an evaluation of how representative the analytical results are of the medium being evaluated based on measures such as sampling design and quality control results. It will also include a discussion on the sufficiency of the data set for meeting project DQOs. The Report will also contain a discussion of any unusable data and follow-up actions for subsequent data collection to meet the project DQOs.

15.4 Project Completeness Assessment

The Ramboll Project Manager will examine the project data for consistency with historical data, data quality, and usability.

16. PROJECT REPORTING

16.1 Data Validation Reports

The data validation report will contain separate QA sections in which data quality information collected during the investigation is summarized. The data validation report will be prepared under the direction of the Ramboll QAO and will include the report on the usability of the data.

16.2 Other Reporting

Other reports that will be prepared during implementation of the RA are described in the RAWP.

17. REFERENCES

AWWA, APHA, WEF. 1998. *Standard Methods for the Examination of Water and Wastewater, 20th Edition*. Washington, D.C.

NYSDEC. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation*. Albany, NY.

O'Brien & Gere. 2014. *Remedial Investigation Report*. Former ITT Rochester Form Machine Facility, Site # 8-28-112, Town of Gates, NY 3356 / 35273, October 20, 2014.

O'Brien & Gere. 2015. *Feasibility Study*. Former ITT Rochester Form Machine Facility, Site # 8-28-112, Town of Gates, NY 3356 / 35273, April 24, 2015.

USEPA. 2006b. Guidance for the Data Quality Objectives Process (EPA QA/G-4), Washington, D.C.

USEPA. 2006a. *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations,* EPA QA/R-5. Washington, D.C.

USEPA. 2006b. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, 3rd Edition. Washington D.C.

USEPA. 2014. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, 3rd Edition, Update V. Washington D.C.

TABLES

Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times		QC Sample Frequency			
					Number of Samples*	Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
VOCs (USEPA Methods 5030C/8000C/ 8260C)[1]	Groundwater Samples	3 - 40-milliliter glass vials with Teflon® lined septum caps	≤6°C HCL to pH≤2 FC Sealed and Headspace Free	Analysis within 14 days from collection for preserved samples. Analysis within 7 days from collection for samples not acid preserved.	TBD	One for every 20 samples collected	1 each in cooler with VOC samples	One for every 20 samples collected	One per 20 samples or one per sampling event
SVOCs/1,4-Dioxane/SIM (USEPA Methods 3510C/8000C/ 8270D/SIM)[2]	Groundwater	2-250 ml amber glass container with Teflon® lined screw caps	≤6°C	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
SVOCs/PAHs (USEPA Methods 3510C/8000C/ 8270D)[2]	Aqueous QC Samples	2-250 ml amber glass container with Teflon® lined screw caps	≤6°C	7 days from collection to extraction; 40 days from extraction to analysis.	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per sampling event
SVOCs/PAHs/(USEPA Methods 3541/3550B/ 8000C/8270D)[2]	Soil Samples	250 milliliter wide mouth glass container	≤6°C	14 days from collection to extraction;	TBD	One for every 20 samples collected	NA	One for every 20 samples collected	One per 20 samples or one per

Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Samples*	QC Sample Frequency			
						Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank
		with Teflon® lined lid. 30 grams sample volume required		40 days from extraction to analysis					sampling event
Percent Solids (SM20 2540G)[3]	Soil Samples	100 milliliter wide mouth glass container with Teflon® lined lid. 10 grams sample volume required	≤6°C	NA	NA	NA	NA	NA	NA
Temperature, specific conductance, dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, pH	Aqueous	Field collection and analysis	NA	NA	NA	NA	NA	NA	NA

NOTES:

MS/MSD indicates matrix spike/matrix spike duplicate sample.

VOCs indicates volatile organic compounds.

SVOCs indicates semivolatile organic compounds.

PAHs indicates polynuclear aromatic hydrocarbons.

SIM indicates selected ion monitoring.

FC indicates that free chlorine must be removed by appropriate addition of sodium thiosulfate to the sample container.

Table 1. Field Sampling Summary

Parameter and Method	Matrix	Sample Containers and Volumes	Preservation	Holding Times		QC Sample Frequency			
					Number of Samples*	Field Duplicate	Trip Blank	MS/MSD or Spike Duplicate	Field Rinsate Blank

* Indicates sample numbers will be determined during project implementation.

Method references:

1- USEPA. 2006. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition. Washington D.C.

5- USEPA. 2014. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update V. Washington D.C.

3. AWWA, APHA, WEF. 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. Washington, D.C.

Table 2-1. Laboratory limits and regulatory limits for VOCs in aqueous samples

Target Analytes	CAS Number	USEPA Method	Laboratory RL Aqueous (µg/L)	Laboratory MDL Aqueous (µg/L)	Ambient Water Quality Standards (1) (µg/L)
Volatile Organic Compounds					
1,1,1-Trichloroethane	71-55-6	8260C	1	0.2	5
1,1,2,2-Tetrachloroethane	79-34-5	8260C	1	0.2	5
1,1,2-Trichloroethane	79-00-5	8260C	1	0.2	1
1,1-Dichloroethane	75-34-3	8260C	1	0.2	5
1,1-Dichloroethene	75-35-4	8260C	1	0.2	5
1,2-Dichloroethane	107-06-2	8260C	1	0.2	0.6
1,2-Dichloropropane	78-87-5	8260C	1	0.2	1
2-Butanone (Methylethyl ketone)	78-93-3	8260C	5	0.78	50*
2-Hexanone	591-78-6	8260C	5	0.2	50*
4-Methyl-2-pentanone (methyl isobutyl ketone MIBK	108-10-1	8260C	5	0.2	NA
Acetone	67-64-1	8260C	5	5	50*
Benzene	71-43-2	8260C	1	0.2	1
Bromodichloromethane	75-27-4	8260C	1	0.2	50*
Bromoform	75-25-2	8260C	1	0.25	50*
Bromomethane	74-83-9	8260C	1	0.7	5
Carbon disulfide	75-15-0	8260C	1	0.42	60*
Carbon tetrachloride	56-23-5	8260C	1	0.34	5
Chlorobenzene	108-90-7	8260C	1	0.2	5
Chloroethane	75-00-3	8260C	1	0.23	5
Chloroform	67-66-3	8260C	1	0.24	7
Chloromethane	74-87-3	8260C	1	0.28	5
cis-1,2-Dichloroethene	156-59-2	8260C	1	0.23	5
cis-1,3-Dichloropropene	10061-01-5	8260C	1	0.2	0.4
Dibromochloromethane	124-48-1	8260C	1	0.2	50*
Ethylbenzene	100-41-4	8260C	1	0.2	5
Methylene chloride	75-09-2	8260C	1	0.65	5
Styrene	100-42-5	8260C	1	0.2	5
Tetrachloroethene	127-18-4	8260C	1	0.21	5
Toluene	108-88-3	8260C	1	0.2	5
trans-1,2-Dichloroethene	156-60-5	8260C	1	0.2	5
trans-1,3-Dichloropropene	10061-02-6	8260C	1	0.23	0.4
Trichloroethene	79-01-6	8260C	1	0.2	5
Vinyl chloride	75-01-4	8260C	1	0.2	2
m,p-Xylene	179601-23-1	8260C	2	0.2	5**
o-Xylene	95-47-6	8260C	1	0.2	5**
Xylenes (total)	1330-20-7	8260C	3	0.23	5

Notes:

RL indicates reporting limit.

MDL indicates method detection limit.

RLs and MDLs provided by ALS Rochester of Rochester, New York, current as of June 2020

ug/L indicates micrograms per Liter.

Target analyte list: project specific analyte list.

Regulatory criteria:

1- NYS Class GA standards in 6 NYCRR Part 703 and guidance values in NYSDEC’s Technical & Operational Guidance Series (TOGS) 1.1.1.

NA- actions limits are not available.

*Indicates guidance values not standards.

**5 ug/L is the criteria for total Xylenes

Table 2-2. Laboratory limits and regulatory limits for SVOCs in aqueous and solid samples

Target Analytes	CAS Number	USEPA Method	Laboratory RL Aqueous (µg/L)	Laboratory MDL Aqueous (µg/L)	Laboratory RL Solid (µg/Kg)	Laboratory MDL - Solid (µg/Kg)	Ambient Water Quality Standards (1) (µg/L)	Unrestricted Use Soil Cleanup Objective (2) (µg/Kg)	Restricted Use Soil Cleanup Objective - Protection of Public Health - Commercial (2) (µg/Kg)	Restricted Use Soil Cleanup Objective - Protection of Groundwater (2) (µg/Kg)
SVOC -1,4-Dioxane										
1,4-Dioxane	123-91-1	8270D/SIM	1	0.14	NA	NA	NA	NA	NA	NA
SVOCs - PAHs										
Acenaphthene	83329	8270D	0.2	0.055	6.6	1.7	NA	20,000	500,000	98,000
Acenaphthylene	208968	8270D	0.2	0.053	6.6	1.8	NA	100,000	500,000	107,000
Anthracene	120127	8270D	0.2	0.071	6.6	4.4	NA	100,000	500,000	1,000,000
Benzo[a]anthracene	56553	8270D	0.2	0.13	6.6	5	NA	1,000	5,600	1,000
Benzo[a]pyrene	50328	8270D	0.2	0.12	6.6	2.7	NA	1,000	1,000	22,000
Benzo[b]fluoranthene	205992	8270D	0.2	0.13	6.6	3.5	NA	1,000	5,600	1,700
Benzo[g,h,i]perylene	191242	8270D	0.2	0.15	6.6	2.7	NA	100,000	500,000	1,000,000
Benzo[k]fluoranthene	207089	8270D	0.2	0.11	6.6	3.8	NA	800	56,000	17,000
Chrysene	218-01-9	8270D	0.2	0.089	6.6	2.7	NA	1,000	56,000	1,000
Dibenz[a,h]anthracene	53-70-3	8270D	0.2	0.095	6.6	2.7	NA	330	560	1,000,000
Fluoranthene	206-44-0	8270D	0.2	0.14	6.6	4.9	NA	100,000	500,000	1,000,000
Fluorene	86-73-7	8270D	0.2	0.065	6.6	1.7	NA	30,000	500,000	386,000
Indeno[1,2,3-cd]pyrene	193-39-5	8270D	0.2	0.11	6.6	2.9	NA	500	5,600	8,200
Naphthalene	91-20-3	8270D	0.2	0.058	6.6	2.3	NA	12,000	500,000	12,000
Phenanthrene	85-01-8	8270D	0.2	0.1	6.6	3.5	NA	100,000	500,000	1,000,000
Pyrene	129-00-0	8270D	0.2	0.11	6.6	3.2	NA	100,000	500,000	1,000,000

Notes:

RL indicates reporting limit.
MDL indicate method detection limit.
RLs and MDLs provided by ALS Rochester, Rochester, New York, current as of June 2020
ug/L indicates micrograms per Liter.
ug/Kg indicates micrograms per kilogram.
SVOCs indicates semivolatile organic compounds.
PAHs indicates polynuclear aromatic hydrocarbons.
SIM indicates selected ion monitoring.

Target analyte list: project specific analyte list.

Regulatory criteria and notes:

1- NYS Class GA standards in 6 NYCRR Part 703 and guidance values in NYSDEC’s Technical & Operational Guidance Series (TOGS) 1.1.1.

2 - NYS Part 375 Unrestricted Use, Restricted Use (Commercial) and Protection of Groundwater Criteria.
NA- actions limits are not available.

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions.

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
Sample preservation	Samples must be preserved based on method and QAPP requirements	For aqueous samples: cooler temperature ≤6°C, preserve with HCL to pH≤2, Sealed and Headspace Free. See Table 1 for sample preservation information.	1. Notify Project Manager since re-sampling may be required. 2. Document corrective action in the case narrative.
Holding times (Sensitivity)	Samples must be analyzed within holding time.	See Table 1 For aqueous samples: Analyze within 14 days from collection for preserved samples. Analysis within 7 days from collection to analysis for aqueous samples not acid preserved. See Table 1 for sample collection information.	3. If holding times are exceeded for initial or any re-analyses required due to QC excursions. 4. Notify QAO since re-sampling may be required. 5. Document corrective action in the case narrative.
MS Tuning (Accuracy)	Once every 12 hours prior to initial calibration and calibration verifications. Analytical sequence must be completed within 12 hours of the GC/MS Instrument Performance Check	1. Bromofluorobenzene (BFB) key ions and abundance criteria listed in the method Table 3 must be met for all 9 ions and analyses must be performed within 12 hours of injection of the BFB. 2. Part of the BFB peak will not be background subtracted to meet tune criteria. 3. Documentation of all bromofluorobenzene analyses and evaluation must be included in the data packages.	1. Tune the mass spectrometer. 2. Document corrective action in the runlog. 3. Samples cannot be analyzed until control limit criteria have been met.

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions.

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
Initial Calibration Initial Calibration Verification (ICV) (Accuracy)	Prior to sample analysis and when calibration verifications criteria are not met. Initial calibration will contain all target analytes in each standard. Quantitation of analyses will utilize the initial calibration results.	1. Five or more concentrations bracketing expected concentration range for all compounds of interest with one standard at or less than the RL. A minimum of 6 concentrations are required for quadratic. 2. One second-source standard (ICV) must be analyzed immediately following the initial calibration at the mid-calibration concentration. This standard must be within 30% recovery or within laboratory control limits. 3. Response factor (RF) as listed in Table 4, Method 8260C, with remaining RFs factor ≥ 0.050 except for ketones with allowable response factor ≥ 0.010. 4. For compound with %RSD >20, quantitation must be performed using a separate calibration curve and the Coefficient of Determination (COD) must be ≥ 0.99. If linear regression is used for the calibration curve, the low initial calibration standard should be evaluated for accuracy using criteria of %D <30% from true value.	1. Identify and correct problem. 2. If criteria are still not met, recalibrate. 3. Document corrective action in the case narrative. 4. Samples should not be analyzed until calibration control limit criteria are met. 5. Contact QAO to discuss problem target analytes before proceeding with analysis.

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions.

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
Calibration Verification (Accuracy)	Every 12 hours, following BFB. The calibration verification will contain all target analytes in each standard at a concentration that is representative of the midpoint of the initial calibration.	1. Within percent drift or percent difference (%D) ≤ 20 for compounds, RF same as listed in initial calibration. 2. The internal standards areas and retention times must meet the method criteria.	1. To continue daily analysis, up to 20% of compounds may fail up to 40%D. Otherwise, reanalyze. If criteria are still not met, identify and correct problem, recalibrate. 2. Any compounds >20%D must be repeated with a compliant CCV if sensitive to a project. 3. ND samples may be reported with a high bias CCV without qualification. 4. Document corrective action in the case narrative.
Preparation Blank Analysis (Sensitivity)	Every 12 hours, following calibration verification	Acetone and methylene chloride less than 5 times RL. Remaining analytes less than RL.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate if needed, and reanalyze all samples if detected for same compounds as in blank. Samples with target concentrations >10X the blank contamination may be reported without qualification. 3. Document corrective action in the case narrative.
Field Blank Analysis (Sensitivity)	Collected per QAPP requirements.	Methylene chloride less than 3 times RL and 2-butanone and acetone less than 5 times RL remaining analytes less than RL will be provided along with the preparation blank results.	1. Investigate problem. 2. Document in the case narrative.
Trip Blank (Sensitivity)	1 per cooler containing VOC samples.	Methylene chloride less than 3 times RL and 2-butanone and acetone less than 5 times RL remaining analytes less than RL will be provided along with the preparation blank results.	1. Investigate problem. 2. Document in the case narrative.

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions.

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
Laboratory Control Sample Analysis (Accuracy)	Each analytical batch (every 12 hours). Prepared independently from calibration standards. Spike must contain all target analytes and should be at a concentration, which is in the lower 1/2 of the calibration curve.	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. If recovery failures are above control limits and these compounds are not detected in the associated samples, corrective action is not required. 2. If recovery failures are below control limits, examine results of other QC analyses. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action in the case narrative.
Internal Standards (Accuracy)	All samples and blanks (including MS/MSD)	1. Response -50% - +200% of internal standards from continuing calibration of the day. 2. RT must be ± 10 sec. from associated calibration verification standard of that sequence.	1. Reanalyze. 2. If response still outside of the limits, report both analysis and note the confirmation in the case narrative. 3. If response is within limits, report the re-analysis result. 4. If the RT fails, correct system malfunctions and reanalyze.

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions.

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
Surrogate Spike (Accuracy)	All samples and blanks (including MS/MSD)	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. Examine for chromatographic matrix interferences and historical failures. 2. Reanalyze any environmental or QC sample with surrogates that exceed control limits. Exception: Samples without detections of target analytes may be reported with high bias surrogate recoveries. 3. If still outside of the limits, report both analyses and document the confirmation of failure in the case narrative.
Matrix Spike/ Matrix Spike Dup. (MS/MSD) Analysis (Accuracy/Precision)	Collected per QAPP requirements. Samples from the investigation must be used for MS/MSD analysis. Spike must contain complete list of target analytes.	Recovery and RPD within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. If LCS is within LCS control limits, assume matrix interference and flag. 2. If LCS criteria are exceeded also, follow corrective action for LCS. Examine other QC data for source of problem; *i.e.*, surrogate recoveries for extraction efficiency and calibration data for instrument performance issues.
Field Dup. Analysis (Precision)	Collected per QAPP requirements. Field duplicate will not be identified to the laboratory.	Validation criteria: 30% RPD for waters, 50% RPD for solids. For sample results that are less than or equal to five times the RL, the criterion of plus or minus two times the RL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis.

Target Analyte Identification (Accuracy)	As required for identification of target analytes	1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion. 2. The retention time of the Internal standards within 10 seconds of the RT of the internal standard in the CCV. 3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%.) 4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times 5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s)	Not applicable

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions.

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
		or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important.	
Target Analyte Identification (Accuracy)	As required for identification of target analytes	Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes co-elute (i.e., only one chromatographic peak is apparent), the identification criteria may be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.	Not applicable
Target Analyte Quantitation (Accuracy)	Apply USEPA Method 8000C for medium level extraction technique	Moisture correction in accordance with USEPA Method 8000C will be applied to the complete set of solid samples, regardless of the percent moisture content..	Not applicable
Tentatively Identified Compound (Accuracy)	If required, perform for each sample and blank analysis. Non-target compounds will be reported using a Mass Spectral Library search.	Not applicable	Not applicable

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions.

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
Dilutions	1. When target analyte concentration exceeds upper limit of calibration curve. 2. When matrix interference is demonstrated by the lab and documented in the case narrative (highly viscous samples or a large number of nontarget peaks on the chromatogram). 3. It is recommended that a reagent blank be analyzed if an analyte saturates the detector or if highly concentrated analytes are detected. Otherwise data impacted from carryover cannot be used. 4. Laboratory will note in the data deliverables which analytical runs were reported.	1. The reagent blank will meet the method blank criteria.	1. Reanalyze reagent blank until method blank criteria are met. 2. Document corrective action in the case narrative.
pH Determination	Once sample aliquot is taken from the VOC vial, the pH of water samples must be determined.	Record pH in the runlog.	Not applicable
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages.	Not applicable	Not applicable
Laboratory control limits	Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable

Table 3-1. VOCs using USEPA Methods 8000C/8260C quality control requirements and corrective actions.

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
Deliverables (When requested)	1. Full CLP-like/ASP-Category B deliverables must be provided to document each audit item for easy reference and inspection. 2. An example calculation will be provided for each analysis, for each type of matrix in the data, package using samples from the project, upon request. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. Standard tracing information will be provided. 6. Cooler temperatures and any observations of bubbles in sample containers will be provided in the data packages. 7. Run logs will be provided in the data packages.	Not applicable	Provide missing or additional deliverables for validation purposes.
Method and QAPP requirements	The laboratory will perform the method as presented in this QAPP and will adhere to the method and QAPP requirements presented herein.	Not applicable	Not applicable

Notes:

Data validation will be performed in accordance with QA/QC criteria established in the tables and the analytical methods used by the laboratory.

Communications with the QAO will be documented and included in the data packages.

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
Sample preservation	Samples must be preserved based on method and QAPP requirements	For aqueous and soil samples: cooler temperature ≤6°C. See Table 1 for sample preservation information.	1. Notify Project Manager since re-sampling may be required. 2. Document corrective action in the case narrative.
Holding times (Sensitivity)	Samples must be extracted and analyzed within holding time.	Extract within 7 days from collection for aqueous samples; 14 days from collection for soil samples. Analyze extracts within 40 days of extraction. See Table 1 for sample collection information.	If holding times are exceeded for initial or any re-analyses required due to QC excursions, notify the QAO since re-sampling may be required.
MS Tuning (Accuracy)	Once every 12 hours prior to initial calibration and calibration verification. Must contain 50ng/uL of 4,4-DDT, pentachlorophenol, and benzidine.	1. DFTPP key ions and abundance criteria listed in the method must be met for all 13 ions and analyses must be performed within 12 hours of injection of the DFTPP. 2. Part of the DFTPP peak will not be background subtracted to meet tune criteria. 3. Documentation of all DFTPP analyses and evaluations must be included in the data packages. 4. Degradation of 4,4-DDT <20%. Peak tailing must not be evident.	1. Tune the mass spectrometer. 2. Document any observations and corrective action in the case narrative - samples cannot be analyzed until control limit criteria have been met.
Initial Calibration **Initial Calibration Verification (ICV)**	Prior to sample analysis and when calibration verification criteria are not met.	1. Five or more concentrations bracketing expected concentration range for all compounds of interest	1. Identify and correct problem. 2. If criteria are still not met, recalibrate.

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
(Accuracy)	Initial calibration will contain all target analytes in each standard. Quantitation of analyses will utilize the initial calibration results.	with one standard at or less than the RL. A minimum of 6 concentrations are required for quadratic. 2. One second-source standard should be analyzed immediately following the initial calibration at the mid-calibration concentration. This standard must be within 30% recovery or within laboratory control limits. 3. RFs must meet criteria listed in Method 8270D; remaining RFs must be 0.05 with RF of 0.01 for n-nitroso-di-n-propylamine and 2,4-dimethylphenol. 4. For compounds with %RSD >20, quantification must be performed using a separate calibration curve and the COD must be ≥ 0.99. If linear regression is used for the calibration curve, the low level initial calibration standard should be evaluated for accuracy using criteria of %D < 30% from the true value. 8. Relative retention for each target analyte in each calibration standard must agree within ± 0.06 units.	3. Document any observations and corrective action in the case narrative - samples should not be analyzed until calibration control limit criteria are met.
Calibration Verification (Accuracy)	Every 12 hours, following DFTPP. Calibration verification will contain all	1. Within method specified criteria, percent drift or percent difference (%D) ≤ 20	1. To continue daily analysis, up to 20% of compounds may fail up to 40%D. Otherwise, reanalyze. If criteria are still

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions			
Audit Parameter (DQI)	**Frequency**	**Laboratory Control Limits**	**Laboratory Corrective Action**
	target analytes in each standard at a concentration that is representative of the midpoint of the initial calibration.	for target analytes. Response factor requirements as listed in initial calibration. *2.* The internal standards areas and retention times must meet the method criteria.	not met, identify and correct problem, recalibrate. 2. Any compounds >20%D must be repeated with a compliant CCV if sensitive to a project. 3. ND samples may be reported with a high bias CCV without qualification. 4. Document any observations and corrective action in the case narrative.
Preparation Blank Analysis (Sensitivity)	Prepared with each extraction batch of no more than 20 analytical samples.	1. Common laboratory contaminants (phthalate) less than 5 x RL. Remaining analytes less than RL. 2. RLs and MDLS will be provided along with the preparation blank results.	1. Reanalyze blank. 2. If limits are still exceeded, clean instrument, recalibrate analytical system and re-extract and reanalyze all samples if detected for same compounds as in the blank. Samples with target concentrations >10X the blank contamination may be reported without qualification. 3. Document any observations and corrective action in the case narrative - samples should not be analyzed until blank criteria have been met.
Field Blank Analysis (Sensitivity)	Collected per QAPP requirements.	Validation criteria:	1. NA.
Laboratory Control Sample Analysis (Accuracy)	Prepared with each extraction batch, of no more than 20 analytical samples. Prepared independently from calibration standards. Spike must contain all target compounds and should be at a concentration that is approximately in the	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. If recovery failures are above control limits and these compounds are not detected in the associated samples, no corrective action is required. 2. If recovery failures are below the control limits, reanalyze LCS and examine results of other QC analyses. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions			
Audit Parameter (DQI)	**Frequency**	**Laboratory Control Limits**	**Laboratory Corrective Action**
	lower 1/2 of the calibration curve.		reanalyze samples since last satisfactory LCS. 4. Document any observations and corrective action in the case narrative.
Internal Standards (Accuracy) **Internal Standards (Accuracy)**	All samples and blanks (including MS/MSD).	Response -50% - +200% of the internal standards from the continuing cal of the day. RT must be ± 10 sec. from calibration verification of that sequence.	1. Reanalyze. 2. If the re-analysis meets criteria or demonstrates fewer excursions, report the re-analysis result. 3. If the re-analysis does not meet criteria or demonstrates fewer excursions, report the initial analysis and include raw data for both analyses in the data package. 4. If the RT fails, correct system malfunctions and reanalyze.
Surrogate Spike (Accuracy)	All samples and blanks (including MS/MSD).	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. If surrogates are diluted more than 10 times, report as "D". 2. ND Samples associated with surrogates above upper limit are noted in the case narrative. 3. Reanalyze. If re-analysis meets criteria, report re-analysis result. 3. If reanalysis recovery fails criteria re-extract. 4. Report the analysis that demonstrates fewer excursions and include raw data for both analyses in the data package. 5. Document corrective action in the case narrative.
Matrix Spike/ Matrix Spike Dup. (MS/MSD) Analysis (Accuracy/Precision)	Collected per QAPP requirements. Samples from the investigation must be used for MS/MSD analysis.	Recovery and RPD within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used.	1. If LCS is within LCS control limits, assume matrix interference and flag. 2. If LCS criteria are exceeded also, follow corrective action for LCS. Examine other QC data for source of problem; i.e. surrogate recoveries for

RAMBOLL

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions			
Audit Parameter (DQI)	**Frequency**	**Laboratory Control Limits**	**Laboratory Corrective Action**
	Spike must contain complete list of target analytes.	The lowest acceptable control limits for recovery will be 10%.	extraction efficiency and calibration data for instrument performance issues.
Field Duplicate Analysis (Precision)	Collected per QAPP requirements. Field duplicate will not be identified to the laboratory.	Validation criteria: 30% RPD for waters, 50% RPD for solids. For sample results that are less than or equal to five times the RL, the criterion of plus or minus two times the RL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis.
Target Analyte Identification (Accuracy)	As required for identification of target analytes	1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion. 2. The retention time of the Internal standards within 10	Not applicable

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
		seconds of the RT of the internal standard in the CCV. 3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%.) 4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. 5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important. 6. Examination of extracted ion current profiles of	

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
		appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes co-elute (i.e., only one chromatographic peak is apparent), the identification criteria may be met, but each analyte spectrum will contain extraneous ions contributed by the co-eluting compound.	
Screening samples	As required for samples suspected to contain high concentrations or matrix interferences	It is highly recommended that samples be screened prior to analysis. Screening data (performed prior to the initial analysis) does not need to be included in the data package. Data for samples analyzed at dilutions for initial or subsequent analyses is required to be included in the data package.	Not applicable
Tentatively Identified Compound (Accuracy)	If required, for each sample and blank analysis. Non-target compounds will be reported using a Mass Spectral Library search.	Not applicable	Not applicable
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages.	Not applicable	Not applicable
Percent solids	For soil/ samples, the percent solids will be	Not applicable	Not applicable

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions			
Audit Parameter (DQI)	**Frequency**	**Laboratory Control Limits**	**Laboratory Corrective Action**
	determined and sample results will be corrected for percent solids.		
Dilutions	1. When target analyte concentration exceed upper limit of calibration curve. 2. When matrix interference demonstrated by lab and documented in the case narrative (highly viscous samples or a large number of non-target peaks on the chromatogram). 3. Samples should be cleaned up during sample preparation/extraction procedure using appropriate methods when matrix interference is present. 4. Laboratory will note in the data deliverables which analytical runs were reported.	The laboratory will not dilute samples unless elevated concentrations of target analytes or matrix interference is demonstrated in the samples.	Not applicable
Laboratory control limits	1. Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard	Not applicable	Not applicable

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions			
Audit Parameter (DQI)	**Frequency**	**Laboratory Control Limits**	**Laboratory Corrective Action**
	deviation. The control limits are updated annually.		
Deliverables	1. Full CLP-like/ASP-Category B deliverables must be provided to document each audit item for easy reference and inspection. 2. An example calculation will be provided for each analysis, for each type of matrix in the data package using samples from the project, upon request. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. For the initial data package, standard tracing information will be provided. 6. Cooler temperatures will be provided in the data packages. 7. Run logs will be provided in the data packages.	Not applicable	Provide missing or additional deliverables for validation purposes.
Method and QAPP requirements	The laboratory will perform the method as presented in this QAPP and will adhere to the QAPP requirements presented herein.	Not applicable	Not applicable

Table 3-2. SVOCs/PAHs/14D using USEPA Methods 8000C/8270D/SIM quality control requirements and corrective actions

Audit Parameter (DQI)	Frequency	Laboratory Control Limits	Laboratory Corrective Action
	Otherwise the laboratory will specifically note any procedures that differ from the method or the QAPP in the data package case narrative.		

Notes:
Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods that are currently used by the laboratory. Excursions from QA/QC criteria will be qualified based on guidance provided in this QAPP.
Communications with the QAO will be documented and included in the data packages.

FIGURES

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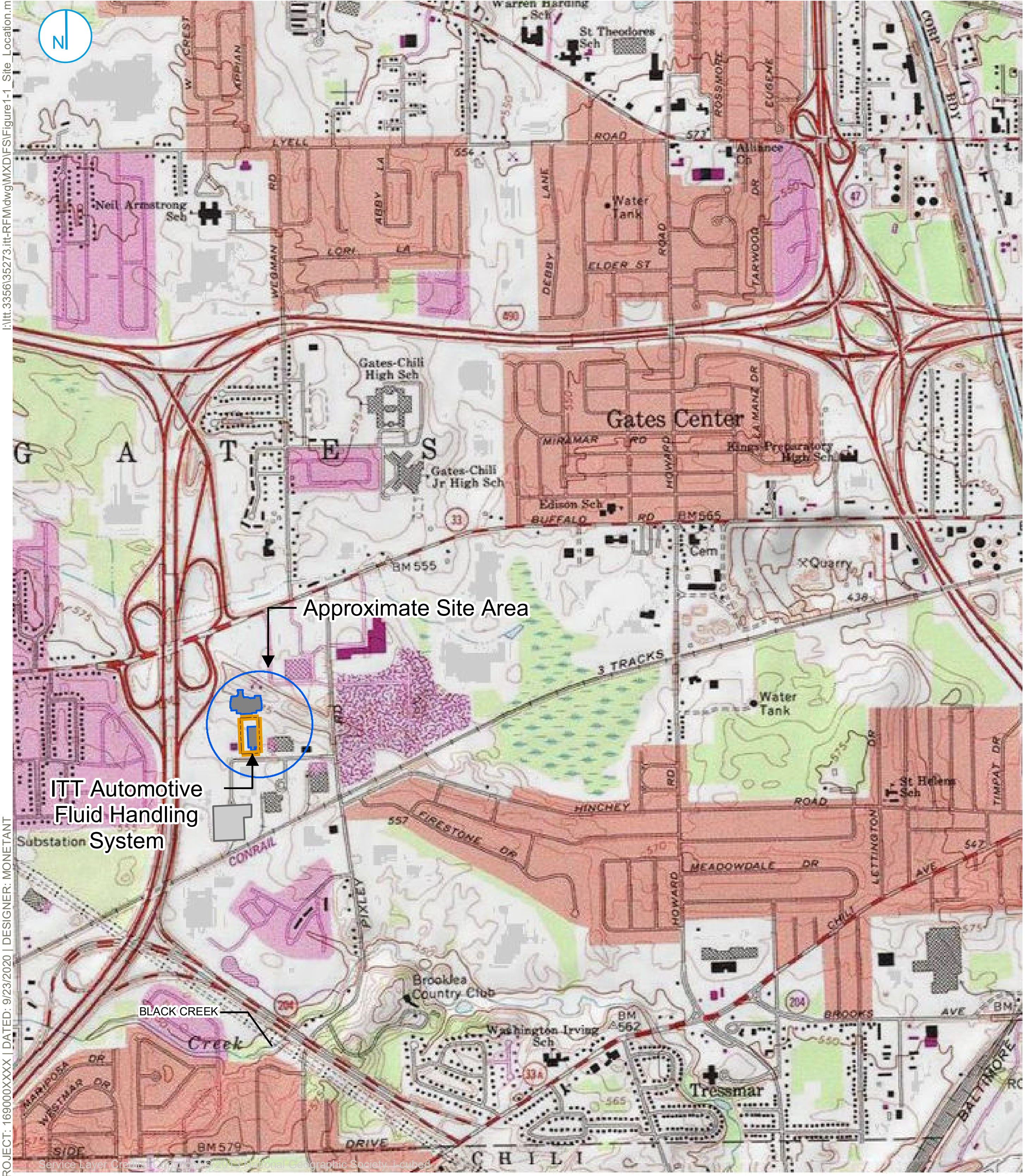
PROJECT: 169000XXXX | DATED: 9/23/2020 | DESIGNER: MONETANT




KEY MAP

▭ PROPERTY LINE

▭ BUILDING

Map Scale: 1:1:22,934;
Map Center: 77°41'57"W 43°8'51"N

ITT AUTOMOTIVE FLUID HANDLING SYSTEM

SITE LOCATION

SITE #8-28-122
Town of Gates,
New York

FIGURE 1-1

O'BRIEN & GERE ENGINEERS, INC.
A RAMBOLL COMPANY

RAMBOLL

APPENDIX 1
ALS ROCHESTER LABORATORY DOCUMENTS

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

NY Lab Id No: 10145

MS. CHRISTINE KUTZER
ALS ENVIRONMENTAL - ROCHESTER
1565 JEFFERSON ROAD BUILDING 300, SUITE 360
ROCHESTER, NY 14623

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Bacteriology

Coliform, Total / E. coli (Qualitative)	SM 20, 21-23 9223B (-04) (Colilert)

Dissolved Gases

Acetylene	RSK-175
Ethane	RSK-175
Ethene (Ethylene)	RSK-175
Methane	RSK-175
Propane	RSK-175

Metals I

Arsenic, Total	EPA 200.8 Rev. 5.4
Barium, Total	EPA 200.8 Rev. 5.4
Cadmium, Total	EPA 200.8 Rev. 5.4
Chromium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Copper, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Iron, Total	EPA 200.7 Rev. 4.4
Lead, Total	EPA 200.8 Rev. 5.4
Manganese, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Mercury, Total	EPA 245.1 Rev. 3.0
Selenium, Total	EPA 200.8 Rev. 5.4
Silver, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Zinc, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4

Metals II

Aluminum, Total	EPA 200.7 Rev. 4.4
Antimony, Total	EPA 200.8 Rev. 5.4
Beryllium, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Molybdenum, Total	EPA 200.7 Rev. 4.4
	EPA 200.8 Rev. 5.4
Nickel, Total	EPA 200.8 Rev. 5.4
Thallium, Total	EPA 200.8 Rev. 5.4
Vanadium, Total	EPA 200.7 Rev. 4.4

Metals III

Boron, Total	EPA 200.7 Rev. 4.4
Calcium, Total	EPA 200.7 Rev. 4.4
Magnesium, Total	EPA 200.7 Rev. 4.4
Potassium, Total	EPA 200.7 Rev. 4.4
Sodium, Total	EPA 200.7 Rev. 4.4

Miscellaneous

1,4-Dioxane	EPA 522
Organic Carbon, Dissolved	SM 21-23 5310C (-00)
Organic Carbon, Total	SM 21-23 5310B (-00)
	SM 21-23 5310C (-00)
Turbidity	EPA 180.1 Rev. 2.0
UV 254	SM 21-23 5910B (-00,-11)

Non-Metals

Alkalinity	SM 21-23 2320B (-97)

Serial No.: 61013

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

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ROCHESTER, NY 14623

NY Lab Id No: 10145

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All approved analytes are listed below:

Non-Metals

Calcium Hardness	SM 18-22 2340B (-97)
Chloride	EPA 300.0 Rev. 2.1
Color	SM 21-23 2120B (-01)
Corrosivity	SM 18-22 2330
Cyanide	Kelada 01, Rev. 1.2
	EPA 335.4 Rev. 1.0
Fluoride, Total	EPA 300.0 Rev. 2.1
Nitrate (as N)	EPA 353.2 Rev. 2.0
Nitrite (as N)	EPA 353.2 Rev. 2.0
Orthophosphate (as P)	EPA 365.1 Rev. 2.0
Solids, Total Dissolved	SM 21-23 2540C (-97)
Specific Conductance	EPA 120.1 Rev. 1982
Sulfate (as SO4)	EPA 300.0 Rev. 2.1

Serial No.: 61013

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CHRISTINE KUTZER
ALS ENVIRONMENTAL - ROCHESTER
1565 JEFFERSON ROAD BUILDING 300, SUITE 360
ROCHESTER, NY 14623

NY Lab Id No: 10145

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All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260C
	EPA 624.1
Acrylonitrile	EPA 8260C
	EPA 624.1
Ethyl methacrylate	EPA 8260C
Methyl acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C

Amines

1,2-Diphenylhydrazine	EPA 625.1
	EPA 8270D
1,4-Phenylenediamine	EPA 8270D
1-Naphthylamine	EPA 8270D
2-Naphthylamine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
5-Nitro-o-toluidine	EPA 8270D
Aniline	EPA 625.1
	EPA 8270D
Carbazole	EPA 625.1
	EPA 8270D
Diphenylamine	EPA 8270D
Methapyrilene	EPA 8270D
Pronamide	EPA 8270D

Amines

Propionitrile	EPA 8260C
Pyridine	EPA 625.1
	EPA 8270D

Benzidines

3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270D
3,3'-Dimethylbenzidine	EPA 8270D
Benzidine	EPA 625.1
	EPA 8270D

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
	EPA 608.3
4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3
Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B
	EPA 608.3
alpha-Chlordane	EPA 8081B
beta-BHC	EPA 8081B
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3

Serial No.: 61014

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Chlorinated Hydrocarbon Pesticides	
Chlorobenzilate	EPA 8270D
delta-BHC	EPA 8081B
	EPA 608.3
Diallate	EPA 8270D
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3
Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
	EPA 608.3
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Isodrin	EPA 8270D
Kepone	EPA 8081B
Lindane	EPA 8081B
	EPA 608.3

Chlorinated Hydrocarbon Pesticides	
Methoxychlor	EPA 8081B
	EPA 608.3
Mirex	EPA 8081B
PCNB	EPA 8270D
Toxaphene	EPA 8081B
	EPA 608.3

Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
1,2,4-Trichlorobenzene	EPA 625.1
	EPA 8270D
2-Chloronaphthalene	EPA 625.1
	EPA 8270D
Hexachlorobenzene	EPA 625.1
	EPA 8270D
Hexachlorobutadiene	EPA 625.1
	EPA 8270D
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270D
Hexachloroethane	EPA 625.1
	EPA 8270D
Hexachloropropene	EPA 8270D
Pentachlorobenzene	EPA 8270D

Chlorophenoxy Acid Pesticides	
2,4,5-T	EPA 8151A

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Chlorophenoxy Acid Pesticides	
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Dinoseb	EPA 8151A EPA 8270D
Pentachlorophenol	EPA 8151A
Demand	
Biochemical Oxygen Demand	SM 5210B-2011
Carbonaceous BOD	SM 5210B-2011
Chemical Oxygen Demand	EPA 410.4, Rev. 2.0 (1993)
Dissolved Gases	
Acetylene	RSK-175
Ethane	RSK-175
Ethene (Ethylene)	RSK-175
Methane	RSK-175
Propane	RSK-175
Fuel Oxygenates	
Di-isopropyl ether	EPA 8260C EPA 8015C
Ethanol	EPA 8015C
Methyl tert-butyl ether	EPA 8260C EPA 624.1
tert-amyl methyl ether (TAME)	EPA 8260C
tert-butyl alcohol	EPA 8260C
Fuel Oxygenates	
tert-butyl alcohol	EPA 624.1
tert-butyl ethyl ether (ETBE)	EPA 8260C
Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 625.1 EPA 8270D
4-Bromophenylphenyl ether	EPA 625.1 EPA 8270D
4-Chlorophenylphenyl ether	EPA 625.1 EPA 8270D
Bis(2-chloroethoxy)methane	EPA 625.1 EPA 8270D
Bis(2-chloroethyl)ether	EPA 625.1 EPA 8270D
Low Level Polynuclear Aromatics	
Acenaphthene Low Level	EPA 8310 EPA 610 EPA 8270D
Acenaphthylene Low Level	EPA 8310 EPA 610 EPA 8270D
Anthracene Low Level	EPA 8310 EPA 610 EPA 8270D
Benzo(a)anthracene Low Level	EPA 8310 EPA 610

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Low Level Polynuclear Aromatics

Benzo(a)anthracene Low Level	EPA 8270D
Benzo(a)pyrene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Benzo(b)fluoranthene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Benzo(g,h,i)perylene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Benzo(k)fluoranthene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Chrysene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Dibenzo(a,h)anthracene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Fluoranthene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Fluorene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Indeno(1,2,3-cd)pyrene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Naphthalene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Phenanthrene Low Level	EPA 8310
	EPA 610
	EPA 8270D
Pyrene Low Level	EPA 8310
	EPA 610
	EPA 8270D

Metals I

Barium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Cadmium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Calcium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
Chromium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A

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Metals I

Chromium, Total	EPA 200.8, Rev. 5.4 (1994)
Copper, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Iron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
Lead, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Magnesium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
Manganese, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Nickel, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Potassium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
Silver, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A

Metals I

Silver, Total	EPA 200.8, Rev. 5.4 (1994)
Sodium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
Strontium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C

Metals II

Aluminum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 200.8, Rev. 5.4 (1994)
Antimony, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Arsenic, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Beryllium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Chromium VI	EPA 218.6, Rev. 3.3 (1994)
	EPA 7196A
	EPA 7199
	SM 3500-Cr B-2011

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Metals II

Mercury, Low Level	EPA 1631E
Mercury, Total	EPA 245.1, Rev. 3.0 (1994)
	EPA 7470A
Selenium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Vanadium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Zinc, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)

Metals III

Cobalt, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Gold, Total	EPA 200.7, Rev. 4.4 (1994)
Molybdenum, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)

Metals III

Palladium, Total	EPA 200.7, Rev. 4.4 (1994)
Thallium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
	EPA 6020A
	EPA 200.8, Rev. 5.4 (1994)
Tin, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
Titanium, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
Uranium (Mass)	EPA 6020A

Mineral

Alkalinity	SM 2320B-2011
Calcium Hardness	SM 2340B-2011
Chloride	EPA 300.0, Rev. 2.1 (1993)
	EPA 9056A
Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)
	EPA 9056A
Hardness, Total	SM 2340C-2011
	SM 2340B-2011
Sulfate (as SO4)	EPA 300.0, Rev. 2.1 (1993)
	EPA 9056A

Miscellaneous

Boron, Total	EPA 200.7, Rev. 4.4 (1994)
	EPA 6010C
Bromide	EPA 300.0, Rev. 2.1 (1993)

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Miscellaneous

Bromide	EPA 9056A
Color	SM 2120B-2011
Corrosivity	SM 2330
Cyanide, Available	SM 4500-CN G-2011
Cyanide, Total	Kelada-01
	SM 4500-CN E-2011
	EPA 335.4, Rev. 1.0 (1993)
	EPA 9012B
Formaldehyde	EPA 8315A
non-Polar Extractable Material (TPH)	EPA 1664A
Oil and Grease Total Recoverable (HEM)	EPA 1664A
Organic Carbon, Total	SM 5310B-2011
	SM 5310C-2011
	EPA 9060A
Phenols	EPA 420.4, Rev. 1.0 (1993)
	EPA 9066
Specific Conductance	EPA 120.1 (Rev. 1982)
Sulfide (as S)	SM 4500-S2- F-2011
	EPA 9034
Turbidity	EPA 180.1, Rev. 2.0 (1993)

Nitroaromatics and Isophorone

1,3,5-Trinitrobenzene	EPA 8270D
1,3-Dinitrobenzene	EPA 8270D
1,4-Naphthoquinone	EPA 8270D
2,4-Dinitrotoluene	EPA 625.1

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270D
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270D
4-Nitroquinoline-1-oxide	EPA 8270D
Isophorone	EPA 625.1
	EPA 8270D
Nitrobenzene	EPA 625.1
	EPA 8270D

Nitrosoamines

N-Nitrosodiethylamine	EPA 8270D
N-Nitrosodimethylamine	EPA 625.1
	EPA 8270D
N-Nitrosodi-n-butylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270D
N-Nitrosodiphenylamine	EPA 625.1
	EPA 8270D
N-nitrosomethylethylamine	EPA 8270D
N-nitrosomorpholine	EPA 8270D
N-nitrosopiperidine	EPA 8270D
N-Nitrosopyrrolidine	EPA 8270D

Nutrient

Ammonia (as N)	EPA 350.1, Rev. 2.0 (1993)
	ASTM D6919-09
Kjeldahl Nitrogen, Total	EPA 351.2, Rev. 2.0 (1993)

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Nutrient

Nitrate (as N)	EPA 353.2, Rev. 2.0 (1993)
	EPA 300.0, Rev. 2.1 (1993)
	EPA 9056A
Nitrate-Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993)
Nitrite (as N)	EPA 353.2, Rev. 2.0 (1993)
	EPA 300.0, Rev. 2.1 (1993)
	EPA 9056A
Orthophosphate (as P)	EPA 365.1, Rev. 2.0 (1993)
Phosphorus, Total	EPA 365.1, Rev. 2.0 (1993)

Organophosphate Pesticides

Atrazine	EPA 8270D
Dimethoate	EPA 8270D
Disulfoton	EPA 8270D
Parathion ethyl	EPA 8270D
Parathion methyl	EPA 8270D
Phorate	EPA 8270D
Sulfotepp	EPA 8270D
Thionazin	EPA 8270D

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015C

Phthalate Esters

Benzyl butyl phthalate	EPA 625.1
	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 625.1

Phthalate Esters

Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 625.1
	EPA 8270D
Dimethyl phthalate	EPA 625.1
	EPA 8270D
Di-n-butyl phthalate	EPA 625.1
	EPA 8270D
Di-n-octyl phthalate	EPA 625.1
	EPA 8270D

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A

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All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1268 (PCB-1268)	EPA 8082A

Polynuclear Aromatics

2-Acetylaminofluorene	EPA 8270D
3-Methylcholanthrene	EPA 8270D
7,12-Dimethylbenzyl (a) anthracene	EPA 8270D
Acenaphthene	EPA 625.1 EPA 8270D
Acenaphthylene	EPA 625.1 EPA 8270D
Anthracene	EPA 625.1 EPA 8270D
Benzo(a)anthracene	EPA 625.1 EPA 8270D
Benzo(a)pyrene	EPA 625.1 EPA 8270D
Benzo(b)fluoranthene	EPA 625.1 EPA 8270D
Benzo(g,h,i)perylene	EPA 625.1 EPA 8270D
Benzo(k)fluoranthene	EPA 625.1 EPA 8270D
Chrysene	EPA 625.1 EPA 8270D
Dibenzo(a,h)anthracene	EPA 625.1 EPA 8270D

Polynuclear Aromatics

Fluoranthene	EPA 625.1 EPA 8270D
Fluorene	EPA 625.1 EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 625.1 EPA 8270D
Naphthalene	EPA 625.1 EPA 8270D
Phenanthrene	EPA 625.1 EPA 8270D
Pyrene	EPA 625.1 EPA 8270D

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 625.1 EPA 8270D
2,4,6-Trichlorophenol	EPA 625.1 EPA 8270D
2,4-Dichlorophenol	EPA 625.1 EPA 8270D
2,4-Dimethylphenol	EPA 625.1 EPA 8270D
2,4-Dinitrophenol	EPA 625.1 EPA 8270D
2,6-Dichlorophenol	EPA 8270D

Serial No.: 61014

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. CHRISTINE KUTZER
ALS ENVIRONMENTAL - ROCHESTER
1565 JEFFERSON ROAD BUILDING 300, SUITE 360
ROCHESTER, NY 14623

NY Lab Id No: 10145

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Priority Pollutant Phenols

2-Chlorophenol	EPA 625.1
	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270D
2-Methylphenol	EPA 625.1
	EPA 8270D
2-Nitrophenol	EPA 625.1
	EPA 8270D
3-Methylphenol	EPA 625.1
	EPA 8270D
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270D
4-Methylphenol	EPA 625.1
	EPA 8270D
4-Nitrophenol	EPA 625.1
	EPA 8270D
Cresols, Total	EPA 8270D
Pentachlorophenol	EPA 625.1
	EPA 8270D
Phenol	EPA 625.1
	EPA 8270D

Residue

Settleable Solids	SM 2540 F-2011
Solids, Total	SM 2540 B-2011
Solids, Total Dissolved	SM 2540 C-2011

Residue

Solids, Total Suspended	SM 2540 D-2011
Solids, Volatile	SM 2540 E-2011

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
2-Picoline	EPA 8270D
4-Amino biphenyl	EPA 8270D
Acetophenone	EPA 625.1
	EPA 8270D
alpha-Terpineol	EPA 625.1
Aramite	EPA 8270D
Benzaldehyde	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Ethyl methanesulfonate	EPA 8270D
Isosafrole	EPA 8270D
Methyl methanesulfonate	EPA 8270D
O,O,O-Triethyl phosphorothioate	EPA 8270D
p-Dimethylaminoazobenzene	EPA 8270D
Phenacetin	EPA 8270D

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Semi-Volatile Organics

Safrole	EPA 8270D

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C EPA 624.1
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C EPA 624.1
1,4-Dichlorobenzene	EPA 8260C EPA 624.1
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C EPA 624.1
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C EPA 624.1
Ethyl benzene	EPA 8260C EPA 624.1
Isopropylbenzene	EPA 8260C
m/p-Xylenes	EPA 8260C EPA 624.1
Naphthalene, Volatile	EPA 8260C EPA 624.1

Volatile Aromatics

n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C EPA 624.1
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C EPA 624.1
Total Xylenes	EPA 8260C EPA 624.1

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260C EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C EPA 624.1
1,1,2-Trichloroethane	EPA 8260C EPA 624.1
1,1-Dichloroethane	EPA 8260C EPA 624.1

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Volatile Halocarbons

1,1-Dichloroethene	EPA 8260C
	EPA 624.1
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloro-1,1,2-Trifluoroethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
	EPA 624.1
1,2-Dichloropropane	EPA 8260C
	EPA 624.1
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
	EPA 624.1
3-Chloropropene (Allyl chloride)	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
	EPA 624.1
Bromoform	EPA 8260C
	EPA 624.1
Bromomethane	EPA 8260C
	EPA 624.1
Carbon tetrachloride	EPA 8260C
	EPA 624.1

Volatile Halocarbons

Chloroethane	EPA 8260C
	EPA 624.1
Chloroform	EPA 8260C
	EPA 624.1
Chloromethane	EPA 8260C
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260C
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260C
	EPA 624.1
Dibromochloromethane	EPA 8260C
	EPA 624.1
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260C
Methyl iodide	EPA 8260C
Methylene chloride	EPA 8260C
	EPA 624.1
Tetrachloroethene	EPA 8260C
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260C
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260C
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260C

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All approved analytes are listed below:

Volatile Halocarbons

Trichloroethene	EPA 8260C
	EPA 624.1
Trichlorofluoromethane	EPA 8260C
	EPA 624.1
Vinyl chloride	EPA 8260C
	EPA 624.1

Volatiles Organics

1,4-Dioxane	EPA 8260C
	EPA 8270D
	EPA 8270D SIM
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
2-Nitropropane	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
	EPA 624.1
Acetone	EPA 8260C
	EPA 624.1
Acetonitrile	EPA 8260C
	EPA 624.1
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Di-ethyl ether	EPA 8260C
Ethyl Acetate	EPA 8260C
	EPA 8015C
Ethylene Glycol	EPA 8015C

Volatiles Organics

Isobutyl alcohol	EPA 8260C
	EPA 8015C
Isopropanol	EPA 8260C
Methanol	EPA 8015C
Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
n-Butanol	EPA 8260C
o-Toluidine	EPA 8270D
Propylene Glycol	EPA 8015C
Tetrahydrofuran	EPA 8260C
	EPA 624.1
Vinyl acetate	EPA 8260C
	EPA 624.1

Sample Preparation Methods

	EPA 5030C
	EPA 200.2
	EPA 9030B
	EPA 3010A
	EPA 3005A
	EPA 3510C
	EPA 3535A

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All approved analytes are listed below:

Acrylates

Acrolein (Propenal)	EPA 8260C
Acrylonitrile	EPA 8260C
Ethyl methacrylate	EPA 8260C
Methyl acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C

Amines

1,2-Diphenylhydrazine	EPA 8270D
1,4-Phenylenediamine	EPA 8270D
1-Naphthylamine	EPA 8270D
2-Naphthylamine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
5-Nitro-o-toluidine	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D
Diphenylamine	EPA 8270D
Methapyrilene	EPA 8270D
Pronamide	EPA 8270D

Benzidines

3,3'-Dichlorobenzidine	EPA 8270D
3,3'-Dimethylbenzidine	EPA 8270D
Benzidine	EPA 8270D

Characteristic Testing

Corrosivity (pH)	EPA 9040C
	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
Chlorobenzilate	EPA 8270D
delta-BHC	EPA 8081B
Diallate	EPA 8270D
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B

Serial No.: 62020

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All approved analytes are listed below:

Chlorinated Hydrocarbon Pesticides

Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Isodrin	EPA 8270D
Kepone	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Pentachloronitrobenzene	EPA 8270D
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D
1,2,4-Trichlorobenzene	EPA 8270D
1-Chloronaphthalene	EPA 8270D
2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 8270D
Hexachlorobutadiene	EPA 8270D
Hexachlorocyclopentadiene	EPA 8270D
Hexachloroethane	EPA 8270D
Hexachlorophene	EPA 8270D
Hexachloropropene	EPA 8270D
Pentachlorobenzene	EPA 8270D

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A

Chlorophenoxy Acid Pesticides

2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A
Dinoseb	EPA 8270D
Pentachlorophenol	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270D
4-Bromophenylphenyl ether	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270D

Low Level Polynuclear Aromatic Hydrocarbons

Acenaphthene Low Level	EPA 8270D
Acenaphthylene Low Level	EPA 8270D
Anthracene Low Level	EPA 8270D
Benzo(a)anthracene Low Level	EPA 8270D
Benzo(a)pyrene Low Level	EPA 8270D
Benzo(b)fluoranthene Low Level	EPA 8270D
Benzo(g,h,i)perylene Low Level	EPA 8270D
Benzo(k)fluoranthene Low Level	EPA 8270D
Chrysene Low Level	EPA 8270D
Dibenzo(a,h)anthracene Low Level	EPA 8270D
Fluoranthene Low Level	EPA 8270D
Fluorene Low Level	EPA 8270D
Indeno(1,2,3-cd)pyrene Low Level	EPA 8270D

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All approved analytes are listed below:

Low Level Polynuclear Aromatic Hydrocarbons

Naphthalene Low Level	EPA 8270D
Phenanthrene Low Level	EPA 8270D
Pyrene Low Level	EPA 8270D

Metals I

Barium, Total	EPA 6010C
	EPA 6020A
Cadmium, Total	EPA 6010C
	EPA 6020A
Calcium, Total	EPA 6010C
Chromium, Total	EPA 6010C
	EPA 6020A
Copper, Total	EPA 6010C
	EPA 6020A
Iron, Total	EPA 6010C
Lead, Total	EPA 6010C
	EPA 6020A
Magnesium, Total	EPA 6010C
Manganese, Total	EPA 6010C
	EPA 6020A
Nickel, Total	EPA 6010C
	EPA 6020A
Potassium, Total	EPA 6010C
Silver, Total	EPA 6010C
	EPA 6020A
Sodium, Total	EPA 6010C
Strontium, Total	EPA 6010C

Metals II

Aluminum, Total	EPA 6010C
Antimony, Total	EPA 6010C
	EPA 6020A
Arsenic, Total	EPA 6010C
	EPA 6020A
Beryllium, Total	EPA 6010C
	EPA 6020A
Chromium VI	EPA 7199
Lithium, Total	EPA 6010C
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010C
	EPA 6020A
Vanadium, Total	EPA 6010C
	EPA 6020A
Zinc, Total	EPA 6010C
	EPA 6020A

Metals III

Cobalt, Total	EPA 6010C
	EPA 6020A
Molybdenum, Total	EPA 6010C
	EPA 6020A
Silica, Dissolved	EPA 6010C
Thallium, Total	EPA 6010C

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Metals III

Thallium, Total	EPA 6020A
Tin, Total	EPA 6010C
Titanium, Total	EPA 6010C

Minerals

Bromide	EPA 9056A
Chloride	EPA 9056A
Fluoride, Total	EPA 9056A
Sulfate (as SO4)	EPA 9056A

Miscellaneous

Boron, Total	EPA 6010C
Cyanide, Total	EPA 9012B
Organic Carbon, Total	Lloyd Kahn Method
Phenols	EPA 9066
Sulfide (as S)	EPA 9034

Nitroaromatics and Isophorone

1,3,5-Trinitrobenzene	EPA 8270D
1,3-Dinitrobenzene	EPA 8270D
1,4-Naphthoquinone	EPA 8270D
2,4-Dinitrotoluene	EPA 8270D
2,6-Dinitrotoluene	EPA 8270D
4-Dimethylaminoazobenzene	EPA 8270D
4-Nitroquinoline-1-oxide	EPA 8270D
Isophorone	EPA 8270D
Nitrobenzene	EPA 8270D

Nitroaromatics and Isophorone

Pyridine	EPA 8270D

Nitrosoamines

N-Nitrosodiethylamine	EPA 8270D
N-Nitrosodimethylamine	EPA 8270D
N-Nitrosodi-n-butylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 8270D
N-Nitrosodiphenylamine	EPA 8270D
N-nitrosomethylethylamine	EPA 8270D
N-nitrosomorpholine	EPA 8270D
N-nitrosopiperidine	EPA 8270D
N-Nitrosopyrrolidine	EPA 8270D

Nutrients

Nitrate (as N)	EPA 9056A
Nitrite (as N)	EPA 9056A

Organophosphate Pesticides

Dimethoate	EPA 8270D
Disulfoton	EPA 8270D
Parathion ethyl	EPA 8270D
Parathion methyl	EPA 8270D
Phorate	EPA 8270D
Sulfotepp	EPA 8270D
Thionazin	EPA 8270D

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015C

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Phthalate Esters

Benzyl butyl phthalate	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 8270D
Dimethyl phthalate	EPA 8270D
Di-n-butyl phthalate	EPA 8270D
Di-n-octyl phthalate	EPA 8270D

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A

Polynuclear Aromatic Hydrocarbons

2-Acetylaminofluorene	EPA 8270D
3-Methylcholanthrene	EPA 8270D
7,12-Dimethylbenzyl (a) anthracene	EPA 8270D
Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(g,h,i)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Pyrene	EPA 8270D

Priority Pollutant Phenols

2,3,4,6 Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 8270D
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D
2,4-Dimethylphenol	EPA 8270D

Serial No.: 62020

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Expires 12:01 AM April 01, 2021
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Revised May 20, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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ALS ENVIRONMENTAL - ROCHESTER
1565 JEFFERSON ROAD BUILDING 300, SUITE 360
ROCHESTER, NY 14623

NY Lab Id No: 10145

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All approved analytes are listed below:

Priority Pollutant Phenols

2,4-Dinitrophenol	EPA 8270D
2,6-Dichlorophenol	EPA 8270D
2-Chlorophenol	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270D
2-Methylphenol	EPA 8270D
2-Nitrophenol	EPA 8270D
3-Methylphenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 8270D
Phenol	EPA 8270D

Semi-Volatile Organics

1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
2-Picoline	EPA 8270D
4-Amino biphenyl	EPA 8270D
Acetophenone	EPA 8270D
Aramite	EPA 8270D
Benzaldehyde	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D

Semi-Volatile Organics

Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Ethyl methanesulfonate	EPA 8270D
Isosafrole	EPA 8270D
Methyl methanesulfonate	EPA 8270D
O,O,O-Triethyl phosphorothioate	EPA 8270D
Phenacetin	EPA 8270D
Safrole	EPA 8270D

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
1,4-Dichlorobenzene	EPA 8260C
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
Ethyl benzene	EPA 8260C
Isopropylbenzene	EPA 8260C
m/p-Xylenes	EPA 8260C
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C

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WADSWORTH CENTER

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Volatile Aromatics

n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C
Total Xylenes	EPA 8260C

Volatile Chlorinated Organics

Benzyl chloride	EPA 8260C

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
1,1-Dichloroethane	EPA 8260C
1,1-Dichloroethene	EPA 8260C
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260C

Volatile Halocarbons

2,2-Dichloropropane	EPA 8260C
2-Chloro-1,3-butadiene (Chloroprene)	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
3-Chloropropene (Allyl chloride)	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
Bromoform	EPA 8260C
Bromomethane	EPA 8260C
Carbon tetrachloride	EPA 8260C
Chloroethane	EPA 8260C
Chloroform	EPA 8260C
Chloromethane	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260C
Dibromochloromethane	EPA 8260C
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methyl iodide	EPA 8260C
Methylene chloride	EPA 8260C
Tetrachloroethene	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260C
trans-1,4-Dichloro-2-butene	EPA 8260C
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260C

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Volatile Halocarbons

Vinyl chloride	EPA 8260C

Volatile Organics

1,4-Dioxane	EPA 8260C
	EPA 8270D
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
2-Nitropropane	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
Acetonitrile	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Di-ethyl ether	EPA 8260C
Ethyl Acetate	EPA 8260C
Ethylene Glycol	EPA 8015C
Isobutyl alcohol	EPA 8260C
Isopropanol	EPA 8260C
Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
Methyl tert-butyl ether	EPA 8260C
n-Butanol	EPA 8260C
o-Toluidine	EPA 8260C
	EPA 8270D
Propionitrile	EPA 8260C
tert-butyl alcohol	EPA 8260C

Volatile Organics

Tetrahydrofuran	EPA 8260C
Vinyl acetate	EPA 8260C

Sample Preparation Methods

EPA 5035A-L
EPA 5035A-H
EPA 3580A
EPA 9030B
EPA 3050B
EPA 3060A
EPA 3541

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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous	
Lead in Dust Wipes	EPA 6010C
Sample Preparation Methods	
	EPA 3050B

Serial No.: 61016

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WADSWORTH CENTER

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ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Miscellaneous

Sulfur Dioxide	40 CFR 60 Method 8
Sulfuric Acid	40 CFR 60 Method 8

Serial No.: 61017

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APPENDIX 2
FIELD METHOD GUIDANCE DOCUMENTS

Analytical Soil Sampling Guidance

I. Scope and Application

This field guidance provides guidelines for the procedures associated with the collection of analytical soil samples regardless of the sampler used. Analytical soil samples may be collected as discrete(grab) or composite samples.
This field guidance does not address equipment decontamination (see FG 002 Field Equipment Decontamination) or sample packaging, shipping, and chain-of-custody procedures (see FG 003 Analytical Sample Handling).

II. Materials

As required, the following materials shall be available during the collection of analytical soil samples:

- Work plan or field sampling plan;
- Field logbook;
- Field sampling or log form;
- Chain-of-custody record and custody seals;
- Laboratory provided, certified clean, bottleware;
- Sample labels;
- Indelible labelling marker (Sharpie® or similar)
- Field screening equipment (e.g. photoionization detector [PID]);
- Soil sample coring device (as applicable);
- Powder-free nitrile gloves;
- Stainless steel or disposable scoop/trowel;
- Stainless steel, or disposable aluminum homogenization container (if applicable);
- Paper towels;
- Cooler with wet ice;
- Sealable bags for ice and sample bottles;
- Equipment decontamination supplies (as described in SOP 002 to this Quality Assurance Project Plan [QAPP]); and
- Location marking flags and stakes.

III. Methods

Soil samples may be collected at various depth intervals below ground surface as specified in each task specific work plan. Soil samples that will be collected near ground surface may be collected using manual sampling methods; samples that will be collected at depths greater than four feet below ground surface will be obtained from soil cores using direct-push drilling methods or other drilling methods appropriate to the task. Each sample location will be marked using stakes and flagging, and will be noted in the field log book.

ANALYTICAL SOIL SAMPLE COLLECTION

1. Review the Work Plan to identify the soil sample location and sample interval rationale
2. Prepare a clean work area by placing clean plastic sheeting adjacent to the sampling location (*e.g.* on a portable table), if conditions allow. Otherwise, prevent sampling equipment from contacting the ground or other surface that could compromise sample integrity.
3. Identify the required bottleware for each analytical sample based upon the laboratory provided bottle inventory.
4. If convenient, pre-label the sample bottleware.
5. Regardless of the sampler type, clean, powder-free, nitrile sampling gloves should be donned immediately prior to collecting analytical soil samples from the sampling device.
6. Obtain an undisturbed sample (split spoon, macrocore, etc.)
7. Screen the sample by visual, olfactory, PID, and other screening methods (if applicable) to identify the analytical sample interval.
   a. For discrete/grab samples:
      - Standard Sample Collection
        - Identify a discrete depth interval to be sampled within the soil core based on screening observations;
        - Using an appropriate sampling device (disposable sanitary scoop, properly decontaminated reusable stainless-steel scoop, auger, or shovel; fresh nitrile gloved hand), extract the volume of soil from the desired sample interval or location
        - Transfer the collected soil directly from the sampling device to the appropriate, laboratory-provided bottle(s); and
        - Firmly seal laboratory bottle subsequent to sample transfer.

      OR
      - En-Core® Sample Collection (for sample collection by SW-846 Method 5035C)
        - Identify a discrete depth interval to be sampled within the soil core based on screening observations
        - Press the EnCore® sampler into the soil interval to be sampled to a depth of approximately 5/8” to obtain an approximate 5-gram sample.
        - Remove excess soil from end of EnCore® sampler to ensure proper seal and when capping.
        - Cap EnCore® sampler. Three, 5-gram, EnCore® samplers will be collected per sample.
        - Fill contents of dry-weight sample bottle, and firmly seal the bottle.

      OR
      - Terra-Core® Sample Collection (for sample collection by SW-846 Method 5035C)
        - Identify a discrete depth interval to be sampled within the soil core based on screening observations
        - Press Terra-Core® sampler into the soil interval to be sampled to a depth of approximately 5/8” to obtain an approximate 5-gram sample.
        - Remove excess soil from end of sampler and extrude the sample into a pre-preserved 40 ml vial. Promptly replace the vial cap and firmly seal the vial.
        - Repeat previous two steps until each 40 ml vial within the sample kit has been filled.
        - Fill the 60 ml soil moisture bottle.

   b. For composite samples:
      - Soil from the designated sample interval/location will be placed in a stainless steel, or disposable aluminum homogenization container as indicated by the applicable work plan.

Homogenize the soil sample in the container. Place the appropriate volume of the homogenized sample directly into a laboratory bottle. Firmly seal the sample bottle.

8. Sealed, fully labelled sample bottles will be placed in a cooler containing ice immediately after collection.
9. Following the collection of an analytical soil sample the sample will be recorded on a Chain-of-Custody in accordance with the QAPP.
10. Pack and ship all analytical samples in accordance with SOP003 (Analytical Sample Handling).

IV. Quality Assurance

Field duplicate, matrix spike, and matrix spike duplicate samples will be collected at the frequency consistent with the approved work plan or Quality Assurance Project Plan (QAPP) governing each sampling task. Equipment blanks will be collected to verify that the decontamination procedures of non-dedicated equipment are effective in minimizing potential for cross contamination. The equipment blank is prepared by pouring analyte-free water provided by the laboratory over the clean and dry equipment, while collecting the rinsate into appropriate sample containers. Equipment blanks will be collected at the frequency and analyzed for the parameters described in the approved work plan or QAPP.

DUPLICATE SAMPLES

Duplicate samples are prepared by alternately filling the container for the "primary sample" for a particular parameter and then filling the container for the "duplicate sample" for that same parameter. Duplicate samples need to be included on the chain-of-custody.

MATRIX SPIKE/MATRIX SPIKE DUPLICATES

Matrix spike/matrix spike duplicates (MS/MSDs) are collected in the same manner as a duplicate sample. MS/MSDs need to be included on the chain-of-custody form.

EQUIPMENT BLANKS

Equipment blanks are prepared by slowly pouring laboratory-quality deionized (DI) water over decontaminated, non-dedicated, non-disposable sampling equipment (i.e., stainless-steel trowels, shovels, bucket augers etc.) and collecting the resulting run-off in the appropriate clean, laboratory provided sampling container(s). An equipment blank should be collected for the same analyses as the samples. Equipment blanks need to be included on the chain-of-custody form.

V. Decontamination

Collection of analytical soil samples may involve the use of disposable and non-disposable sampling equipment. Non-disposable equipment will be decontaminated in accordance with the Equipment Decontamination Guidance before collecting each sample, between sampling events, and prior to leaving the site. Dedicated and/or disposable (not to be re-used) sampling equipment will not require decontamination. Decontamination of sampling equipment will be noted in the field logbook.

VI. Data Recording and Management

The collection of each analytical soil sample will be recorded on applicable sampling logs and in the field logbook. Information will include the sample time, depth, purpose, applicable screening results, applicable physical description, and any deviations from this FG.

Passive Diffusion Bag Sampling Guidance

I. Scope and Application

This field guidance presents general guidelines established by Ramboll for the collection of groundwater samples via the polyethylene-based Passive Diffusion Bag (PDB) sampler no purge method. Passive-diffusion sampling of ground water using a semipermeable membrane is a patented technology [U.S. Patent Number 5,804,743 held by Don A. Vroblesky (U.S. Geological Survey) and William T. Hyde (General Electric Company)].

Passive-diffusion sampling of ground water using a semipermeable membrane was initially studied and described by Vroblesky and Hyde (1997). The method is based on the principal that volatile organic compounds (VOCs) in ground water migrate via molecular diffusion through a semipermeable membrane such as polyethylene until the concentrations on either side of the membrane reach equilibrium. Deionized water sealed within a semipermeable passive-diffusion bag serves as the sample medium, which is placed in the open interval of the monitoring well and removed after an equilibration period. Certain types of VOCs (e.g., some ketones) do not equilibrate rapidly enough for practical sampling using passive bags. Passive-diffusion bags have been successfully benchmarked, however, for many common VOCs including aromatics and chlorinated ethenes and ethanes. Comparative passive-diffusion sampling for other groups of analytes (e.g., semivolatile organic compounds, pesticides, polychlorinated biphenols, and inorganics) has not been demonstrated.

With the passive-diffusion sampling method, it is assumed that the water inside the open interval of a monitoring well represents ambient ground water quality without any purging. This assumption is based on the fact that the wellbore hydraulic conductivity is higher than that of the surrounding formation in almost all geologic settings. Thus, the open interval of the well is assumed to be constantly flushed with ambient ground water. Vroblesky and Hyde (1997) presented results comparing passive-diffusion ground-water sampling results for VOCs to those obtained using other methods, including submersible pump, bladder pump, and bailer. They concluded that the passive-diffusion sampling results were similar to those obtained using the other purging and sampling methods.

II. Materials

As required, the following materials shall be available during the collection of groundwater samples with the low flow sampling technique:

- Site plan, well construction records, prior ground water sampling records (if available);
- Passive-diffusion bag sampler, constructed as described below;
- Water level probe;
- Temperature, pH, specific conductivity, ORP, and/or turbidity meters (optional);
- Appropriate water sample containers; and
- Appropriate blanks (trip blanks supplied by the laboratory)..

III. Methods

PRE-SAMPLING ACTIVITIES

1. Coordinate and obtain permission for site access;
2. Review project-specific Work Plan/sampling plan, where applicable;
3. Review project-specific Quality Assurance Project Plan (QAPP), where applicable;
4. Review and discuss the proposed Work Plan/sampling plan or sampling strategy;
5. Review the standard instruction manual provided by the PDB vendor; and
6. Verify that all equipment/materials required to complete the work have been packed prior to travel.

PASSIVE-DIFFUSION BAG SAMPLER CONSTRUCTION

Passive-diffusion bag samplers will be purchased from a licensed commercial supplier, or, subject to licensing requirements, may be constructed in a clean, laboratory or office environment according to the following procedures:

1. Cut a roll of 4-mil polyethylene, flat (2-inch wide) tubing into 18-inch-long sections. Close one end of each cut section using a 24-inch impulse heat sealer to create an elongated bag. In addition, heat seal the two sides of the bag to create a double side seal. Fill the bag with approximately 150 milliliters (ml) of laboratory-grade deionized water. Heat-seal the other end of the bag, taking care to minimize or eliminate headspace
2. Place the passive-diffusion bag samplers in a clean plastic bag or wrap in clear polyethylene sheeting, and transport to the site in a cooler containing wet ice to minimize the formation of headspace inside the passive-diffusion bags.
3. Prior to mobilization to the site, review well construction details and water levels in each well to be sampled. Fabricate well-specific passive bag holders by measuring the line (i.e., nylon, stainless steel, nylon - coated stainless steel or Teflon®– coated stainless-steel line) and attaching the snap hooks on the line such that the deionized water-filled polyethylene bag can be secured by the hooks within the screened or open rock interval of the well and the stainless-steel weight will barely rest on the bottom of the well. Generally, the deionized water-filled polyethylene bag will be placed at the midpoint of the saturated portion of the open interval of the well. For wells with partially saturated screens or open intervals, the deionized water-filled polyethylene bag will be placed at a location corresponding to the approximate midpoint of the water column, or deeper within the water column if necessary, to ensure the placement of the passive bag is 2 to 3 feet below the measured water level. Leave several feet of extra line at the top to facilitate the proper placement of the passive bag sampler within the well. To minimize the potential for contamination, place each well-specific passive bag holder in a labeled zip- sealing bag upon completion for transport to the site. After the first sampling event, the holders may be dedicated to certain wells if stainless-steel or Teflon®-coated stainless-steel line is utilized. The dedicated bag holder may be attached to the top of the well casing or to the well cap to prevent the line from falling into the well during placement of the deionized water-filled polyethylene bag or between sampling events.

PASSIVE-DIFFUSION BAG SAMPLER CONSTRUCTION

1. Don appropriate personal protective equipment (as required by the Health and Safety Plan).
2. Place plastic sheeting around the well (optional, based on field conditions at the time of sampling and the method used to contain the wire sample holder)
3. Clean the non-disposable, down-hole monitoring equipment (e.g., water-level probe, field parameter meters)

4. Open the well cover while standing upwind of the well. remove well cap and place it in a location that will minimize the potential for contamination. If the historical concentrations of VOCs in the well indicates the potential for exposure to VOCs in the breathing zone, or if no ground water quality information exists for the well, then complete the remainder of this step. If exposure to VOCs is unlikely, then, at the discretion of the sampler, proceed to step 5.

   Insert photoionization detector (PID) probe approximately 4 to 6 inches into the casing or the well headspace and cover with gloved hand. Record the PID reading in the field log. If the well headspace reading is less than 5 PID units, proceed; if the headspace reading is greater than 5 PID units, screen the air within the breathing zone. If the breathing zone reading is less than 5 PID units, proceed. If the PID reading in the breathing zone is above 5 PID units, move upwind from well for five minutes to allow the volatiles to dissipate. Repeat the breathing zone test. If the reading is still above 5 PID units, don appropriate respiratory protection in accordance with the requirements of the health and safety plan. Record all PID readings.
5. Measure the depth to water and the total well depth [if a complete round of water level measurements were obtained prior to conducting the ground water sampling event, redundant water-level measurements do not need to be collected at the actual tine of sampling. Further, total depth measurements will be obtained on an annual basis (typically in October of each year) in conjunction with monitoring network inspection activities.

6. Remove the appropriate passive-diffusion bag sampler from the shipping container.

7. Attach the deionized water-filled polyethylene bag to the line of the well-specific passive bag holder or the dedicated holder using the stainless-steel snap hooks.

8. Slowly lower the passive bag sampler down the well until the stainless-steel weight reaches the bottom of the well indicating that the sampler is properly positioned in the screened or open rock interval. The passive bag sampler will generally be placed at the midpoint of the saturated portion of the open interval of the well.

9. Secure the line extending above the top of the well riser pipe either to the steel casing or the locking cap.

10. Close and lock the well.

11. Record the date and time of placement of the passive bag sampler in the well on the passive bag installation inventory form provided at the end of this attachment.

12. Allow an equilibration period of 14 days or more before retrieving the passive-diffusion bag. If necessary, the well may be accessed briefly during the equilibration period (e.g., to obtain fluid water level measurements), provided that the line remains at the top of the well casing throughout the equilibration period, which should be a minimum of 14 days.

PASSIVE-DIFFUSION BAG SAMPLER RETRIEVAL AND SAMPLE COLLECTION

1. After the equilibration period, unlock and open the well by following steps 1 through 4 from the installation procedure. Slowly remove the passive-diffusion bag sampler from the monitoring well.

2. Remove the sample-filled polyethylene bag from the stainless-steel snap hooks and dry with a clean paper towel. Cut a small hole in the sample-filled polyethylene bag using a decontaminated knife or decontaminated stainless-steel scissors. Pour water from the bag directly into appropriate laboratory sample container.

3. Complete the sample label and place sample container in a cooler containing wet ice.

4. Record on the passive bag installation inventory form the date and time of sample collection. In addition, record in the field log, any pertinent observations of the sample (e.g., physical appearance, the presence of, or lack of, odors, sheens, etc.), and the values of the field indicator parameters, if measured.

5. Return dedicated holders, if used, to the monitoring well after sampling activities are complete. close and lock the monitoring well.

IV. Quality Assurance

Field duplicate, matrix spike, and matrix spike duplicate samples will be collected at the frequency consistent with the approved work plan or Quality Assurance Project Plan (QAPP) governing each sampling task.

DUPLICATE SAMPLES

Duplicate samples are prepared by alternately filling the container for the "primary sample" for a particular parameter and then filling the container for the "duplicate sample" for that same parameter. Duplicate samples need to be included on the chain-of-custody.

MATRIX SPIKE/MATRIX SPIKE DUPLICATES

Matrix spike/matrix spike duplicates (MS/MSDs) are collected in the same manner as a duplicate sample. MS/MSDs need to be included on the chain-of-custody form.

The following quality assurance procedures should be observed in the field:

Samples should be collected from monitoring wells in order of increasing concentration, to the extent known;

- All monitoring instrumentation shall be operated in accordance with manufacturer instructions. Instruments should be calibrated at the beginning of each day, and the calibration should be verified at the end of each day.
- If passive diffusion is being benchmarked versus another sampling method (e.g., low-flow or traditional purge using a pump or bailer), the other sampling method should be performed on

the same day that the passive-diffusion bag is retrieved and sampled at a given well. This protocol will provide the best practicable comparison between the results of the different sampling methods.

- Each passive sampler should be dedicated to a single monitoring well. If a passive-diffusion bag holder is being re-used following a period of storage, the length of the line and position of the snap hooks relative to the sample interval should be verified prior to placement in the monitoring well.

Data Recording and Management

The collection of each sample will be recorded on applicable sampling logs and in the field logbook. Information will include the sample time, depth, purpose, applicable screening results, applicable physical description, and any deviations from this FG.

Low Flow Groundwater Sampling Guidance

I. Scope and Application

This field guidance provides guidelines for the collection of groundwater samples from monitoring wells using the low flow sampling technique. The low flow sampling technique is used to collect samples that are representative of groundwater conditions in the geologic formation. There are three primary benefits of sampling using the low flow technique. First, it minimizes disturbances of sediment at the bottom of the well, thus producing a sample with low turbidity. Second, it minimizes the aeration of groundwater during sample collection. Third, it significantly reduces the volume of purged groundwater. The low flow sampling technique is ideal for collecting biodegradation-related samples for the reasons stated above.

II. Materials

As required, the following materials shall be available during the collection of groundwater samples with the low flow sampling technique:

- Well construction records and most recent low-flow sampling log, if available
- Polyethylene sheeting
- Photoionization detector (PID), if required by the site Health and Safety Plan (HASP)
- Low flow sampling pump (e.g., submersible pump, bladder pump, etc.)
- New or dedicated polyethylene tubing (LDPE or HDPE)
- Water level probe
- Flow rate measurement supplies (i.e., graduated cylinder and stop watch)
- Power source [e.g., generator or nearby electrical outlet with GFI protection if using an electric submersible pump or source of compressed gas if using a bladder pump (compressed gas cylinder or oil free compressor)]
- Purge water container (e.g., bucket, drum or polyethylene tank)
- In-line water quality indicator that measures the following parameters:
  - Temperature, measured in degrees Celsius (°C)
  - pH, measured in standard units (SU)
  - Specific conductivity, measured in microsiemens, millisiemens or Siemens per centimeter (µS/cm, mS/cm, or S/cm)
  - Oxidation-reduction potential (ORP), measured in millivolts (mV)
  - Dissolved oxygen (DO), measured in milligrams per liter (mg/L)
- Flow through cell
- Meter for measuring turbidity in nephelometric turbidity units (NTU)
- Three-way valve to act as a bypass for collecting turbidity readings
- A check valve to prevent back flow should the pump stop
- Personal protective equipment (PPE), as required by the site HASP
- Groundwater sample containers per the Quality Assurance Project Plan (QAPP)
- Single-use filter(s) that fits the LDPE tubing being used (as applicable)
- Low flow sampling form
- Field logbook

- Decontamination supplies as recommended in the Equipment Decontamination Guidance

III. Methods

PRE-SAMPLING ACTIVITIES

1. Determine the order of sampling.
2. Perform calibration checks on field monitoring instruments as recommended by manufacturer and document the calibration in the Field Logbook or appropriate field calibration form.
3. Lay out a sheet of polyethylene sheeting around the well to be sampled.
4. Don appropriate PPE as described in the HASP.
5. If required by the site HASP, monitor for volatile organic compounds (VOCs) in accordance with procedures outlined in the HASP.
6. Measure and record the depth to water and the total depth of the well as described in the Water Level Measurement field guidance document.

GROUNDWATER SAMPLE COLLECTION

1. If a non-dedicated, non-disposable pump is to be used, install the pump in the well. Attach new or dedicated low-density polyethylene (LDPE) tubing to the pump. Slowly lower the pump, tubing, and the pump electrical lead cable or air lines, depending on the type of pump being used, into the well to the specified sample depth. Generally, the pump should be installed so that it is positioned at the mid-point of the open interval (i.e., the screened interval or the open bedrock borehole). Record the pumping intake depth in the Field Log Book or appropriate field sampling form.
2. Measure and record the depth to water in the well as described in SOP 012 – Water Level Measurement. Leave the water level probe suspended in the well for use during purging.
3. Attach the three-way valve, check valve and flow through cell and/or in-line water quality meter between the pump and the purge water container.
4. Attach tubing from the outlet of the flow through cell and/or meter to the purge water container ensuring that the end of the tubing discharges above the water surface in the container to prevent the potential for purge water backflow into the well when the pump is turned off.
5. Attach the pump electrical lead or air lines to the pump control box.
6. If using a generator, place the generator downwind of the sampling location to the extent feasible, then start the generator.
7. Plug the pump control box into the power source or connect air lines to source of compressed gas, depending on the type of pump being used.
8. During low flow sampling, the pump should produce a flow rate of no less than 100 milliliters per minute (ml/min) and no greater than 500 ml/min. Measure and record the depth to water every 3 to 5 minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 feet or less). Adjust the flow rate as necessary so that pumping does not induce drawdown.
9. During the purging of the well, measure and record the field parameters (temperature, pH, specific conductivity, ORP, DO and turbidity) at the same frequency as the depth to water measurements. Purging and field parameter monitoring should continue until the field parameters have stabilized for at least three consecutive measurements. Stabilization is defined as:
   a. pH within ± 0.1 SU

   b. Specific conductivity within ± 3%
   c. ORP within ± 10 mV
   d. DO and turbidity within ± 10%
   b. Evaluate field parameters to ensure consistency in parameter relationships (e.g., if ORP is negative, DO should be very low or 0 mg/L).

10. Once stabilization has occurred, disconnect the in-line water quality meter while continuing to purge the well, taking care to not allow water to spill on the ground surface.
11. The pump should not be turned off prior to sampling. If, at any point, the pump shuts down or flow is lost, stabilization must be re-achieved before sampling, even if it has already been achieved.
12. Field personnel conducting the sampling should don a new pair of nitrile gloves immediately before sampling the groundwater.
13. Label the sample containers as outlined in the QAPP prior to sampling.
14. Sampling should be conducted using flow rates between 100 and 250 ml/min. Samples for VOC analysis should be collected first. If field-filtered samples are to be collected, collect all unfiltered samples first, then attach a single-use filter to the LDPE tubing. Sample through the filter for any field-filtered samples.
15. After the samples have been collected, turn off the pump control box and then turn off the pumps power supply (i.e., the electrical or compressed gas sources). Disconnect the pump control box from the power supply, and then disconnect the pump electrical lead or air lines from the control box.
16. Remove the pump, LDPE tubing and electrical or air lines from the well, while winding the lead cable back around the reel to minimize tangling. The LDPE tubing should not be allowed to touch the ground and should be coiled as it is pulled out of the well. If the tubing is to be dedicated, it should be placed back in the well after the pump has been removed or the coil should be placed in a clean and labeled plastic bag for future use. If the LDPE tubing will be discarded, it should be cut into manageable pieces and discarded in accordance with the task work plan.
17. Close and lock the well. Clean up all equipment, and discard polyethylene sheeting in accordance with the waste management procedures discussed in the Investigation Study Work Plan and Remedial Design Work Plan 1, depending on which plan is being implemented.
18. If a non-dedicated, non-disposable pump is used, decontaminate the pump prior to its next use in accordance with SOP 002 – Field Equipment Decontamination. It is recommended that the pump be disassembled during decontamination.

IV. Quality Assurance

Specific details related to field quality assurance and quality control (QA/QC) samples are described in the QAPP. A brief overview of the collection of QA/QC samples is included here for reference.

DUPLICATE SAMPLES

Duplicate samples are prepared by alternately filling the container for the "primary sample" for a particular parameter and then filling the container for the "duplicate sample" for that same parameter. Duplicate samples need to be included on the chain-of-custody.

TRIP BLANKS

Trip blanks are prepared in the laboratory and are shipped from the laboratory with the applicable sample collection vials for each project. The trip blank vials should be inspected for air bubbles upon receipt from the laboratory. The trip blanks are not opened in the field. A trip blank should be present in each shipping cooler containing samples to be analyzed for volatile compounds (i.e. VOCs, methanol, dissolved gases, etc.). Trip blanks need to be included on the chain-of-custody form.

MATRIX SPIKE/MATRIX SPIKE DUPLICATES

Matrix spike/matrix spike duplicates (MS/MSDs) are collected in the same manner as a duplicate sample. MS/MSDs need to be included on the chain-of-custody form.

EQUIPMENT BLANKS

Equipment blanks are prepared by slowly pouring laboratory-quality deionized (DI) water over decontaminated, non-dedicated, non-disposable sampling equipment (i.e., Grundfos pump, etc.) and collecting the resulting run-off in the appropriate clean, laboratory provided sampling container(s). An equipment blank should be collected for the same analyses as the samples. Equipment blanks need to be included on the chain-of-custody form.

Analytical Sample Handling Guidance

I. Scope and Application

This field guidance provides guidelines for the handling, packing, and shipping procedures for the management of analytical samples.

II. Materials

As required, the following materials and supplies shall be available during analytical sample handling, packaging, and shipping:

- Indelible ink pens (black or blue)
- Polyethylene bags (re-sealable type)
- Clear packing tape, strapping tape, duct tape
- Chain-of-custody forms
- DOT shipping forms, as applicable
- Custody seals or tape
- Appropriate sample containers and labels
- Insulated coolers of adequate size for samples and ice
- Wet ice
- Cushioning material (i.e., bubble wrap)
- Temperature blank (if provided by laboratory)
- Sample return shipping papers and addresses
- Field logbook

III. Methods

CHAIN-OF-CUSTODY

1. Start chain-of-custody records in the field when sample collection is completed and kept with the sample containers placed in the coolers for transportation to the laboratory. One completed chain-of-custody record must be kept with each sample cooler at all times.
2. Complete chain-of-custody and sample collection forms in waterproof, non-erasable ink or electronically.
3. Complete chain-of-custody forms neatly using printed or typed text. If a simple mistake is made, the error will be lined out with a single line, initialed, and dated.
4. Sequentially number each separate sample entry.
5. Avoid the use of "Ditto" or quotation marks to indicate repetitive information in columnar entries. A continuous vertical arrow will be used between the first entry and the next different entry if numerous repetitive entries must be made in the same column.
6. Consecutively number each form using the "Page ___ of ___" format when more than one chain-of-custody form is used for a single shipment.
7. Place additional instructions directly onto the chain-of-custody form, if necessary.

8. Define acronyms used on a chain-of-custody form.
9. The chain-of-custody form will contain the following information:
   a. Project identification and number,
   b. Sample description/location,
   c. Required analysis,
   d. Date and time of sample collection,
   e. Type and matrix of sample,
   f. Number of sample containers,
   g. Analysis requested/comments,
   h. Sampler signature/date/time,
   i. Date and signature of the laboratory representative,
   j. Carrier used to ship coolers, and
   k. Air bill number (if shipped by a commercial carrier).
10. The field sampling team will transport or ship the cooler via an overnight delivery service or hand deliver to the laboratory. Prior to shipment of sample coolers, the field sampling team will contact the laboratory to notify the laboratory of the shipment.
11. The COC document will be completed by the field sampler and provided for each sample cooler. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the COC. Custody of samples must be continuous between parties, and time gaps must not be present. Each shipment of samples to the laboratory must have its own COC record with the contents of the shipment, method of shipment, name of courier, and other pertinent information written on the record.

HANDLING

1. The field sampler is personally responsible for the care and custody of the sample until transferred. The field logbook will be used to note information regarding collection of samples and any observations. All entries will be signed and dated.
2. The following information will be recorded in the field logbook or on associated field forms by the field sampling team:
   a. Project number and site name
   b. Sample identification code and other sample identification information
   c. Sampling method
   d. Date and time
   e. Sample media
   f. Name of sampler(s)
   g. Location of field duplicates and sample identifications
   h. Locations that field quality control (QC) samples were collected including blind duplicates and matrix spikes/matrix spike duplicates
3. The sample label will be completed with the following information in indelible ink:
   a. Sample identification code and other sample identification information
   b. Analysis required
   c. Date and time sampled
   d. Initials of sampling personnel
   e. Preservative added, if applicable

4. The label will be covered with clear packing tape (if water-proof labels are not being used) to secure the label onto the container and to protect the label from liquid.

PACKING

1. For aqueous and solid samples, ice that has been placed in heavy-duty polyethylene bags and properly sealed will be placed on top of or between the samples. Samples will be packed securely to eliminate breakage during shipment with ice packs to maintain the inside temperature at approximately 6°C.
2. Sampling containers will be packed with packing materials. When possible, sample container preparation and packing for shipment will be completed in a well-organized and clean area. Sample containers will be prepared for shipment by wiping containers clean of debris/water using paper towels.
3. The chain-of-custody record will be placed into a Ziploc plastic bag; the bag will be taped to the inner side of the cooler lid; and the top of the cooler will be closed and securely taped (preferably with fiber tape) shut. Two custody seals will be affixed to the latch and lid of the cooler. The number of the security seal will be recorded on the chain-of-custody form. The custody seals will consist of adhesive-backed tape that easily rips if it is disturbed. The field sampler will initial and date the seal. The seals must be broken to open the cooler and will indicate tampering if the seal is broken before receipt at the laboratory.
4. A label containing the name and address of the shipper will be placed on the outside of the container.

SHIPPING

1. All samples should be delivered by an express carrier within 24 hours of sample collection. Alternatively, samples may be delivered directly to the laboratory or laboratory service center, or a laboratory courier may be used for sample pickup.
2. Sampling personnel will take precautions to ship or deliver samples to the laboratory so that the holding times will not be exceeded.
3. Samples must be maintained at 6°C, ±2°C until shipment and through receipt at the laboratory
4. When the samples are received by the laboratory, laboratory personnel will complete the chain-of-custody by recording the date and time of receipt of samples, measuring and recording the internal temperature of the shipping container, and checking the sample identification numbers on the containers to ensure they correspond with the chain-of-custody forms.

IV. Quality Assurance

Specific details related to field quality assurance and quality control (QA/QC) samples are described in the QAPP. A brief overview of the collection of QA/QC samples is included here for reference.

DUPLICATE SAMPLES

Duplicate samples are prepared by alternately filling the container for the "primary sample" for a particular parameter and then filling the container for the "duplicate sample" for that same parameter. Duplicate samples need to be included on the chain-of-custody.

TRIP BLANKS

Trip blanks are prepared in the laboratory and are shipped from the laboratory with the applicable sample collection vials for each project. The trip blank vials should be inspected for air bubbles upon receipt from the laboratory. The trip blanks are not opened in the field. A trip blank should be present in each shipping cooler containing samples to be analyzed for volatile compounds (i.e., VOCs, methanol, dissolved gases, etc.). Trip blanks need to be included on the chain-of-custody form.

MATRIX SPIKE/MATRIX SPIKE DUPLICATES

Matrix spike/matrix spike duplicates (MS/MSDs) are collected in the same manner as a duplicate sample. MS/MSDs need to be included on the chain-of-custody form.

EQUIPMENT BLANKS

Equipment blanks are prepared by slowly pouring laboratory-quality deionized (DI) water over decontaminated, non-dedicated, non-disposable sampling equipment (i.e., Grundfos pump, etc.) and collecting the resulting run-off in the appropriate clean, laboratory provided sampling container(s). An equipment blank should be collected for the same analyses as the samples. Equipment blanks need to be included on the chain-of-custody form.

V. Data Recording and Management

The original chain-of-custody record accompanies the shipment, and the copies are distributed to the Project Manager. Freight bills, postal service receipts, and bills of lading will be retained as permanent documentation. The laboratory will immediately contact the Project Manager if issues pertaining to sample condition or documentation are detected (i.e., broken security seal; broken, open, or otherwise compromised sample containers; chain-of-custody information in disagreement with sample labels; etc.).

Equipment Decontamination Guidance

I. Scope and Application

This field guidance provides guidelines for the steps to be used to decontaminate sampling equipment. Equipment decontamination is performed to minimize the potential for cross-contamination prior to sample collection. Equipment that may require decontamination include non-dedicated sampling devices and water testing instruments. Non-dedicated equipment will be cleaned before collecting each sample, between sampling events, and prior to leaving the site. Dedicated and/or disposable (not to be re-used) sampling equipment will not require decontamination.

II. Materials

As required, the following materials shall be available during equipment decontamination:

- Distilled water
- Non-phosphate detergent (e.g., Alconox®, or similar)
- Potable water
- Brushes
- Trash bags
- Personal Protective Equipment (Nitrile gloves and safety glasses)
- Spray bottles
- Plastic sheeting
- 5-gallon buckets with snap on lids
- Dedicated decontamination tubes for submersible pumps, if applicable.

III. Methods

Equipment decontamination areas will be set up within or adjacent to the specific work areas. The general sampling equipment decontamination will be conducted as follows:

1. Prepare a wash solution by filling mixing the desired volume of potable water and adding the recommended amount on non-phosphate detergent. Prepare two rinse solutions. The first will consist of potable water while the second will consist of distilled water.
2. Wash and scrub the equipment per the manufacture’s guidelines, if available, in the wash solution.
3. Remove as much soap residue as possible and thoroughly rinse the equipment with the potable water rinse to remove the remaining soap residue.
4. Rinse the equipment with the distilled water.
5. Wrap the decontaminated equipment in aluminum foil or place inside clean, unused garbage bags prior to next use.

DECONTAMINATING SUBMERSIBLE PUMPS

Submersible pumps may be used during groundwater sampling activities. The pumps will be decontaminated before and between uses. The decontamination process for submersible pumps will consist of the general decontamination procedure above, as well as flushing wash solution, potable water rinse, and distilled water rinse through the pump.

1. Prepare appropriately sized, non-electrically conductive, dedicated containers, one container each for the wash solution, potable water rinse, and distilled water rinse.
2. Following the completion of the general decontamination procedure, place the pump in the wash solution container. Add an appropriate volume of wash solution to the container.
3. Pump the wash solution through the pump and non-disposable tubing (if applicable) into a used decontamination fluid container. Caution should be exercised to avoid contact with the pump casing and fluid in the container while the pump is running to limit the chance of electrical shock.
4. Remove the pump from the wash solution container and remove excess soap residue. Place the pump in the potable water rinse container and pump the potable water rinse through the pump.
5. Transfer the pump to the distilled water rinse container and pump the distilled water rinse through the pump.
6. Following the final rinse, wrap the pump in aluminum foil or place in a clean, unused garbage bag.

If the pump or discharge hose must be laid on the ground surface at any point during the decontamination process, the pump and hose should be placed on or in clean polyethylene sheeting to avoid contact with the ground surface.

IV. Handling of Decontamination Materials

Liquid wastes (i.e., water and/or water with small amounts of non-phosphate detergent) generated during equipment decontamination will be contained in 55-gallon drums, labeled, and characterized for off-site treatment and disposal.

V. Data Recording and Management

Equipment cleaning and decontamination will be documented in the field logbook. Information will include the type of equipment cleaned, the decontamination location and any deviations from this field guidance.

VI. Quality Assurance

Equipment blanks will be collected to assess the effectiveness of the decontamination of non-dedicated equipment in minimizing potential for cross contamination. The equipment blank is prepared by pouring analyte-free water provided by the laboratory over the clean and dry equipment while collecting the rinsate in the appropriate laboratory provided sample containers. Equipment blanks will be collected at the frequency and analyzed for the parameters described in the Quality Assurance Project Plan (QAPP).

Overburden Logging

I. Scope and Application

This field guidance provides guidelines to describe and classify unconsolidated soils based on field observation**.** These observations may be validated by laboratory testing at the discretion of the geologist or geotechnical engineer as required by the work plan.
Field activities that involve the handling, description, documentation, and storage of bedrock core samples will be performed by a geologist or geotechnical engineer familiar with the content of this field guidance document and possess the required skills, training, and experience necessary to successfully complete field activities.

II. Materials

As required, the following materials and supplies shall be available during the logging of unconsolidated soils unless indicated “as applicable”:

- Field notebook;
- Overburden log forms or field computing device with applicable borehole logging software;
- Black permanent marker(s) and indelible ink pen(s);
- Engineers scale(s) (retractable or folding);
- Color chart (Munsell® Soil Color Book or Munsell® Rock Color Book, if possible);
- Retractable safety knife (as applicable);
- Digital camera;
- Work table(s) (optional);
- Canopy tent (optional);
- Historic boring logs nearest to the borehole (if available); and
- Personal protective equipment (PPE) as required by the Job Safety Analysis (JSA) or Health and Safety Plan (HASP).

III. Methods

Prior to advancing a boring the following notes should be recorded in the field notebook:

- Sample location
- Date and time
- Weather conditions
- Sampler's name

Additionally, a boring log (see Attachment A) will be prepared to document the description of the unconsolidated samples. The following information should be recorded on a paper boring log form or on field computer with applicable borehole logging software prior to advancing each boring:

- Boring start date
- Client, project location, sample point identification, and qualitative location description
- Boring location (northing and easting) and ground surface elevation (if known)

- Borehole inclination
- Logging geologist or geotechnical engineer
- Drill rig make and model
- Drill crew foreman / master driller
- Drilling method(s)
- Drill fluids used (if applicable)
- Sampler type and geometry (e.g. split spoon, macrocore, Shelby, California, etc.). Attachment B presents sampler type examples
- Sampler advancement method (e.g. hammer weight and fall)
- Sample point or borehole purpose

Once a boring has commenced the following information should be recorded on a paper boring log form or on field computer with applicable borehole logging software for each unconsolidated soil sample:

- Sequential sample number
- Sample start and end depth
- Depth penetrated
- Sample recovery
- Blow counts over ever six-inch interval penetrated for ASTM 1586-84 (as applicable)
- N-value (as applicable)
- Sample description

  The description of the unconsolidated samples will include the following in characteristics in this order:

  1. Color / mottling
  2. Saturation state (dry, moist, %, etc.)
  3. Density description (from blow count)
  4. Soil description
     - Grain size (include both “a” and “b”)
       a) Wentworth (for environmental and hydrogeological purposes) or Burmister (for geotechnical purposes)
       b) Unified Soil Classification (USC)
     - Grain shape
     - Sorting
     - Internal structure (layering / laminations)
     - Plasticity
  5. Other
     - Weathering
     - Discernable mineralogy
     - Observed odor
     - Stains/discoloration
     - Organic content (plant fragments, roots, or skeletal debris)

  Note: Detail instructions for describing the unconsolidated samples are included in Attachment A.

- Field testing observations (e.g. photoionization or flame ionization detector screening results)
- Other observations pertinent to each sample.
  - Sampling tool behavior (refusal, no recovery, etc.)
  - Drill string behavior (refusal, changes in advancement rate

During the advancement of each borehole the observations consistent with the following should be recorded in the field notebook:

- Limiting field conditions
- Problems encountered

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ATTACHMENTS

A. Detailed sampling description instructions
B. Sampler types

Appendix A

SAMPLE DESCRIPTION INSTRUCTIONS

The following detailed instructions should be followed to complete each sample description:

1. **Descriptive Color**
   - Color name, Munsell® Color Code
     Example: Dark Yellowish Brown
   - Color notation including hue, value, chroma, and qualifiers
     Example: 10YR 4/2
     hue = 10YR
     value = 4
     chroma = 2

   Mottling with abbreviations, descriptors, and criteria for descriptions of mottles. **Table 1** below lists these terms.

   Example: few, fine to medium, faint Very Pale Orange (10YR 8/2) mottles…

TABLE 1. DESCRIPTORS FOR MOTTLING

Abundance	**Size**	**Contrast**
few (<2%)	fine (<5 mm)	faint
common (2%-20%)	medium (5-5 mm)	distinct
many (>20%)	coarse (>15 mm)	prominent

2. **Saturation State**

   The saturation state of each sample should be described using one or more of the following descriptors:
   - dry,
   - damp,
   - moist,
   - wet, or
   - saturated.

   These descriptors may be combined to indicated changes in saturation across a single sample (Example: …, damp to moist, …). If saturated samples are observed the depth to groundwater within the borehole should be noted.

3. **Density Description**

   For a 24-inch long, 2-inch diameter split spoon sampler, count the blows of each 6-inch increment of the split spoon (ASTM-1586-84). Add the blows from the second and third 6-inch intervals and record the sum as the “n-value”. The density descriptor associated with the n-value for each sample should correspond to the value ranges in **Table 2** below. (Example: the blows recorded for a cohesive soil were 6-8-6-9 the n-value is 14 and the sample density descriptor is “stiff”)

TABLE 2. TERMS TO DESCRIBE DENSITY.

Cohesive clays	**Non-cohesive granular soils**
0-2 .... very soft	0-3 .... very loose
2-4 .... soft	4-9 .... loose
5-7 .... firm	10-29 .... medium dense
8-15 .... stiff	30-49 .... dense
16-29 .... hard	50-80 .... very dense
30-49 .... very hard	80+ .... extremely dense
50-80 .... extremely hard	

4. Grain Size Description

The grain size represented in each sample will be described in accordance with either the Modified Wentworth Scale (**Table 3**), the Burmister System (**Table 4**) or the ASTM Unifies Soil Classification System (USC) (**Tables 6, 7, and 8**).

MODIFIED WENTWORTH SCALE

TABLE 3. GRAIN SIZE SCALES – MODIFIED WENTWORTH SCALE.

Grade limits		**Grade names**		
mm	**mm**			
4,096				
		very large		
2,048				
		large		
1,024				boulders
		medium		
512				
		small		
256				
		large		
128			cobbles	
		small		*gravel*
64				
		very coarse		
32				
		coarse		
16				
		medium	pebbles	
8				
		fine		
4				
		very fine		
2				
		very coarse		
1				

		coarse		
1/2	0.5			
		medium	sand	
1/4	0.250			
		fine		
1/8	0.125			
		very fine		
1/16	0.062			
		Coarse		
1/32	0.031			
		medium		
1/64	0.016		silt	
		fine		
1/128	0.008			
		very fine		
1/256	0.004			*mud*
		coarse		
1/512	0.002			
		medium		
1/1024	0.001			clay size
		fine		
1/2048	0.005			
		very fine		
1/4096	0.00025			

Source: Ingram. Cited by AGI data sheet 29.1.

BURMISTER SYSTEM

When using the Burmister System, the soil components are described with the terms in **Table 4** below.

TABLE 4. GRAIN SIZE SCALES – BURMISTER SYSTEM

	Sieve limit	
Soil component	**Upper**	**Lower**
Gravel		
coarse	3 inch	1 inch
medium	1 inch	3/8 inch
fine	3/8 inch	No. 10 (2.0 mm)
Sand		
coarse	No. 10 (2.0 mm)	No. 30 (0.590 mm)
medium	No. 30 (0.590 mm)	No. 60 (0.250 mm)
fine	No. 60 (0.250 mm)	No. 200 (0.074 mm)
Silt	No. 200	0.005 mm
Clay	0.005 mm to	0.001 mm
Colloids	finer than 0.001 mm	

RELATIVE ABUNDANCE TERMINOLOGY

Each sample may consist of more than one grain size. The principal grain size represented in the sample is to be written in capital letters. The less abundant constituents are to be recorded from most abundant to least abundant and preceded by the descriptive terminology presented in **Table 5** to denote the percentage by weight of each component.
(*Example*: for a sample consisting of 80% silt, 15% fine to medium sand, and 5% clay the description would be recorded as “SILT, little fm sand, trace clay”.)

TABLE 5. DESCRIPTIVE TERMINOLOGY

Descriptive Terms	**Range of Proportion**
Trace	1-10%
Little	10-20%
Some	20-35%
And	35-50%

ASTM UNIFIED SOIL CLASSIFICATION

Coarse grained soils include clean gravels and sands and silty or clayey gravels and sands with more than 50% retained on the No. 200 sieve. **Table 6** presents the grade limits and grade names used by engineers according to ASTM standards D422-63 and D643-78.

TABLE 6. GRAIN SIZE SCALE USED BY ENGINEERS

	Grade limits	**U.S. standard**		**Grade names**
mm	**inch**	**sieve series**		
				boulders
305	12.0			
				cobbles
76.2	3.0	3.0 inch		
		gravel		
4.75	0.19	No. 4		
2.00	0.08	No. 10		
			medium	sand
0.425		No. 40		
0.074		No. 200		
				silt
0.005				
				clay size

Source: AGI data sheet 29.2

TABLE 7. COARSE GRAINED SOILS: USCS SYMBOLS AND TYPICAL NAMES.

Symbol	Description
GW	Well graded gravels, gravel-sand mixtures, little or no fines
GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well graded sands, gravelly sands, little or no fines
SP	Poorly graded sands, gravelly sands, little of no fines
SM	Silty sand, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures

Fine grained soils include inorganic and organic silts and clays, gravelly, sandy, or silty clays and clayey silts with more than 50% passing the No. 200 sieve. **Table 8** shows the USC symbols and typical names of fine grained soils.

TABLE 8. FINE GRAINED SOILS: USCS SYMBOLS AND TYPICAL NAMES.

Symbol	Description
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
CH	Inorganic clays of high plasticity (residual clays), fat clays
OH	Organic clays of medium to high plasticity, organic silts
Pt	Peat and other highly organic soils

5. **Table 9** presents soil descriptors.

TABLE 9. SOIL DESCRIPTORS

Descriptor	Definition
Calcareous	containing appreciable quantities of calcium carbonate
Fissured	containing shrinkage cracks, often filled with fine sand or silt, usually more or less vertical
Intermixed	containing appreciable, random and disoriented quantities of varying color, texture of constituency
Mottled	containing appreciable random speckles or pockets of varying color, texture or constituency
Interbedded	containing alternating layers of different soil types
Layered	containing layers of varying color, texture or constituency; typically greater than 3 inches
Laminated	containing thin layers of varying color, texture or constituency
Parting	paper thin textural or consistency variation
Slickensided	having inclined planes of weakness that are slick and glossy in appearance and often result in lower unconfined compression cohesion

Varved	sanded or layered with silt or very fine sand (cyclic sedimentary couplet)
Poorly graded (well sorted)	primarily one grain size, or having a range of sizes with some intermediate size missing
Split graded	containing primarily two predominant grain sizes with intermediate sizes missing
Well graded (poorly sorted)	containing wide range of grain sizes and substantial amounts of all intermediate particle sizes
Modifiers	Predominant type, 50% to 100% Modifying type, 12% to 50% With, 5% to 12% Trace, 1% to 5%

6. **Table 10** presents the terms used to denote the various degrees of plasticity of soil that passes the No. 200 sieve.

TABLE 10. PLASTICITY

Descriptive Term	Degree of Plasticity	Plasticity Index Range
SILT	none	non-plastic
Clayey SILT	slight	1-5
SILT & CLAY	low	5-10
CLAY & SILT	medium	10-20
Silty CLAY	high	20-40
CLAY	very high	over 40

Appendix B

BOREHOLE ADVANCE METHODS

Borehole advancement method descriptions may consist of one of the following:

- Cable Tool
- Coring
- Cut and Wash
- Direct Push
- Hollow Stem Auger (HSA)
- Drive and Wash
- Geoprobe®
- Macrocore
- Air Rotary
- Dual Rotary/Odex®
- Fluid Rotary
- Mud Rotary
- Rotosonic
- Vibracore

SAMPLER TYPES

Sample type descriptions may consist of one of the following:

- Auger Cutting
- Macrocore
- Grab Sample
- Rock Core
- Rotosonic
- General Sample
- Standard Penetration Test
- Split Spoon
- Shelby Tube
- Vane Shear
- Geoprobe dual tube

Photoionization Detector (PID)

I. Scope and Application

This field guidance provides guidelines for the use of a photoionization detector (PID) to measure total organic vapors in work and breathing zones. A PID is a portable, hand-held monitoring instrument that measures total organic compounds by photoionization of organic vapors. Monitoring for the potential presence of organic vapors by photoionization detector should be performed as specified in a given work plan, consistent with the following guidance, and the Health and Safety Plan (HASP).

II. Materials

As required, the following materials shall be available when a PID is required for use in monitoring work breathing zones:

- HASP;
- Personal protective equipment (PPE) as specified in the HASP for the activity to be conducted;
- Operating manual for the model of PID to be used;
- PID with appropriate lamp rating for the organic compounds known or anticipated to be present in the work area. The instrument will not detect/measure volatile organic compounds that have ionization potentials outside the rating of the lamp;
- Intake dust filters;
- Calibration gas in the concentration range appropriate for the expected use;
- Field logbook, or field log form; and
- Indelible ink pens with blue or black ink

III. Methods

PRE-SAMPLING ACTIVITIES

1. Prior to use program the PID with the action level identified in the HASP

2. Charge the PID before use each day.

3. Connect the measurement probe to the instrument (if necessary, depending on the model of PID) and dust filter, turn on the instrument, and make necessary operational checks in accordance with the manufacturer’s instructions provided in the operating manual.

4. Calibrate the instrument using appropriate calibration gas and calibration steps in accordance with the manufacturer’s instructions provided in the operating manual.

5. Return instrument to its monitoring mode.

6. Point the tip of the probe into the zone to be monitored and observe the readings measured in parts per million (ppm).

7. Record the highest reading observed in the field logbook or field log form and compare the reading to action levels identified in the HASP. Make appropriate upgrades to PPE, if necessary, as specified in the HASP.

IV. Quality Assurance

At the beginning of each day of use, make sure the PID battery is fully charged, is in proper working order and calibrated in accordance with manufacturer's specifications. If problems are observed when using or calibrating the PID, refer to the manufacturer's instructions to trouble-shoot the problem, and/or replace the PID if necessary.

Be aware that high humidity/precipitation can interfere with the operation of the PID and can cause the PID to stop working or give erroneous readings. If the PID is believed to be responding abnormally and moisture is the suspected cause, use the calibration gas as a check (not calibration) on the instrument response. If the PID reading is lower than the concentration of the calibration gas then dry out the probe and ionization chamber in accordance with the manufacturer's instructions before returning the PID to use.

Water Level Measurement

I. Scope and Application

This field guidance provides guidelines associated with measuring and recording groundwater levels. Groundwater levels may be measured using an electronic water level probe or pressure transducer(s). Groundwater levels will be measured from an established, surveyed, reference point, typically marked on the top of the well casing. Groundwater levels will be converted to groundwater elevations by subtracting the depth to the groundwater surface within the well from the reference point elevation.

II. Materials

As required, the following materials shall be available during water level measurements:

- Electronic water level probe with sufficient cable length to reach the water level in the well;
- Well keys;
- Nitrile gloves;
- Decontamination supplies (spray bottles containing non-phosphate detergent/distilled water and distilled water, paper towels, buckets and lids to contain and properly dispose of any rinse water);
- Trash bags;
- Indelible ink pen; and
- Appropriate field form or bound, project specific field logbook

III. Methods

1. Record the monitoring well identification/number in field logbook along with date, time using indelible ink.
2. Don a new pair of nitrile gloves.
3. Stand upwind of the monitoring well and unlock and open the monitoring well.
4. Locate the reference point on the well casing. If a reference point is not present, create one by marking the casing at its highest point using a permanent marker. Document in the field book that a new reference mark has been established.
5. If using an electronic water level probe, slowly lower the level indicator probe until it emits a tone and/or light indicating that the water surface has been encountered. Observe the water level from the reference mark to the nearest 0.01 feet.
6. If using a pressure transducer, first measure the water level to the nearest 0.01 feet with an electronic water level probe and record the reading in the field book. Program the data logger to record the water level at appropriate time intervals to meet the project objectives. Connect the pressure transducer to the data logger and lower the transducer into the well to a depth that does not exceed the operating range of the transducer and the anticipated fluctuation in water levels. Secure the position of the transducer by securing the transducer cable to the well casing (if the edges of the well casing are sharp, cover them with cloth or duct tape to protect the transducer cable), or secure the cable inside of the well casing in such a manner that the well can be locked.
7. Record the observed water level on a field form or within a bound project specific field logbook.

8. When finished with the water level measurement, decontaminate the water level measuring device per the Field Equipment Decontamination field guidance document.
9. Secure the well head by locking the lock.

IV. Handling of Investigation-Derived Material

Decontamination water and used personal protective equipment will be managed in accordance with applicable work plans.

V. Data Recording and Management

Each observed water level will be recorded on an appropriate field form or within a bound project specific field book.

VI. Quality Assurance

Water level and/or oil/water interface measurements will be confirmed by repeating each reading multiple times to check that the observed readings are consistent and that the water level in the well is not changing.

APPENDIX 3
FIELD FORMS

RAMBOLL

Low Flow Groundwater Sampling Log

Well ID: ____________
Northing: ____________
Easting: ____________

Site Name: ____________
Site Location: ____________
Project #: ____________

Sampling Method: ____________
Equipment Used: ____________
Pump/Controller ID#: ____________

Field Personnel: ____________
Date: ____________
Weather: ____________

Well information:

Installed Depth of Well*: ____________ ft. bmp.
Measured Depth of Well*: ____________ ft. bmp.
Depth to Water*: ____________ ft. bmp.
Length of Water Column (LWC): ____________ ft.
Well Diameter: ____________ in.

Well Volume Multipliers:

____ 1 in. = 0.041 gal/ft
____ 2 in. = 0.163 gal/ft
____ 4 in. = 0.653 gal/ft
____ 6 in. = 1.469 gal/ft
____ 8 in. = 2.611 gal/ft

Measurement Point*: ____________
MP Notes: ____________
____
Well Volume: ____________ gal.
Pump Intake Depth*: ____________ ft. bmp.

Start Purge Time: ____________

Initial Observations: *Color* ____________ *Odor* ____________ *Sheen/Free Product* ____________

Elapsed Time *Minutes*	**Depth to Water** *ft bmp*	**Temperature** *Celsius*	**pH** *SU*	**Specific Conductivity** *µS/cm*	**ORP** *mV*	**Dissolved Oxygen** *mg/L*	**Turbidity** *NTU*	**Flow Rate** *ml/min*	**Other**
Select Units from Dropdown Menus									
Stabilization	Δ ≤ 0.3'	± 3%	± 0.1	± 3%	± 10 mV	± 10%	± 10%	200 ≤ X ≤ 500	

End Purge Time: ____________

Total volume of groundwater purged: ____________ gal.

DO Titrataion: ________ mg/L

Final Observations: *Color* ____________ *Odor* ____________ *Sheen/Free Product* ____________

Analytical Sample ID: ____________ **Date:** ____________ **Time:** ____________

Container Size	Container Type	Qty Collected	Field Filtered?	Preservative	Laboratory

Notes: ____________

RAMBOLL

PASSIVE DIFFUSION BAG LOG

PDBs installed by:
PDBs retrieved by:
Page: 1 of 1

Site Name:
Site Location:
Project Name:
Project #:

Provider Lot #:
PDBs received on:
Received condition:
PDB volume:

PDB = Passive Diffusion Bag
MP = Measurement Point
ft bmp = feet below measurement point
QA/QC = Quality Assurance / Quality Control

Well ID	MP Type	PDB Depth (ft bmp)			Depth to Water (ft bmp)	Water Above PDB (ft)	PDB Installed			PDB Collected		Sample ID	QA/QC Samples
		Top	-	Bottom			Date	Time	Qty	Date	Time		
			-										
			-										
			-										
			-										
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Notes:

Analytical: VOCs by USEPA 8260C

V:\Office-Ops\ENV\Div71\Hydrogeology\Field_Forms\Groundwater-Sampling\Passive_Diffusion_Bag-Sampling_Log-121416.xlsx

Test Pit / Excavation Log Form

Test Pit / Excavation ID: ______
Field Personnel: ______

Client: ______
Site Name: ______
Site Location: ______
Project #: ______

Excavation Location: ______
Easting: ______
Northing: ______
Total Depth: ______ ft bgs
Material Volume Removed: ______
Method of Containment: ______

Contractor: ______
Contractor Foreman: ______
Excavation Method: ______
Date Started: ______
Date Completed: ______
Back Fill Material: ______

Excavation Plan View:

Scale: ______

Indicate the following:

- Excavation dimmensions and geometry.
- Survey reference point.
- Position and geometry of important physical features within the excavation.
- Position and geometry of potentially impacted materials.
- Location of characerization samples using numeric characters.
- Changes in observed strata using alphabetic characters.
- Depth to water (if applicable).
- Please provide cross sectional view(s) as needed.

Notes:

See Page 2 for strata descriptions and Page 3 for cross sectional sketch(es).

RAMBOLL

Test Pit / Excavation Log Form

Test Pit / Excavation ID: ____________________

Field Personnel: ____________________

Stratum ID	Stratum Depth Range (ft)	Physical Description (Lithologic Description)	General Stratum Change	PID Reading (ppm)	Potential Visual / Olfactory Impacts	Other Observations

Notes:

____

____

Test Pit / Excavation Log Form

Test Pit / Excavation ID: ____________________

Field Personnel: ____________________

Notes:

Scale: ____________________

Water Level Measurement Log

Field Personnel: ____________
Date: ____________
Weather: ____________

Site Name: ____________
Site Location: ____________
Project #: ____________
WLI Used: ____________
Interface Probe Used: ____________

Location ID	***Measurement Point***	***Measurement Point Elev.***	***Water Level***			***Notes***
			Depth	***Elevation***	***Time***	
		ft amsl	*ft bmp*	*ft amsl*	*hh:mm*	

Notes: WLI = Water Level Indicator

Page: *of*

Chain of Custody / Analysis Report

Page of

Sampler(s):
(Signature)

Laboratory Use Only
Project Number:
Job Number:
Laboratory ID:

Contact:
Address:
Phone:
E-mail:
Project:
Location:

Laboratory:
ALS Rochester
1565 Jefferson Road, Bldg 300, Suite 360
Rochester, New York 14623
Attn: Janice Jaeger
Phone: (585) 288-5380

Holding Time:

Package Requirement:
NYS Cat. B Data Deliverable

EDD Format:
EQuIS 4-file

Analysis Required
Preservatives: (see key at bottom)

	Sample Identification									**Analysis Required**																	
	Unique Field Sample ID (sys_sample_code)	**Sample Location**	**Date**	**Time**	**Sample Type (See Key)**	**Sample Matrix (See Key)**	**Number of Containers**	**Grab [G] or Composite [C]**	**Field Filtered? (Y / N)** **Reporting Units**																		**Lab Sample ID:**
1																											
2																											
3																											
4																											
5																											
6																											
7																											
8																											
9																											
10																											
11																											
12																											
13																											
14																											

Special Instructions:

Use the top boxes if the samples are to be shipped via courier (e.g., Fed Ex)

Relinquished by: *Of:*	*Date:* *Time:*	*Received By:* *Of:*	*Date:* *Time:*	Condition:	Other comments or notes regarding condition of samples as received:
Relinquished by: *Of:*	*Date:* *Time:*	*Courier Name:* *Tracking #:*	*Date:* *Time:*	Custody Seals Intact? *(if so, indicate the #, date, and time of the seal)*	
Courier Name: *Tracking #:*	*Date:* *Time:*	*Received By:* *Of:*	*Date:* *Time:*	Cooler Temperature:	

Sample Type: N = Normal env. sample, FD = field duplicate, EB = Equipment Blank, TB = Trip Blank, MS = Lab Matrix Spike, Other (Specify):
Sample Matrix: SE = Sediment, SO = Soil, WG = Groundwater, WQ = Water Quality, WS = Surface Water, WW = Waste Water, WP = Potable Water, AA = Ambient Air, Other (Specify):
Preservative Code: 0 = none, 1 = HCL, 2 = HNO_3, 3 = H_2SO_4, 4 = NaOH, 5 = Zn Acetate, 6 = MeOH, 7 = $NaHSO_4$, 8 = Na3PO4, 9 = BenzalkoniumCl, 10 = other

APPENDIX 2
2004 RI/FS HASP AND ADDENDA

REPORT

Health & Safety Plan
ITT Automotive, Inc.
Town of Gates, New York
(Site #8-28-112)

ITT Automotive, Inc.

May 2004

4655/31777

REPORT

Health & Safety Plan
ITT Automotive, Inc.
Town of Gates, New York
(Site #8-28-112)

ITT Automotive, Inc.

Steven J. Roland

Steven J. Roland, P.E.
Executive Vice President

May 2004

O'BRIEN & GERE
ENGINEERS, INC.

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1. Introduction

1.1. General

This Health and Safety Plan (HASP) has been developed to provide general procedures to be followed by engineering, construction and oversight personnel while performing the Remedial Investigation/ Feasibility Study (RI/FS) at the ITT Automotive Inc. (ITT) site located in the Town of Gates, New York. The adjacent former Alliance Metal Stamping and Fabricating (AMSF) property is presently considered an off-site property for purposes of the RI/FS, however due to the distribution of constituents of concern the combined ITT and AMSF properties are included in the scope of work and are presented in figures. A Site Plan is included as Figure 1.

This HASP describes the minimum safety requirements and general procedures to be met by employees of the ITT's consultants implementing the RI/FS (Engineer), the Engineer's subcontracted personnel, and those representatives designated by ITT or State and local governmental agencies, while on-Site. Accordingly, the HASP describes the responsibilities, training requirements, protective equipment, and procedures necessary to protect workers and visitors from exposure to potentially harmful materials. The HASP will be discussed with Site personnel and will be available on-Site for employee inspection and review while work activities are underway. A qualified Health & Safety Coordinator will be designated by the Engineer to implement the HASP during the investigations.

O'Brien & Gere Engineers, Inc. has been retained by ITT to prepare this HASP and the RI/FS for the ITT and offsite properties.

1.2. Site Background and Description

The Site and off-site properties (the ITT and AMSF facilities) are situated to the southeast of the intersection of I-490 and State Route 33 in the Town of Gates, New York. The ITT facility was constructed on vacant land in 1973 for Rochester Form Machine and was purchased by ITT-Higbie Baylock in 1979. The AMSF facility was constructed on vacant land around 1966. Prior land use for this area was observed as farmland.

1.3. Scope of Work

The following work activities are governed by this HASP.

The scope of work presented below for the Site and off-site is based on the information presented in the RI/FS Work Plan, ITT Automotive, Inc, Site # 8-28-112, November 2003 (O'Brien & Gere, 2003).

Site and off-site reconnaissance.
A Site and off-site reconnaissance was performed to gather information regarding current Site and off-site conditions for the development of the RI/FS Work Plan.

Marking of subsurface utilities.
Prior to initiation of intrusive activities, an underground facilities protective organization (UFPO) request will be made. A date and time will then be established for review of these utility locations with utility representatives at the Site and off-site to mark subsurface public utilities in the areas of proposed work. Representatives of ITT and for the AMSF property will also be contacted to locate private subsurface utilities.

Mobilization.
Prior to the initiation of the RI/FS fieldwork, subcontractors will be retained for drilling, surveying and analytical services. Field equipment needed to complete the work will be procured and arrangements will be made with the appropriate laboratories for sample containers. Access to non-ITT property will be obtained by ITT from the property owners.

Sub-slab soil vapor sampling.
Sub-slab soil vapor samples will be collected from the northwestern portion of the former AMSF building and the ITT building to assess the potential for migration of vapor to indoor air at concentrations that are incompatible with building uses and potential receptors.

Approach: This sampling method involves the collection of a sample of vapor from the unsaturated soil beneath the building foundation for analysis. The sample collection device is typically tubing constructed of Teflon. If the surface is covered by asphalt of concrete a nominal hole shall be drilled through the surface. A 1 to 2 inch diameter hole shall be completed to just below the concrete or asphalt slab using a slide hammer, drill or soil gas sampling device. Tubing is placed to the base of the hole and the annulus of the tubing is sealed. The tubing will be attached to the metering pump of the Summa canister.

Soil borings and bedrock coring
Advancement of soil borings and rock cores to further evaluate the vertical and horizontal profile of volatile organic compounds (VOCs) and 1,4-dioxane within overburden materials.

Approach. Soil borings will be advanced to bedrock. Borings will be installed using conventional hollow stem auger drilling techniques or direct push techniques. Soil samples will be collected continuously throughout the boring. For hollow stem auger drilling soil samples will be collected in accordance with ASTM Method D1586-84 using a 140-lb hammer and 2 ft split-barrel samplers. Drilling will be overseen by a geologist who will complete a boring log to document encountered subsurface strata and other pertinent observations. In addition, each soil sample will be screened using a photo-ionization detector (PID) and a UV light.

Soil samples will be used to characterize the nature and extent of residuals associated with the overburden material. Soil samples for laboratory analysis will be transferred to the appropriate laboratory containers and placed in a cooler containing ice. Samples will be submitted to a NYS-certified laboratory for analysis.

Shallow bedrock cores will be completed in the northern portion of the Site to a depth of 25 ft. The shallow bedrock core will be advanced by coring, using HQ wireline coring techniques, and using water as the drilling fluid. Each core run will be examined for lithology, mineralogy, degree of cementation and/or infilling, grain size, color, percent recovery, and rock quality designation. The cores will be screened for VOCs in the field using a PID, visual observations, and a UV light.

Monitoring well installation.
Objective. Installation and sampling of monitoring wells to provide better definition of ground water flow and chemical composition.

Approach. Shallow bedrock and deep bedrock monitoring wells will be installed at the Site. The installations will be conducted by advancing 6¼-inch inside diameter (ID) augers from the ground surface to the top of bedrock. During advancement of the 6¼-inch augers, continuous soil samples will be collected in continuous 2-ft intervals using 2-inch diameter split-barrel samplers in accordance with ASTM Method D1586-84. At locations where borings were previously completed samples will not be collected in duplicate intervals.

Upon reaching the top of bedrock, the boreholes for the shallow bedrock monitoring wells will be advanced approximately 2 ft into bedrock. The boreholes will be advanced using a 5-inch roller bit through the augers. A 4-inch diameter steel casing fitted with a plastic end cap will be lowered through the auger string. The annular space between the borehole wall and the 4-inch casing will be filled with cement/bentonite grout using a tremie pipe as the auger string is removed. The grout will be allowed to cure for a minimum of 12 hours prior to further borehole advancement.

Subsequent to curing the grout, air-hammer, odex, or coring drilling methods will be used to deepen the boreholes to the terminal depths. Cuttings that are carried to the ground surface will be managed according to section 4.9 IDW management.

The shallow bedrock wells will be completed as open hole bedrock wells, similar to the wells previously installed at the Site. Well completion will include the installation of a flush mounted protective casing/road box. A concrete pad will be installed around the well to direct precipitation away from the borehole.

Deep bedrock monitoring well installation will be advanced using a 6¼-inch ID hollow steam auger with continuous split-spoon sampling to the bedrock interface. The borehole for the deep bedrock monitoring well will be advanced approximately 2 ft below the bottom of the shallow bedrock monitoring wells. A 4-inch diameter steel casing fitted with a plastic end cap will be lowered through the auger string. The annular space between the borehole wall and the 4-inch casing will be filled with cement/bentonite grout using a tremie pipe as the auger string is removed. The grout will be allowed to cure for a minimum of 12 hours prior to further borehole advancement. Subsequent to curing grout, air-hammer, odex, or coring drilling methods will be used to deepen the boreholes to the terminal depths. The volume of drilling water lost to the bedrock formation will be recorded. Monitoring for explosive gases will be performed during the installation of the deep well.

Subsequent to the terminal depth for the borehole, a 2-inch diameter PVC well consisting of a 10-ft length of 0.010-inch slot screen flush-threaded to riser casing will be lowered through the 4-inch casing. The riser casing will be extended to ground surface. A sandpack suitable for use with the screen slot size will be installed within the annular space between the borehole and the well. The sandpack will extend from the bottom of the well to 2 ft above the top of the well screen. A 2 ft thick bentonite seal will be installed in the annular space above the sand pack. The remaining annular space will be filled with a Portland cement/bentonite grout through a tremie pipe to a maximum depth of 5-ft below grade. Well completion will include the installation of a flush mounted protective casing/road box. A concrete pad will be installed around the well to direct precipitation away from the borehole.

Following installation of the wells and prior to collection of ground water samples, each well will be developed to remove the fine material which may have settled in the monitoring wells, to remove introduced drilling fluids, and to provide better hydraulic communication with the surrounding formation. Development will consist of the removal of 5 well volumes using either a bailer or centrifugal pump. A 50 nephelometric turbidity unit (NTU) turbidity goal has been established. If this goal cannot be achieved, ITT's representative will coordinate with NYSDEC to establish a mutually agreeable development volume.

Development water will be contained in 55-gallon drums for subsequent disposal. The method of disposal will be selected based on ground water analytical results. Sampling will be conducted a minimum of seven days after well development.

Prior to the installation of the monitoring well screen and casing, a dual-inflatable packer testing apparatus will be utilized to measure the hydraulic conductivity of the isolated fracture intervals in the boring for the deep bedrock monitoring well. Fracture intervals for ground water sampling will be determined in the field during the drilling processes.

Hydraulic conductivity testing.
In-situ hydraulic conductivity tests will be performed in the newly installed monitoring wells, and existing wells not previously tested to estimate the horizontal hydraulic conductivity of sediments surrounding the well screen. Rising and falling head measurements will be obtained following both insertion and removal of a PVC slug into the well. Water level data will be monitored using a transducer.

Ground water sampling.
Objective: Ground water sampling will be completed to provide information regarding temporal variations in ground water elevations, flow patterns and chemical composition.

Approach: Ground water samples will be collected from newly installed and existing wells. Ground water samples will be collected using either bailing or low flow sampling techniques. Low flow purging involves inserting a stainless steel Grundfos® pump (or similar pump) and dedicated Teflon tubing within the screened interval of the well and purging at a maximum rate of 0.5 liters/minute. During purging, ground water quality parameters including pH, conductivity, temperature, eH, turbidity and dissolved oxygen will be monitored continuously using an in-line meter. Once the ground water quality parameters have stabilized, samples will be collected directly from the Teflon tubing. The pump will be decontaminated between wells in accordance with the procedures set forth in the QAPP. For sampling with a bailer, a dedicated or decontaminated bailer will be used to purge three well volumes from the well and then sample the well. During purging, ground water quality parameters including pH, conductivity, and temperature will be monitored using a Horiba U-10 water quality instrument. After removal of 3 well volumes, samples will be transferred directly from the bailer to the appropriate sample containers. Purged water will be contained in 55-gallon drums for subsequent disposal.

The ground water samples will be submitted to the laboratory for analysis by USEPA SW846 method (USEPA, 1996). The ground water samples will be analyzed for VOCs and 1,4-dioxane parameters using Method 8260.

1.4. Hazard Overview

Based on previous Site and off-site studies, the possible hazards associated with the above work activities are the inhalation of organic vapors and direct contact with ground water and soils containing volatile organic compounds. In addition, there is a potential to encounter explosive gases during drilling of the deep bedrock well.

Because the degree of hazard is largely location specific, the protective measures outlined in this plan focus on individual work activities rather than on site-wide levels of protection. These measures are consistent with applicable USEPA protocols and provisions of the Occupational Safety and Health Administration (OSHA) 29 CFR 1910 and 1926).

2. Project Personnel

2.1. General

While each person involved in the investigation implicitly has a part in implementing the overall project HASP, certain individuals have specifically designated responsibilities. These include the Project Manager, Project Supervisor, and the Health & Safety Coordinator.

2.2. Personnel

2.2.1. Project Manager

The Project Manager is responsible for the overall administration and technical execution of the project. The Project Manager is further responsible for the acquisition and delegation of resources necessary for project completion and HASP implementation.

2.2.2. Project Supervisor

The Project Supervisor reports to the Project Manager and is directly responsible for the technical progress and financial control of the project

2.2.3. Health & Safety Coordinator

The Health & Safety Coordinator is responsible solely for the Engineer's employees and the Engineer's subcontracted personnel, unless otherwise specified in this plan. Specifically, the Health & Safety Coordinator has the following responsibilities:

- Assuring that a complete copy of the HASP is available prior to the start of field activities and that workers are familiar with it.

- Conducting health and safety training and briefing sessions.

- Ensuring the availability, use and proper maintenance of personal protective equipment, decontamination equipment, and other safety or health equipment.

- Maintaining a high level of safety awareness among field personnel and communicating pertinent safety and health matters to them promptly.

- Assuring that field activities are performed in a manner consistent with Engineer's policy and this HASP.

- Monitoring for potentially hazardous conditions during field activities.

- Coordinating with emergency response personnel and medical support facilities.

- Notifying the Project Manager of the need to initiate immediate corrective actions in the event of an emergency, accident, health or safety problem, unsafe condition or exception to this HASP.

- Recommending improvements in safety and health measures to the Project Manager.

- Conducting safety and health performance and system audits.

- Selecting and inspecting personal protective equipment (PPE).

- Ensuring the daily Health and Safety Log is completed and available for review when requested by an ITT representative.

- Forwarding all accident/emergency reports to the ITT representative and the Associate for Health and Safety within 24 hours.

The Health & Safety Coordinator has the authority to recommend that the Project Manager take the following actions:

- Suspend field activities or otherwise limit exposures if the health or safety of any site worker appears to be endangered.

- Notify the Engineer or subcontractor personnel to alter work practices that are not properly protective to either workers or the environment.

- Suspend an individual from field activities for violation of the requirements of this HASP.

3. Health and Safety Hazards

3.1. General

Table 1 lists chemical compounds that may be present during work activities. Those compounds listed have been chosen to provide a frame of reference for the development of this HASP. . Site air monitoring action levels for volatile organic compounds (VOCs) are conservative relative to the OSHA Permissible Exposure Limits (PELs) for VOCs listed in Table 1.

Table 2 lists potential health and safety hazards that may be associated with general Site tasks. This list has been compiled based on scheduled activities and potential Site and off-site conditions.

Site Reconnaissance – Level D
Well Installation – Modified Level D
Soil Borings – Modified Level D

3.2. Subsurface Investigations

3.2.1. Operations and tasks to be performed

Subsurface soil and bedrock samples will be collected from borings to evaluate the physical and chemical characteristics. Borings will be advanced to evaluate the subsurface geology and allow for installation of monitoring wells. The samples will be visually characterized and field screened using a PID.

3.2.2. Potential health hazards and contaminants

During the handling of soil cores, the process of description and the field screening, the possibility exists for product splash from the sample onto workers and release of volatile materials into the worker's breathing zone. In addition, there is a potential to encounter explosive gases during drilling of the deep bedrock well.

3.2.3. Contaminant dispersion pathways

The contaminants may be spread through the air and through skin contact.

3.2.4. Contaminant control

The initial level of protection is modified Level D including, hard hat, eye protection (splash goggles or a face shield with safety glasses) and organic solvent resistant gloves. Workers must be able to write with the gloves selected.

3.2.5. Explosive gases control

At the proposed deep monitoring well location a 4-inch diameter Schedule 40 BIP will be grouted into the shallow bedrock. The casing will have a threaded connection at or above grade.

During drilling:

- Monitoring of oxygen and combustible/flammable gas levels will be performed while drilling and sampling below the bottom of the 4-inch casing. Following withdrawal of split spoon sampler, monitor for oxygen and combustible/flammable gas using a continuous monitoring instrument.
- Place the inlet for instrument approximately four inches above lip of the casing.
- The action levels will be 19.5% for oxygen and 5 % of the LEL for combustible/flammable gas for 30 seconds. (The PEL for confined spaces is 10% of LEL)

When an Action Level is exceeded or if natural gas is observed (based on odor, sound, rush of gas, or visible discharge of gas) to discharge from the well:

1. Stop drilling activities and turn off drill rig until it is safe to resume drilling, as per Steps 3 and 4.
2. If gas is discharging at a significant rate go to Step 6.
3. Monitor above the casing for oxygen and combustible/flammable gas for one minute.
4. If oxygen increases to above 19.5% and the LEL decreases to below 3% and remains within acceptable limits for one additional minute, resume drilling.
5. If the oxygen level stays below 19.5% or the LEL stays above 3%, wait five additional minutes and resample.
6. If, after five minutes, the oxygen level remains below 19.5% or the LEL level stays above 5%, withdraw drill rods, bits and samplers. Use sparkproof tools to attach the threaded cap to be installed on the 4" casing. This cap will be fitted with a 1" diameter ball valve to be used as a blow off valve or sampling port. If work at the Site is completed for the day and the well continues to vent, a 1-inch diameter standpipe will be connected to the well cap as an additional

safety measure. The standpipe will be a minimum of 8 ft in length and will be constructed of a thermoplastic material or a non-ferrous metal.

7. Work will not resume until notice to proceed is given by the site H & S officer. Drilling can resume when the oxygen level remains above 19.5% and the LEL remains below 3%. Use sparkproof tools to remove the threaded cap that was installed on the 4" casing.

3.3. Air Monitoring

3.3.1. Operations and tasks to be performed

Air samples will be collected to evaluate the potential for air transport of volatile compounds from the Site and off-site and to monitor air in the breathing zone of workers. VOCs will be monitored in accordance with the procedures set forth in Section 5.4. The breathing zone will be monitored using a PID (Section 5.2). In addition, an explosive gases monitoring will be performed during drilling of the deep bedrock well (See Section 3.2.5).

3.3.2. Potential health hazards and contaminants

There is a potential for levels to exceed the action levels established for other tasks.

3.3.3. Contaminant dispersion pathways

The contaminants may be spread through the air.

3.3.4. Contaminant control

Level D PPE will be utilized initially. Upgrades, as appropriate, depending on the level of exposure and the task being monitored will be considered. If explosive gases are detected, controls are described in Section 3.2.5.

3.4. Ground Water Monitoring

3.4.1. Operations and tasks to be performed

Ground water screening samples will be collected for quality characterization. Monitoring wells will be installed and ground water samples collected to evaluate ground water flow patterns and chemical composition.

3.4.2. Potential health hazards and contaminants

During the handling of ground water, the possibility exists for water or product splash from the sample onto workers and release of volatile materials into the worker’s breathing zone. Traces of various compounds may be contained within water samples collected from the Site and off-site. The potential exists for release of these materials into the atmosphere at levels that may present an inhalation hazard. They may also generate an offensive odor at concentrations below the PEL.

3.4.3. Contaminant dispersion pathways

The contaminants may be spread through the air and absorbed through direct contact.

3.4.4. Contaminant control

The initial level of protection is modified Level D. Additional protection during the operations will be provided by wearing a hard hat, eye protection (splash goggles or face shield with safety glasses); and organic solvent resistant gloves. Workers must be able to write with the gloves selected.

4. Personal Protective Equipment

4.1. General

PPE will be worn at times as designated by this HASP. Levels of protective clothing and equipment have been assigned to specific work tasks at either basic Level D or modified Level D and Modified Level C. On-Site monitoring will be used to set task and point specific levels of personal protection. If field measurements or observations indicate that a potential exposure is greater than the protection afforded by the equipment or procedures specified in this HASP, efforts will be made to reduce the exposure and/or increase the level of protection provided.

Level D protection will be worn initially by workers engaged in performing the activities listed in Section 3, except where noted. Upgrades to Modified Level D or Level C protection will be determined by 1) exceedence of action levels described in Table 3, 2) observance of non-aqueous liquid (free product), or 3) at the discretion of the Health & Safety Coordinator. Downgrade from Modified Level D or Level C will be made only upon approval of the on-Site Health & Safety Coordinator.

Personnel will wear appropriate PPE and clothing. Each individual performing work on-Site will be properly trained in the use of this equipment prior to the start of field activities. Safety equipment and protective clothing shall be used as directed by the Health & Safety Coordinator. Such equipment and clothing will be cleaned and maintained in proper condition by project personnel. The Health & Safety Coordinator will monitor the maintenance of personnel protective equipment to ensure proper procedures are followed.

No excessive facial hair, which interferes with the effectiveness of a respirator, will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit testing will be performed prior to respirator use to ensure a proper seal is obtained by the wearer. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use by the worker.

Contact with potentially contaminated surfaces should be avoided whenever possible. There may be no walking through puddles, mud, or other discolored surfaces; kneeling on the ground; leaning, sitting or placing equipment on drums, containers, vehicles, or the ground. If you make contact with contaminated fluids, clean up immediately using plenty of water.

PPE levels designated below are in conformance with OSHA and USEPA criteria for Level C, Modified Level D and Level D protection. Respiratory protective equipment used on-Site, if any, will be approved by the National Institute for Occupational Safety and Health (NIOSH). Respiratory equipment will be maintained in accordance with manufacturer's instructions and within the guidance of 29 CFR 1910.134. Other PPE will be purchased and maintained in accordance with the applicable provisions of Subpart I, 29 CFR 1910.

4.2. Level C Protection

The following Level C protection will be worn under the conditions stated in Table 3.

- NIOSH approved full-face or half face air purifying respirator equipped with P100 dust filters and organic vapor and acid gas cartridges; potential users must be trained and medically approved to use respiratory protection. Cartridges for air-purifying respirators in use will be changed daily at a minimum.

- Hard hat.

- Chemical-resistant clothing: overalls, chemical-splash suit, disposable chemical-resistant overalls (one piece suits with elastic wrist bands).

- Chemical resistant outer gloves (nitrile gloves taped to suit).

- Chemical resistant inner gloves (nitrile gloves).

- Chemical resistant outer boots with steel toe and shank (leather, steel-toe boots with rubber overboots taped to suit).

Optional items include:

- Coveralls.

- Chemical resistant boot covers.

- Face shield with safety glasses or safety glasses when wearing a half face respirator.

- Hearing protection when working in noise hazardous areas.

4.3. Modified Level D Protection

Modified Level D protection, consisting of Level C protective equipment without the use of a respirator, will be worn during soil investigations. However, as stated above, a NIOSH approved full-face or half face air purifying respirator equipped with P100 dust filters and organic vapor cartridges must be available for immediate use. Potential users must be trained and medically approved to use respiratory protection.

For this level of protection, chemical resistant clothing (polyethylene-coated suits) will be required. Suits will be one piece with elastic wristbands. The Health & Safety Coordinator may require the use of suits with hoods.

Options as required:

- NIOSH approved full-face or half-face air purifying respirator equipped with P100 dust filters and organic vapor and acid gases cartridges available for immediate use. Potential users must be trained and medically approved to use respiratory protection.

- Level C clothing/protection must be readily available.

- Hearing protection.

- Escape mask.

4.4. Level D Protection

The following Level D protection will be worn during sampling of ground water in areas where the action levels specified in Table 3 are not exceeded.

- Coveralls or other skin protective clothing (long sleeve shirts and long pants).

- Safety glasses with side shields, chemical splash goggles or face shield with safety glasses.

- Hard hat.

- Water resistant work gloves.

- Chemical resistant boots or shoes with steel toe and shank (leather, steel-toe boots with rubber overboots).

4.5. Heavy Machinery/Equipment

Site employees must remain aware of those activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn during Site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that employees exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others.

The primary piece of heavy equipment associated with activities covered by this HASP is a drill rig. Although the drill rig owner/operator is primarily responsible for the safe setup and operation of the drill rig, the following basic safety precautions should be observed:

1. Operate drill rigs with all guards, safety alarms, and other safety devices in place and functional.
2. Do not move the drill rig with the mast raised.
3. Workers must not be on the mast when the drill rig is in motion or when the driller is making the initial pull on the rods.
4. Rotating parts should never be greased or contacted in any manner while the drill rig is in motion.
5. Evacuate the area upon observation of lightning strikes or the development of storm conditions with a potential for lightning strikes.

4.6. Protective Equipment Failure

If any equipment fails and/or any employee experiences a failure or other alteration of their protective equipment that may affect its protective ability, that person and his/her partner will immediately leave the work area. Re-entry will not be permitted until the equipment has been repaired or replaced and the cause of the failure identified. The Project Manager and the Health & Safety Coordinator will be notified and, after reviewing the situation, will evaluate the effect of the failure on the continuation of ongoing operations. If the failure affects the safety of personnel, the worksite or the surrounding environment, personnel will be evacuated until appropriate corrective actions have been taken.

5. Site Air Monitoring

5.1. General

Field activities associated with the investigation may cause potentially hazardous conditions, through the volatilization of hazardous substances. These substances may be in the form of vapors, dusts, or mists that can enter the body through ingestion, inhalation, adsorption and direct contact. Monitoring of these substances will be performed to ensure appropriate personal protective measures are employed during Site activities.

The following describes the monitoring parameters to be evaluated during the investigation. Recommended instruments to be used are also provided in the discussion. These instruments will meet the established requirements set forth by OSHA, MSHA, NIOSH, and state agencies where applicable. These instruments must be properly maintained. Conditions can change quickly if subsurface areas of contamination are penetrated. Table 4 lists the activities and the associated Site monitoring.

Action levels have been established for activity cessation, site evacuation, emergency response, and determination of personal protection levels. Section 3 discusses the minimal personal protection required for specific Site activities. Table 3 lists action levels, airborne concentrations, and associated personal protection levels. Changes to these specified levels are dependent on the results of air monitoring, as described below and must be approved by the Health & Safety Coordinator.

5.2. Monitoring

5.2.1. Organic vapor

Organic vapor concentrations will be monitored at the start and at 15-minute intervals during specified activities listed in Table 4 using Foxboro organic vapor meter model 128 (FID), Photovac TIP II (PID) or HNu P1-101. The instrument used will be calibrated according to the manufacturer's instructions using a benzene, toluene, xylene standard. Tasks not otherwise specified in Table 4 will be monitored hourly for the first 2 hours. Organic vapor concentrations will be used as action level criteria for upgrading or downgrading protective equipment (See Section 4) and for implementing additional precautions or procedures.

5.3. Action Levels

Action levels have been designated for monitoring the breathing space of workers on the Site. The action levels are based on the OSHA PELs for the specific compounds detected during on-site monitoring.

The approach for air monitoring is as follows:

1. The direct-reading PID will be calibrated to most accurately reflect the scope of volatiles previously identified.

2. Using the PID, work activities will be monitored for organic vapors.

5.4. Community Air Monitoring Plan

All action levels identified in the following sections are assumed to be above background.

5.4.1. Monitoring requirements

Real-time air monitoring for VOCs will be performed in the work zone. If the 15-minute average VOCs level exceeds 5 ppm above background, the downwind perimeter of the exclusion zone at the Site will be monitored periodically during intrusive work. The organic vapor meter will monitor total organic vapors. The monitor will be equipped with audible and visual alarms, have recorders and display the average level for the previous 15 minutes. All readings must be available for New York State Department of Health (NYSDOH) and NYSDEC personnel to review.

5.4.2. Organic vapors

Organic vapor action levels.

When the 15-minute average VOCs level remains below 5 ppm above background, intrusive work activities may continue.

When the 15-minute average VOCs level exceeds 5 ppm above background, intrusive work activities will be suspended. Monitoring will continue under the provisions of the Vapor Emission Response Plan described below.

When the 15-minute average VOCs level exceeds 25 ppm above background, intrusive work will be stopped and the Major Vapor Emissions Plan described below will be activated. Monitoring will continue under the provisions of the Major Vapor Emission Plan described below.

Vapor emission response plan.
If the vapor levels increase above 5 ppm over background at the downwind perimeter of the exclusion zone but remain below 25 ppm above background, work can resume provided:

- The source of the vapors has been identified and corrective actions have been taken to abate the emissions. These actions must reduce the exclusion zone perimeter emissions below 5 ppm.

- The organic vapor level 200 feet downwind of the work area or half of the distance to the nearest residential or commercial structure, whichever is less, is less than 5 ppm over background. If the distance to the nearest occupied building is less than 20 feet, the monitor will be placed at the perimeter of the work area.

- Continuous monitoring continues.

Major vapor emission plan.
If organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half of the distance to the nearest residential or commercial property, whichever is less, all work activities at the site will be halted.

If, following the cessation of the work activities, the downwind organic levels persist above 5 ppm above background, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20-Foot Zone).

If efforts to abate the emission source are unsuccessful and if organic vapors persist at levels ≥5 ppm for more than 30 minutes or any level ≥10 ppm in the 20-foot Zone, then the following actions will be taken:
1. Monitoring will be conducted continuously in the "20 foot zone" until VOC levels are below 5 ppm. All intrusive site activities will be halted during this time.
2. The site owner will be notified.
3. The NYS <u>DEC will be notified.</u>

6. Site Access and Site Control

6.1. Site Access

Access to the areas to be investigated will be limited to the trained authorized personnel governed by this plan. Such personnel are anticipated to include the Engineer's employees, ITT employees, designated subcontracted equipment operators, and those representatives as designated by ITT or State and local agencies.

Personnel and equipment in the work areas should be minimized, consistent with effective Site operations.

Activities in the exclusion zone will be conducted using the "Buddy System". A buddy is another worker fully dressed in the appropriate PPE, who can perform the following activities:

- Provide his/her partner with assistance;
- Observe his/her partner for sign of chemical or heat exposure;
- Periodically check the integrity of his/her partner's PPE; and
- Notify others if emergency help is needed.

6.2. Site Control for Sampling

Work zones will be established at each sampling location by the Health & Safety Coordinator. Three categories of work zones, an exclusion/contaminated work zone, a contamination reduction/buffer zone and a support/clean zone, will be established. These zones will be monitored by the Health & Safety Coordinator (or designee) to ensure only personnel that have been trained and are wearing appropriate PPE are allowed to enter. These zones are described in the following sections.

6.2.1. Exclusion/contaminated work zones

The exclusion/contaminated work zones will be limited to the areas around the sampling point. These areas should only be large enough to contain the sampling apparatus and necessary ancillary equipment and personnel. Access to the established exclusion zones will be limited to those authorized personnel wearing appropriate PPE. Exclusion zones will be marked by traffic cones or caution tapes.

6.2.2. Contamination reduction/buffer zones

The contamination reduction zones, where personnel and equipment are decontaminated, should be located upwind of the active work zone. These zones will only contain equipment and personnel necessary to ensure that potentially contaminated soils are not removed from the sampling location. The contamination reduction area for the Site will be defined as a zone immediately around the drill rig. The contamination reduction zone will be marked by traffic cones or caution tapes.

6.2.3. Support/clean zone

The support zones will be located upwind of the active work zones. These zones will contain the additional personnel and equipment necessary to manage and conduct the Site investigations. Personal hygiene facilities meeting at least the minimum requirements of 29 CFR 1910.120 will be provided in the support zones. The designated support zones will be the surrounding Site not considered the contamination reduction/buffer zone.

6.3. Housekeeping

The work zones shall be maintained in a clean and orderly condition at all times. Construction areas shall be free of waste materials, debris, and rubbish to the extent feasible. Materials and equipment shall not obstruct traffic or emergency response activities. Waste materials, debris, and rubbish shall periodically be removed from the Site and properly disposed off-site as required by site conditions and activities.

6.4. Site Access

Work zones security and control shall be maintained by the Project Supervisor and/or his designee and the Health & Safety Coordinator and/or his designee. Their duties include limiting access to the work zones to authorized personnel, oversight of project equipment and materials, and general oversight of work zone activities. The Project Supervisor and/or his designee will maintain a log-in sheet for Site workers and guests. The log-in sheet will include, at the minimum, personnel on the Site, their arrival and departure times and their destination on the Site.

The following procedures will be followed to ensure suitable site access and control so that those persons who may be unaware of Site conditions are not exposed to inherent Site hazards.

1. Well caps will be secured by padlocks to prevent unauthorized access.
2. Upon completion of the day's drilling activities, heavy machinery and equipment will be stored securely at locations selected by the Health & Safety Coordinator and personnel from ITT.

7. Medical Monitoring

7.1. Medical Surveillance Program

OSHA has established requirements for medical surveillance programs designed to monitor and reduce health risks by employees potentially exposed to hazardous materials (29 CFR 1910.120). This program has been designed to provide baseline medical data for each employee involved in hazardous waste operations including field activities, and to determine his/her ability to wear PPE, such as chemical resistant clothing and respirators. Employees who wear or may wear respiratory protection must be provided respirators as regulated by 29 CFR 1910.134. This standard requires that an individual's ability to wear respiratory protection be medically certified before he/she performs designated duties. Where medical requirements of 29 CFR 1910.120 overlap those of 29 CFR 1910.134, the most stringent of the two will be enforced.

The medical examinations are administered on a pre-employment and annual basis and as warranted by symptoms of exposure or specialized activities. O'Brien & Gere and ITT have obtained the necessary medical monitoring and training for their employees pursuant to 29 CFR 1910.120. The examining physician(s) have made reports to O'Brien & Gere and ITT of any medical condition that would place employees at increased risk of wearing a respirator or other PPE. O'Brien & Gere and ITT will maintain site personnel medical records as regulated by 29 CFR 1910.120 and 29 CFR 1910.1020 where applicable.

7.2. Heat/Cold Stress

The timing and location of this project may be such that heat/cold stress could pose a threat to the health and safety of site personnel. Work/rest regimens will be employed as deemed necessary by the Health & Safety Coordinator so that Site workers do not suffer adverse effects from heat/cold stress. Special clothing and an appropriate diet and fluid intake will be recommended to on-Site personnel to further reduce these temperature-related hazards. The work/rest regimens will be developed following the guidelines in the American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values and Biological Exposure Indices for 1999. Site workers should stop work and notify the Health & Safety Coordinator if they observe symptoms of heat/cold stress in themselves or others.

7.2.1. Cold stress

Work/rest schedules must be altered to minimize the potential for cold stress. Cold stress is defined as a decrease in core body temperature to 98.8°F and/or cold injury to body extremities. Decreases in core body temperature are associated with reduced mental alertness, reduction in rational decision making, or loss of consciousness in severe cases.

Symptoms of cold stress include pain in extremities (i.e. hands and feet) and severe shivering. If workers experience these symptoms, they must stop work and implement one of the following controls:

- Change into adequate dry insulated clothing,
- Adjust the work/rest schedule to increase the amount of rest/rewarming time.

Toolbox safety meetings discussing symptoms of cold stress, clothing requirements and work breaks must be held when the ambient temperature drops below 0°F and when the wind chill temperature is below –25°F.

Wind chill temperatures are a combination of actual air temperature and wind speed as shown in Appendix A. Wind chill temperatures below -25°F are extremely dangerous. Workers must protect any exposed skin, especially the face, ears and fingers.

7.2.2. Heat stress

Heat stress monitoring and control of personnel wearing protective clothing should be considered when the ambient temperature is 70°F or above. One of the following methods should be employed:

- Measure the heart rate by the radial pulse for a 30 second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following cycle by one-third.
- Measure oral temperature at the end of the work period and before drinking. If oral temperature exceeds 99.6°F, shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the next work cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 100.6°F.

The timing and location of this project may be such that heat/cold stress could pose a threat to the health and safety of Site personnel. Work/rest regimens will be employed as deemed necessary by the SSHC so that O'Brien & Gere and subcontracted personnel do not suffer adverse effects from heat/cold stress. Special clothing and an appropriate diet and fluid intake will be recommended to all on-Site personnel to further reduce these temperature-related hazards. Site workers should stop work and notify the SSHC when they observe symptoms of heat/cold stress in themselves or co-workers.

All O'Brien & Gere and subcontracted personnel should review Exhibit 3 – Heat Stress Prevention Plan.

7.3.1. Monitoring

Heat stress monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70°F or above. To monitor the worker, one of the following methods should be employed:

1. Heart rate should be measured by the radial pulse for a 30 second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work cycle by one-third and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following cycle by one-third.

2. Oral temperature should be measured at the end of the work period (before drinking). If oral temperature exceeds 99.6°F, shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6°F at the beginning of the next rest period, shorten the next work cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 100.6°F.

7.3.2. Cold Stress Work/Rest Schedules

Work/rest schedules must be altered to minimize the potential for cold stress. Cold stress is defined as a decrease in core body temperature to 96.8°F and/or cold injury to body extremities. Decreases in core body temperature are associated with reduced mental alertness, reduction in rational decision making, or loss of consciousness in severe cases. Symptoms of cold stress include pain in extremities (i.e., hands and feet) and severe shivering. If workers experience these symptoms, then stop work and implement the following controls

1. Workers must don adequate dry insulating clothing; and

2. Adjust the work/rest schedule to increase the amount of rest/rewarming time.

3. Toolbox safety meetings discussing symptoms of cold stress, clothing requirements, and work breaks must be held when the wind chill temperature (see Appendix A) drops below 0°F and EACH DAY the wind chill temperature is below 25°F.

NOTE: Wind chill temperatures are a combination of actual air temperature and wind speed as shown below. The wind chill index provided below shows the effective cooling on exposed skin. When the wind blows across the skin, it removes the insulating layer of warm air adjacent to the skin. When all factors are the same, the faster the wind blows, the greater the heat loss, which results in a colder feeling. Wind chill temperatures more than 25°F below zero are extremely dangerous. Workers must protect any exposed skin, especially the face, ears, and fingers.

Wind Speed-mph							
Calm	5	10	15	20	25	30	35
Temperature (Degrees F)	**Wind Chill**						
45	43	34	29	26	23	21	20
40	37	28	23	19	16	13	12
35	32	22	16	12	8	6	4
30	27	16	9	4	1	-2	-4
25	22	10	2	-3	-7	-10	-12
20	16	3	-5	-10	-15	-18	-20
15	11	-3	-11	-17	-22	-25	-27
10	6	-9	-18	-24	-29	-33	-35
5	0	-15	-25	-31	-36	-41	-43
0	-5	-22	-31	-39	-44	-49	-52
-5	-10	-27	-38	-46	-51	-59	-64
-10	-15	-34	-45	-51	-59	-64	-67
-15	-21	-40	-51	-60	-66	-71	-74
-20	-26	-46	-58	-67	-74	-79	-82
-25	-31	-52	-65	-74	-81	-86	-89

If you would like to calculate the wind chill index for combinations of temperature and wind other than those given in the table above, you can use the formula:

WC = 91.4 - (0.474677 - 0.020425 * V + 0.303107 * SQRT(V)) * (91.4 - T)
where: WC = wind chill index; V = wind speed (mph); T = temperature (° F)

8. Personnel Training

8.1. General

Employees must, at a minimum, have received training that meets the requirements specified in 29 CFR 1910.120. Subcontractor personnel will document their compliance with training and medical program requirements.

Site personnel involved in field activities will have received the appropriate basic training and any additional activity-specific training where required, prior to initiation of the said activities. This HASP must be distributed to subcontractors prior to the start of field activities. A pre-operation meeting will be held to discuss the content of the Plan. Specialty training will be provided as determined by task and responsibility. Personnel training will be conducted under the supervision of the Health & Safety Coordinator.

Site workers

O'Brien & Gere employees performing the activities listed in the Statement of Work (SOW) must have completed a training course of at least 40 hours meeting the requirements of 29 CFR 1910.120(e) for safety and health at hazardous waste operations. If the course was completed more than 12 months before the date of site work, completion of an approved 8-hour refresher course on health and safety at hazardous waste operations is required.

O'Brien & Gere employees must comply with the O'Brien & Gere Quality Assurance Manual (QAM). The respiratory protection program is specified in Section 004.2 of Vol. 3. The Hazard Communication Program is specified in Section 003 of Vol. 3. The Audit Program is specified in Section 019 of Vol. 3. The Confined Spaces Entry Program is specified in Section 008 of Vol. 3.

Management and leaders

In addition to the requirements described in section 3.1 for O'Brien & Gere site workers, O'Brien & Gere field leaders must have completed an off-site training course of at least 8 hours meeting the requirements of 29 CFR 1910.120(e) on supervisor responsibilities for safety and health at hazardous waste operations.

Emergency response personnel

O'Brien & Gere employees who respond as good samaritans to emergency situations involving health and safety hazards must be trained in how to respond to such emergencies in accordance with the provisions of 29 CFR 1910.120(l). Skills such as cardiopulmonary resuscitation (CPR), mouth-to-mouth rescue breathing, avoidance of blood-borne pathogens, and basic first aid skills may be necessary.

8.2. Site-Specific Training

Employees will undergo Site-specific training prior to the start-up of each project or task. As Site activities change, supplemental training will be provided on the following topics:

- Recognition and control of general Site hazards and specific hazards (including heat and cold hazards) in the work areas,
- Selection, use, testing and care of the PPE required and the limitations of each,
- Decontamination procedures for Site workers, their PPE and other equipment used on-Site,
- Emergency notification procedures (including hand signals) and evacuation routes to be followed,
- Emergency response procedures and requirements, and
- Procedures for obtaining emergency assistance and medical attention.

8.3. Specialized Training

Specialized training will be provided as dictated by the nature of Site activities. Specialized training will be provided for activities such as the handling of unidentified substances. Employees involved in these types of activities will be given off-Site instruction regarding the potential hazards involved with such activities and the appropriate health and safety procedures to be followed. Specialized instruction will take place in an area where employees will not be exposed to Site hazards.

8.4. Training Certification

A record of employee training completion will be maintained on-Site by the Health & Safety Coordinator. This record will include the dates of completion of worker training, supervisor training, refresher training, emergency response training and Site-specific training for Site workers as appropriate.

9. Decontamination

9.1. Personnel Decontamination Procedures

In general, decontamination involves scrubbing with a non-phosphate soap/water solution followed by clean water rinses. Disposable items will be disposed of in a dry container. Decontamination wastewaters will be contained in 55-gallon drums for subsequent off-site disposal. This will be done at the direction of the Project Manager or Project Supervisor.

In addition to being decontaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized before they can be used again unless they are assigned to individuals. The manufacturer's instructions should be followed in sanitizing the respirator masks. The Health & Safety Coordinator (or designee) will be responsible for supervising the proper use and decontamination of protective equipment.

The highest level of protection used for this investigation will be Level C. Based on this level of protection, the following decontamination protocol will be used:

Station 1: Equipment Drop.
Deposit equipment used in the work zone (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.

Station 2: Outer Garment, Boots, and Gloves Wash and Rinse.
Scrub outer boots, outer gloves and splash suit with detergent water. Rinse off using copious amounts of water.

Station 3: Outer Boot, Glove and Canister (or Mask) Removal.
3a. Remove outer boots and gloves. Deposit in container with plastic liner. If boots are to be reused (e.g., when the worker is donned in Level D or modified Level D protection), place in a secure on-Site location, preferably in plastic.

3b. If a worker leaves the exclusion zone to change his/her canister (or mask), this is the last step in the decontamination procedure. At this station, the worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.

Station 4: Boots, Gloves and Outer Garment Removal.
Remove and deposit boots, chemical-resistant splash suit, and inner gloves in separate containers lined with plastic.

Station 5: Face Piece Removal.
Face piece is removed. Avoid touching face with fingers. Deposit face piece on plastic sheet.

Station 6: Inner Glove Removal
Remove and dispose of inner gloves. Deposit them in a container with a plastic liner. If gloves are to be reused (e.g., when the worker is donned in Level D or modified Level D protection), place in a secure on-Site location, preferably in plastic.

Station 7: Field Wash.
Wash hands and face thoroughly. Shower if body contamination is suspected.

9.2. Equipment Decontamination

Decontamination will be applicable to drilling and sampling activities. Drilling equipment mobilized to the Site will receive initial decontamination before use and also be decontaminated before leaving the site. Decontamination will consist of steam cleaning of the rig to the satisfaction of the Project Supervisor or the Health & Safety Coordinator. Dirt, oil grease or other foreign materials that are visible will be removed from metal surfaces. Scrubbing with a wire brush may be required to remove materials that adhere to the surfaces.

Drilling equipment will be stored on plastic sheeting above ground, either on the drill rig at the drill site or on wooden supports. Equipment not in use will be covered with plastic and stored in a designated storage area separated from PPE.

The rear portion of the drill rig will be decontaminated by steam cleaning between test borings and/or monitoring well installations. In addition, equipment entering a monitoring well but not used for sample collection will be decontaminated by a steam cleaning.

Non-dedicated sample collecting equipment will be decontaminated after each use by a low phosphate detergent brushing followed by a clean water rinse. The field decontamination wastes will be collected in drums and disposed of in accordance to IDW management.

It may be necessary to insert hoses and/or narrow diameter pipe into test borings and wells during installation, development, purging, and sampling. These items will also be decontaminated initially, and after each use. The outside of the hose or pipe will be decontaminated as specified above for any item entering a well boring. The inside will be cleaned with soapy water and rinsed with water.

9.3. Investigation Derived Wastes Disposal

Investigation derived waste will be managed in accordance with the procedures described in the work plan. Site refuse will be contained in appropriate areas or facilities. Trash from the project will be disposed properly.

10. Emergency Response

10.1. Notification of Site Emergencies

In the event of an emergency, Site personnel will signal distress either verbally or with three blasts from a horn (vehicle horn, air horn, etc.) and contact the on-Site Health & Safety Coordinator. Site personnel will immediately withdraw from a hazardous situation to reassess procedures and consult with the Health & Safety Coordinator. Appropriate authorities will then be immediately notified of the nature and extent of the emergency.

Table 5 contains Emergency Response Telephone Numbers. This table and directions to the hospital will be maintained at the work site by the Health & Safety Coordinator. The location of the nearest telephone will be determined prior to initiation of on-Site activities.

Should someone require transportation to a hospital or doctor, a copy of this HASP must accompany him/her.

The Health & Safety Coordinator will direct notification, response, and follow-up actions to emergencies with the concurrence of ITT. Contacts with any outside response personnel (ambulance, fire department, etc.) will be done at the direction of the Health & Safety Coordinator, again with the concurrence of ITT.

Follow-up activities must be completed before on-Site work is resumed following an emergency. Used emergency equipment must be recharged, refilled or replaced. Government agencies must be notified as appropriate. An investigation of the incident must be conducted as soon as possible. The resulting report must be accurate, objective, complete, signed and dated. Copies must be submitted in accordance with the O'Brien & Gere QAM.

10.2. Responsibilities

The Health & Safety Coordinator (or designee) will be responsible for responding to emergencies. In addition, the Health & Safety Coordinator will:

1. Notify appropriate individuals, authorities and/or health care facilities of the potentially hazardous activities and potential wastes that may develop as a result of the investigation;

2. Have working knowledge of safety equipment available at the Site; and

3. Ensure a map that details the most direct route to the nearest hospital is prominently posted with the emergency telephone numbers.

The Project Supervisor will ensure that the following safety equipment is available at the Site: eyewash station, first aid supplies, and fire extinguishers.

10.3. Accidents and Injuries

In the event of a safety or health emergency at the Site, appropriate emergency measures will immediately be taken to assist those who have been injured or exposed and to protect others from hazards (See Figure 2 for the location of area hospitals in relation to the Site). The Health & Safety Coordinator will be immediately notified. The Health & Safety Coordinator will then contact the appropriate emergency response personnel, who will, according to the seriousness of the accident, provide recommended medical diagnosis and, if necessary, treatment. Personnel trained in first aid procedures will be present during Site activities to provide appropriate treatment of injuries or illnesses occurring during operations.

The Project Manager, Project Supervisor, and ITT will be immediately informed of any injuries or incidents. If an individual is transported to a hospital or doctor, a copy of this Health & Safety Plan must accompany the individual. The Project Supervisor and the Health & Safety Coordinator will conduct an investigation to determine whether and at what levels exposure actually occurred, the cause of such exposure, and the means to be taken to prevent the incident from recurring.

An exposure-incident report will be completed by the Health & Safety Coordinator, the Project Supervisor and the exposed individual. The form will be submitted to O'Brien & Gere in accordance with the O'Brien & Gere QAM. A copy will be filed with the employee’s medical and safety records to serve as documentation of the incident and the actions taken.

10.4. Site Communications

Cellular telephones and/or two-way radios will be available for use in the field for emergency response and office communications. Hand signals will be utilized where phones/radios are impractical or unsafe. The locations of public telephones will be identified prior to the start of activities. These will provide back up for the cellular telephones.

10.5. Safe Refuge

The project personnel's vehicles shall serve as the immediate place of refuge in the event of an emergency. If evacuation from the area is necessary, the vehicles will be used to transport on-Site personnel to safety.

10.6. Emergency Evacuation

A safe refuge location will be selected each day and the employees working on site will be told its location. In case of an emergency, Site personnel should evacuate to the identified safe refuge location, both for their own personal safety and to prevent hampering response/rescue efforts. The Health & Safety Coordinator will account for all personnel. A log of individuals entering and leaving the Site will be kept so that everyone can be accounted for in an emergency.

10.7. Fire fighting Procedures

A fire extinguisher, intended only for small fires, will be available in the Project Supervisor's (or his designee's) vehicle during on-Site activities. When the fire cannot be controlled with the extinguisher, the area should be evacuated immediately. The Health & Safety Coordinator (or designee) will determine the time to contact fire department response personnel.

10.8. Emergency Decontamination Procedures

The extent of emergency decontamination depends on the severity of the injury or illness and the nature of the contamination. Minimum decontamination will consist of detergent washing, rinsing and removal of contaminated outer clothing and equipment. If the emergency is such that there is insufficient time to complete all of these actions, it is acceptable to remove the contaminated clothing without washing it. If the situation is such that the contaminated clothing can not be removed, the person should be given required first aid treatment, and then wrapped in plastic or a blanket prior to transport to medical care. If heat stress is a factor in the victim's illness/injury, the outer protective garment must be removed from the victim immediately.

10.9. Emergency Equipment

On-Site equipment for safety and emergency response shall be maintained, as follows:

- fire extinguisher
- first aid kit
- eye wash station (wash bottles at a minimum)
- extra copy of the HASP

These will be located in the field vehicle of the on-Site Project Supervisor and/or the Health & Safety Coordinator.

10.10. Review Procedures

The plan will be reviewed to ensure its applicability for the planned day's operations.

11. Special Precautions and Procedures

11.1. General

This investigation poses potential exposure to chemical and physical hazards. The chemical risks have been explained in detail in the previous sections. The potential for chemical exposure to hazardous substances will be significantly reduced through the use of air monitoring, personal protective clothing, engineering controls, and implementation of safe work practices.

11.2. Construction Materials and Site Refuse

Construction materials and Site refuse will be contained in appropriate areas or facilities. Site personnel should make certain that cement, drill cuttings, etc. are not scattered throughout the area of activity and that trash and scrap materials are immediately and properly disposed of.

11.3. Additional Safety Practices

The following are important safety precautions that will be enforced during this investigation:

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases that probability of hand-to-mouth transfer and ingestion of material is prohibited in the exclusion and decontamination zones.

2. Smoking in exclusion and decontamination zones is prohibited.

3. Hands and face must be thoroughly washed upon leaving the exclusion and decontamination zones and before eating, drinking, or any other activity.

4. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

5. No jewelry except medical alert IDs may be worn. Watches should be carried in a pocket. This requirement may be modified at the discretion of the Health & Safety Coordinator.

6. Medicine and alcohol can mask the effect from exposure to certain compounds. Controlled substances and alcoholic beverages must not be consumed by personnel involved in the project. Consumption of prescribed drugs must be at the direction of a physician familiar with the person’s work.

7. Unsafe equipment left unattended will be identified by a “DANGER, DO NOT OPERATE” tag.

8. In any unknown situation, always assume the worst and act accordingly.

11.4. Daily Log Contents

The Project Manager and the Health & Safety Coordinator will establish a system appropriate to the Site, the work and the work zones that will record, as a minimum, the following information:

1. Work zones,
2. Air monitoring equipment calibrations,
3. Personnel on site,
4. Health and Safety status reports.

References

GeoServices, Ltd. 1992. *Characterization of Soil and Groundwater Quality at the Alliance Metal Stamping and Fabricating Property.* Gates, New York.

GeoServices, Ltd. 1994. *Report of June 1993 Site Testing and May 1994 Site Remediation Work.*

Golder Associates Inc. 2000. *Supplemental Subsurface Investigation, Risk Assessment, Natural Attenuation Evaluation, and Soil Remediation*. Rochester*, New York*.

Golder Associates Inc. 2000. *Groundwater Investigation*. Rochester*, New York*.

Table 1. ***Potential Site Compounds and Associated Exposure Information.***

Contaminants	OSHA PEL	ACGIH TLV	Characteristics	Route of Exposure	Symptoms of Overexposure *	Target Organs
1,1,1-Trichloroethane	350 ppm	None Listed				eyes, skin, liver, CNS, CVS
Tetrachloroethene	100 ppm	25 ppm	Colorless liquid with a sweet, chloroform-like odor	inhalation, ingestion, contact		eyes, skin, respiratory system, liver, kidneys, CNS
Trichloroethene	100 ppm	50 ppm	Colorless liquid (unless dyed blue) with a chloroform-like odor	inhalation, ingestion, adsorption, contact		eyes, skin, respiratory system, heart, liver, CNS
1,2-Dichloroethene	200 ppm	none	Colorless liquid with a slightly acrid chloroform-like odor	inhalation, ingestion, contact		eyes, respiratory system, CNS
1,1-Dichloroethene	none	5 ppm				eyes, skin, respiratory system, liver, kidneys, CNS
p-Dichlorobenzene	75 ppm	10 ppm	White crystals or flakes, aromatic mothball odor	inhalation, ingestion, eye irritation	1, 2, 3, 4	lung, liver, kidney, eyes
Toluene	200 ppm	50 ppm	Colorless liquid, aromatic odor	inhalation, ingestion, adsorption, contact	1,2,3,6	eyes, skin, respiratory system, liver, kidneys, CNS
Methyl Ethyl Ketone	200 ppm	200 ppm				skin, respiratory system, CNS
Xylene	100 ppm	100 ppm	Colorless liquid, mild sweet odor	inhilation, ingestion, contact	1,2,3,4,5	eyes, skin, respiratory system, kidneys, liver, CNS, gastrointestinal tract, blood
Acetone	1000 ppm	500 ppm	Colorless liquid with a fragrant mint-like odor	inhilation, ingestion, contact		eyes, skin, respiratory system, CNS
Hydrofluoric Acid	3 ppm	3 ppm				eyes, skin, respiratory system, CNS
Hydrochloric Acid	5 ppm	2 ppm				eyes, skin, respiratory system
Chromium	1 mg/m^3	0.05 mg/m^3				eyes, skin, respiratory system
Mercury	0.1mg/m^3 (vapor)	0.01mg/m^3 (skin)				eyes, skin, respiratory system
Lead	0.05 mg/m^3	0.15 mg/m^3				gastrointestinal tract, CNS, kidneys, blood, gingival tissue
Nickel	1 mg/m^3	0.5 mg/m^3				nasal cavities, lungs, skin
Silver	0.01 mg/m^3	0.01 mg/m^3				nasal spectum, skin, eyes

NOTES:

PEL – Permissible exposure limits (OSHA) – 8 hour exposure

PELs were obtained from 29 CFR 1910 Subpart Z Tables Z-1 and Z-2 (last revised June 30, 1993), except for benzene which was obtained from 29 CFR 1910.1028.

TLV – Threshold limit value (ACGIH) – 8 hour exposure

TLVs were obtained from the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances and Physical Agents (2003)

Symptoms of Overexposure:
*Symptoms may include any or all listed depending upon concentration, duration and route of exposure
1) Eye, nose, throat, skin irritation or burns
2) Headache, fatigue, nausea
3) Lightheaded, some nausea, dull visual and audio response
4) CNS disorder, convulsions, sweating
5) CVS disorder
6) Potential or known carcinogens

Table 2. ***Health and Safety Hazards*.**

Hazard	Description	Location	Procedure Used to Monitor/Reduce the Hazard
Heavy equipment/construction activity	Drill rigs, machinery, backhoes	Throughout site	Personnel maintain eye contact with operators; hard hats, safety shoes and eye protection worn during equipment operation.
Overhead/underground utilities	Electrical, sewer, gas, water	To be determined	Locate existing utilities prior to site operations. Design installation of additional utilities so that they do not interfere with site operations.
Heat producing / electrical equipment	Generators / drill rigs	Throughout site	Operate equipment away from vegetation and other materials that may ignite. Maintain fire-fighting equipment in the vicinity of operating equipment.
Heat / cold stress	Personnel working under extreme temperature are subject to adverse temperature related effects	Throughout site	Employ buddy system. Each worker is responsible for visually monitoring his/her partner for signs of heat / cold stress. Site safety personnel will also monitor worker's conditions and establish work/rest regimens and recommend appropriate diet.
Chemical exposure	Personnel can be exposed to various compounds associated with the site	Throughout site	Follow guidelines in Safety Plan. Be familiar with signs and symptoms of exposure and first aid procedures. Report suspected over-exposure to supervisor immediately.
Elevated noise	Operating heavy equipment and generators	Throughout site	Wear hearing protection. Avoid exposure.

Table 3. Action Levels

Benzene Not Present - Unknown Organic Vapor Concentrations	Level of personal protection
< 5 ppm	Level D and Modified Level D.
5 to 50 ppm	Level C clothing with fullface respirator and cartridges appropriate for organic vapors, dust, mists, and acid gases; engineering controls to decrease vapor levels.
>50 ppm	Cessation of Site activities until engineering controls are implemented to decrease vapor levels.

NOTE – Full Face respirators with qualitative fit testing are limited to a protection factor (PF) of 10 per 29CFR1910.134. Full face respirators with quantitative fit testing may be assigned the full OSHA PF of 50.

Table 4. ***Air Monitoring***

Task	Environmental Monitoring for Personal Protection
Ground water sampling	PID
Subsurface investigations	PID
Deep well installation	PID, Explosive gases meter
Water level measurement	PID
Air sampling	PID, DusTrac air particulate monitor and Draeger tube quantification, if necessary

Note: Monitoring results will be recorded in a field log book.

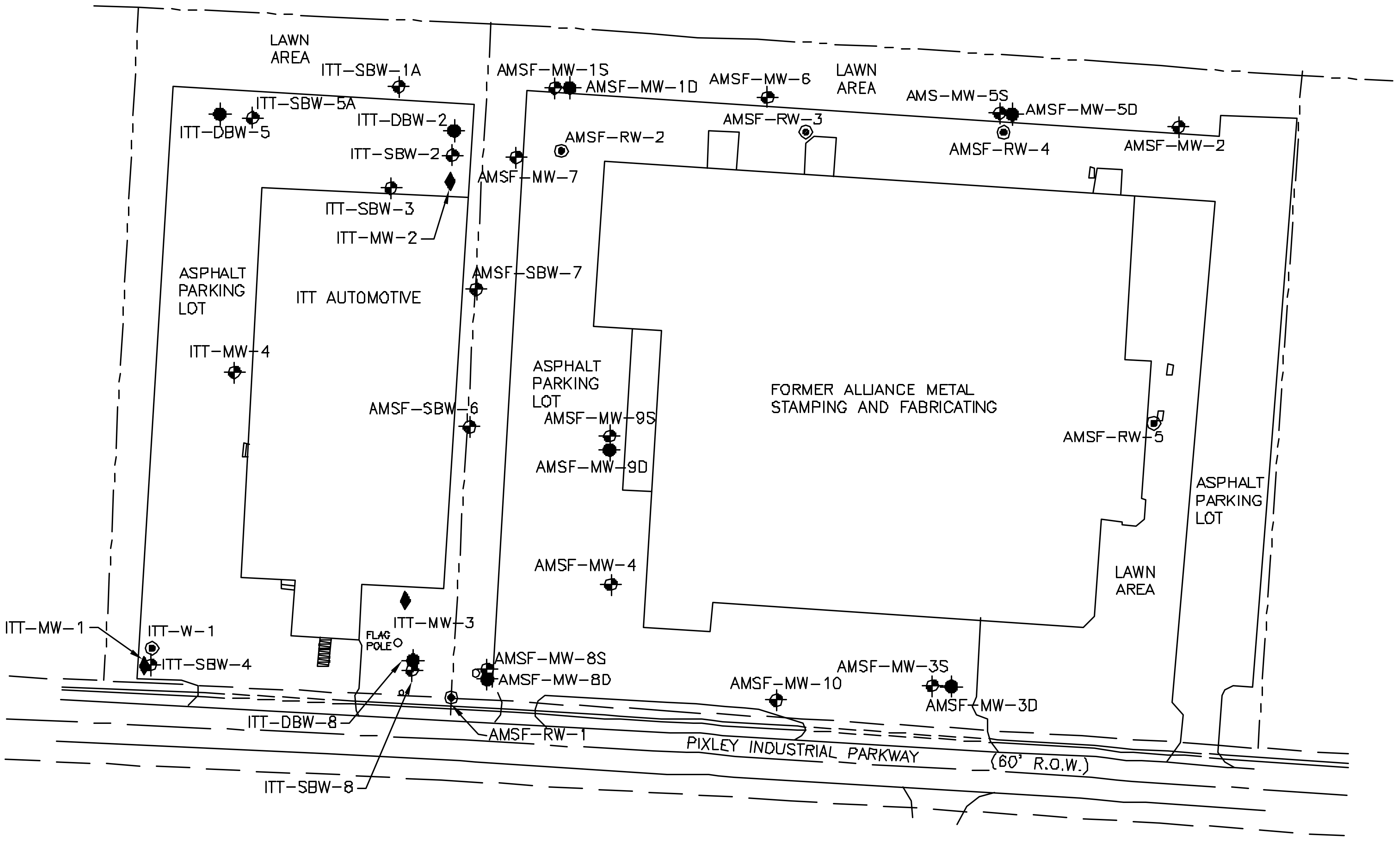
Table 5. ***Emergency Response Telephone Numbers.***

Agency	Address	Telephone Number
Fire Department	NA	911
Police	NA	911
ITT	Bennett A. Leff – Motion and Flow Control. ITT Industries 10 Mountain View Road Upper Saddle River, NJ 07458	201- 760-5768
Ambulance	NA	911
Strong Memorial Hospital	601 Elmwood Avenue Rochester, New York	716-275-2100 or 911
FF Thompson	350 Parish Street Canandaigua, New York	716-396-6000 or 911
New York State Department of Environmental Conservation	6274 East Avon-Lima Road Avon, New York	716-226-2466
New York State Department of Health	Bevier Building 42 South Washington Street Rochester, New York 14608	716-274-8071
O'Brien & Gere Engineers, Inc.	5000 Brittonfield Pkwy East Syracuse, NY 13057	315-420-0554 (Ed Wilson – cell) 315-437-6100 (Ed Wilson – office) 315-437-6100 (Guy Swenson – office)

DWG PATH: I:\DIV71\PROJECTS\4655\31777\DWG\043.DWG SF-100

PLOT DATE: 10/30/03

FIGURE 1



LEGEND

- ⊕ SHALLOW BEDROCK MONITORING WELL
- ● DEEP BEDROCK MONITORING WELL
- ◉ RECHARGE WELL
- ♦ OVERBURDEN MONITORING WELL
- – – – – PROPERTY LINE
- —— — —— CENTER OF ROADWAY

ITT AUTOMOTIVE INC.
TOWN OF GATES, NEW YORK
SITE #8-28-112

SITE PLAN

100 0 100

FILE NO. 4655.31777.043
OCTOBER 2003

O'BRIEN & GERE
ENGINEERS INC.

NOTE:
FIGURE BASED ON NYSDEC DECEMBER 2001 FIGURE 3

PLOT DATE: 10/30/03

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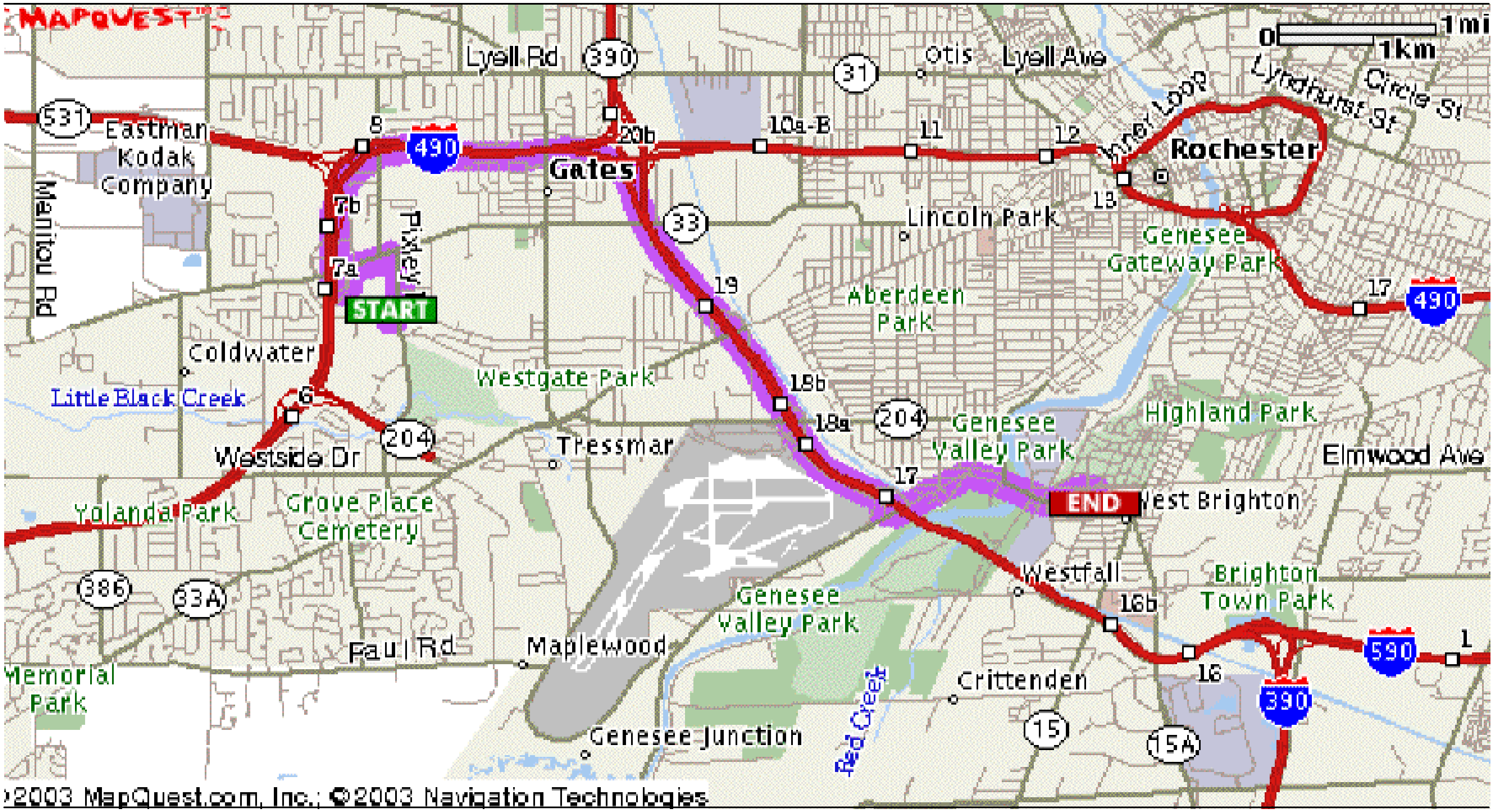
FILE NO. 4655.31777.042
OCTOBER 2003



ENGINEERS INC.

ITT AUTOMOTIVE INC.
TOWN OF GATES, NEW YORK
SITE #8-28-112

HOSPITAL EVACUATION ROUTE MAP

FIGURE 2

EXHIBIT 1

SUBCONTRACTOR OCCUPATIONAL SAFETY AND HEALTH CERTIFICATION

PROJECT: ____

SUBCONTRACTOR: ____

1. Contractor certifies that the following personnel to be employed during the Site Investigation (ITT and AMSF) have met the following requirements of the OSHA Hazardous Waste Operations Standard (29 CFR 1910.120) and other applicable OSHA standards, as required by O'Brien & Gere Engineers, Inc.

Subcontractor Personnel	Training	Respirator Certification	Medical Exam

2. Subcontractor certifies that it has received a copy of the Site Safety and Health Plan and will ensure that its employees are informed and will comply with its requirements.

3. Subcontractor further certifies that it has read and understands and will comply with all provisions of its contractual agreement.

REPORT

Remedial Investigation –
Health & Safety Plan Addendum
ITT Corporation
Town of Gates, New York
(Site #8-28-112)

ITT Corporation

February 2007

Job No. 3356/35273

REPORT

Remedial Investigation –
Health & Safety Plan Addendum
ITT Corporation
Town of Gates, New York
(Site #8-28-112)

ITT Corporation

Steven J. Roland, P.E., Executive Vice President
O'Brien & Gere Engineers, Inc.

February 2007

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1. Introduction

This Health and Safety Plan (HASP) has been developed to provide general procedures to be followed by engineering, construction and oversight personnel while performing the Remedial Investigation/ Feasibility Study (RI/FS) at the ITT Corporation (ITT) site located in the Town of Gates, New York. The adjacent former Alliance Metal Stamping and Fabricating (AMSF) property and Cinemark property are presently considered off-site properties for purposes of the RI/FS, however due to the distribution of constituents of concern the combined ITT, AMSF, and Cinemark properties are included in the scope of work and are presented in figures. A Site Plan is included as Figure 1.

This HASP describes the minimum safety requirements and general procedures to be met by employees of ITT's consultants implementing the RI/FS (Engineer), the Engineer's subcontracted personnel, and those representatives designated by ITT or State and local governmental agencies, while on-Site. Accordingly, the HASP describes the responsibilities, training requirements, protective equipment, and procedures necessary to protect workers and visitors from exposure to potentially harmful materials. The HASP will be discussed with Site personnel and will be available on-Site for employee inspection and review while work activities are underway. A qualified Health & Safety Coordinator will be designated by the Engineer to implement the HASP during the investigations. The designated H&S Coordinator will be identified in any and all reports produced documenting the work.

1.2. Site Background and Description

The Site and off-site properties (the ITT, AMSF, and Cinemark facilities) are situated to the southeast of the intersection of I-490 and State Route 33 in the Town of Gates, New York. The ITT facility was constructed on vacant land in 1973 for Rochester Form Machine and was purchased by ITT-Higbie Baylock in 1979. The AMSF facility was constructed on vacant land around 1966. Prior land use for this area was observed as farmland.

1.3. Scope of Work

The following work activities are governed by this HASP.

The scope of work presented below for the Site and off-Site is based on the information presented in the RI/FS Work Plan, ITT Automotive, Inc, Site # 8-28-112, November 2003 (O'Brien & Gere, 2003) and the RI Phase II Work Plan Addendum, ITT Corporation Site # 8-28-112, January 2007 (O'Brien & Gere, 2007).

Site and Off-Site Reconnaissance
The Site and off-Site reconnaissance will be performed in accordance with Section 1.3 of the 2004 RI/FS Work Plan HASP.

Marking of Subsurface Utilities
Marking of subsurface utilities is described in accordance with the 2004 RI/FS Work Plan HASP (Appendix B, Section 1.3). In addition, a private utility locating service will be contracted to locate the utilities on the off-site properties.

Mobilization
The mobilization will be performed in accordance with Section 1.3 of the 2004 RI/FS Work Plan HASP.

Vapor Intrusion Sampling
Vapor intrusion samples will be collected from the Cinemark building to assess the potential for migration of vapor to indoor air at concentrations that are incompatible with building uses and potential receptors.

Approach
The vapor intrusion sampling is described in the 2004 RI/FS Work Plan HASP (Appendix B, Section 1.3).

Soil Borings and Bedrock Coring
Advancement of rock cores to further evaluate the vertical and horizontal profile of volatile organic compounds (VOCs) and 1,4-dioxane within bedrock.

Approach
Bedrock cores will be completed on ITT, AMSF, and Cinemark properties. Packer tests will be performed in conjunction with coring. Bedrock coring and packer testing will be performed in accordance with bedrock coring protocol provided in Appendix D of the RI/FS Work Plan, May 2004. Three (3) bedrock cores (one 170 ft deep and two greater than 170 ft) will be advanced on the AMSF property, two (2) in the northern section and one (1) in the southern section. One (1) bedrock core will be advanced in the southwest corner of the ITT property. One (1) bedrock core will be advanced in the southern portion of the Cinemark property. Bedrock coring activities are described in the 2004 RI/FS Work Plan HASP (Appendix B, Section 1.3).

Rock core samples will be collected for VOC analysis at locations of selected fractures encountered in the rock cores for the deep and shallow bedrock borings. Samples will be targeted at fracture zones, lithologic changes (or other matrix property changes), and from the matrix between fractures. Samples will be removed by using a hammer and chisel to break off a one to two-inch section. The rock samples will be crushed and preserved in methanol in the field by placing the sample in a stainless steel crushing cell and crushed with a stainless steel piston attached to a hydraulic press. The sample is then immediately transferred to the methanol preserved sample vial. In addition, rock samples will be collected for rock matrix physical parameter analysis (porosity, bulk density, organic carbon content, chloride diffusion coefficient, and matrix permeability). Rock matrix physical parameter samples will be collected by breaking off the required length of core, wrapping in aluminum foil, and shipping to the laboratory.

Upon completion of coring, each bedrock boring will be developed to remove the fine material, which may have settled in the monitoring wells, to remove introduced drilling fluids, and to provide better hydraulic communication with the surrounding formation. Development will consist of the removal of 110% of the volume of drilling water lost (if used) to the bedrock formation or five (5) well volumes whichever is greater. Development water will be contained in containers for subsequent disposal. The method of proper off-Site disposal will be selected based on ground water analytical results. Upon completion of development, blank FLUTe® liners will be installed in 5 of the boreholes until multi-port wells can be constructed and installed.

Borehole geophysics will be performed in each of the deep boreholes on the ITT, Cinemark, and AMSF properties. The blank FLUTe® liners will be removed and the wells will be allowed to equilibrate for two days prior to completion of borehole geophysics. The logging program consists of fluid temperature and fluid resistivity, caliper, acoustic televiewer, optical televiewer, and heat pulse flow meter under static and pumping conditions. Following completion of borehole geophysics the FLUTe® liners will be replaced.

Monitoring Well Installation

Objective

Installation and sampling of monitoring wells to provide better definition of ground water flow and the nature and extent of impacts.

Approach

Shallow bedrock monitoring wells, intermediate bedrock monitoring wells, and deep multi-port bedrock monitoring wells will be installed at the Site and off-Site. Shallow and intermediate bedrock monitoring well installation is described in the 2004 RI/FS Work Plan HASP (Appendix B, Section 1.3).

In general, to install a FLUTe® well, the liner (mounted on a reel) is located adjacent to the well head. Install selected mechanism to allow trapped air to escape during installation. Approximately 4 ft of the liner is then inverted into the well and clamped in place. Water is added to the liner until the liner is settled into the well. Additional equipment is required depending on water table depth at the start of installation. Detailed procedures for installation of the FLUTe® liner are provided in RI Work Plan Addendum Appendix E.

Following installation of the new monitoring wells and multi-port wells, and prior to collection of ground water samples, each new well will be developed to remove water that may have been introduced into fractures during the installation. . Well development is described in the 2004 RI/FS Work Plan HASP (Appendix B, Section 1.3).

Hydraulic Conductivity Testing

In-situ hydraulic conductivity tests will be performed in the newly installed shallow and intermediate monitoring wells. Hydraulic conductivity testing is described in the 2004 RI/FS Work Plan HASP (Appendix B, Section 1.3).

Ground Water Gauging and Sampling

Objective

Ground water sampling and ground water elevation gauging will be completed to provide information regarding temporal variations in ground water elevations, flow patterns and chemical composition.

Approach

Ground water sampling and gauging is described in the 2004 RI/FS Work Plan HASP (Appendix B, Section 1.3).

Ground water elevations will be measured periodically at monitoring and recharge wells during different seasonal and quarterly events. Ground water elevation gauging is described in the 2004 RI/FS Work Plan HASP (Appendix B, Section 1.3).

For a more detailed description of activities to be conducted please consult the final agency approved RI Phase II Work Plan Addendum.

1.4. Hazard Overview

The hazard overview will be performed in accordance with Section 1.3 of the 2004 RI/FS Work Plan HASP.

2. Project Personnel

The project personnel will be in accordance with Section 2 of the 2004 RI/FS Work Plan HASP.

3. Health and Safety Hazards

Health and safety hazards are consistent with Section 3 of the 2004 RI/FS Work Plan HASP.

4. Personal Protective Equipment

Personal protective equipment is consistent with Section 4 of the 2004 RI/FS Work Plan HASP.

5. Site Air Monitoring

5.1 General

A general description of site air monitoring is presented in Section 5 of the 2004 RI/FS Work Plan HASP.

5.2. Monitoring

5.2.1. Organic Vapor

Organic vapor concentrations will be monitored at the start and at 15- minute intervals during specified activities listed in Table 4 using flame ionization detector (FID), or photoionization detector (PID). The instrument used will be calibrated according to the manufacturer's instructions. Tasks not otherwise specified in Table 4 will be monitored hourly for the first 2 hours. Organic vapor concentrations will be used as action level criteria for upgrading or downgrading protective equipment (See Section 4) and for implementing additional precautions or procedures.

5.3. Action Levels

Action levels are presented in Section 5.3 of the 2004 RI/FS Work Plan HASP.

5.4. Community Air Monitoring Plan

The community air monitoring plan is presented in Section 5.4 of the 2004 RI/FS Work Plan HASP.

6. Site Access and Site Control

Site access and site control will be maintained in accordance with Section 6 of the 2004 RI/FS Work Plan HASP.

7. Medical Monitoring

Medical monitoring will be performed in accordance with Section 7 of the 2004 RI/FS Work Plan HASP.

8. Personnel Training

Personnel training will be comply with Section 8 of the 2004 RI/FS Work Plan HASP.

9. Decontamination

9.1 Personnel Decontamination Procedures

Personnel Decontamination will be performed in accordance with Section 9 of the 2004 RI/FS Work Plan HASP.

9.2 Equipment Decontamination

Equipment Decontamination will be performed in accordance with Section 9 of the 2004 RI/FS Work Plan HASP.

9.3 Investigation Derived Wastes Disposal

Wastes will be handled in accordance with Section 4.9 of the RI/FS Work Plan, May 2004. Water produced as part of the Phase II RI investigation may be stored temporarily on-Site in bulk storage containers. All IDW generated will be properly stored, labeled, marked, profiled, manifested, transported and disposed of off-Site in accordance with all applicable local, state and federal regulations. An IDW tracking form will also be maintained. The NYSDEC will be advised as to the proposed disposal method.

10. Emergency Response

Emergency response will be performed in accordance with Section 10 of the 2004 RI/FS Work Plan HASP.

11. Special Precautions and Procedures

Special precautions and procedures will be followed in accordance with Section 11 of the 2004 RI/FS Work Plan HASP.

References

References are presented in the reference page of the 2004 RI/FS Work Plan HASP.

Tables

Table 1. ***Potential Site Compounds and Associated Exposure Information.***

Contaminants	OSHA PEL	ACGIH TLV	Characteristics	Route of Exposure	Symptoms of Overexposure *	Target Organs
1,1,1-Trichloroethane	350 ppm	None Listed				eyes, skin, liver, CNS, CVS
Tetrachloroethene	100 ppm	25 ppm	Colorless liquid with a sweet, chloroform-like odor	inhalation, ingestion, contact		eyes, skin, respiratory system, liver, kidneys, CNS
Trichloroethene	100 ppm	50 ppm	Colorless liquid (unless dyed blue) with a chloroform-like odor	inhalation, ingestion, adsorption, contact		eyes, skin, respiratory system, heart, liver, CNS
1,2-Dichloroethene	200 ppm	none	Colorless liquid with a slightly acrid chloroform-like odor	inhalation, ingestion, contact		eyes, respiratory system, CNS
1,1-Dichloroethene	none	5 ppm				eyes, skin, respiratory system, liver, kidneys, CNS
p-Dichlorobenzene	75 ppm	10 ppm	White crystals or flakes, aromatic mothball odor	inhalation, ingestion, eye irritation	1, 2, 3, 4	lung, liver, kidney, eyes
Toluene	200 ppm	50 ppm	Colorless liquid, aromatic odor	inhalation, ingestion, adsorption, contact	1,2,3,6	eyes, skin, respiratory system, liver, kidneys, CNS
Methyl Ethyl Ketone	200 ppm	200 ppm				skin, respiratory system, CNS
Xylene	100 ppm	100 ppm	Colorless liquid, mild sweet odor	inhilation, ingestion, contact	1,2,3,4,5	eyes, skin, respiratory system, kidneys, liver, CNS, gastrointestinal tract, blood
Acetone	1000 ppm	500 ppm	Colorless liquid with a fragrant mint-like odor	inhilation, ingestion, contact		eyes, skin, respiratory system, CNS
Hydrofluoric Acid	3 ppm	3 ppm				eyes, skin, respiratory system, CNS
Hydrochloric Acid	5 ppm	2 ppm				eyes, skin, respiratory system
Chromium	1 mg/m^3	0.05 mg/m^3				eyes, skin, respiratory system
Mercury	0.1mg/m^3 (vapor)	0.01mg/m^3 (skin)				eyes, skin, respiratory system
Lead	0.05 mg/m^3	0.15 mg/m^3				gastrointestinal tract, CNS, kidneys, blood, gingival tissue
Nickel	1 mg/m^3	0.5 mg/m^3				nasal cavities, lungs, skin
Silver	0.01 mg/m^3	0.01 mg/m^3				nasal spectum, skin, eyes

NOTES:

PEL – Permissible exposure limits (OSHA) – 8 hour exposure

PELs were obtained from 29 CFR 1910 Subpart Z Tables Z-1 and Z-2 (last revised June 30, 1993), except for benzene which was obtained from 29 CFR 1910.1028.

TLV – Threshold limit value (ACGIH) – 8 hour exposure

TLVs were obtained from the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances and Physical Agents (2003)

Symptoms of Overexposure:
*Symptoms may include any or all listed depending upon concentration, duration and route of exposure
1) Eye, nose, throat, skin irritation or burns
2) Headache, fatigue, nausea
3) Lightheaded, some nausea, dull visual and audio response
4) CNS disorder, convulsions, sweating
5) CVS disorder
6) Potential or known carcinogens

Table 2. ***Health and Safety Hazards*****.**

Hazard	Description	Location	Procedure Used to Monitor/Reduce the Hazard
Heavy equipment/construction activity	Drill rigs, machinery, backhoes	Throughout site	Personnel maintain eye contact with operators; hard hats, safety shoes and eye protection worn during equipment operation.
Overhead/underground utilities	Electrical, sewer, gas, water	To be determined	Locate existing utilities prior to site operations. Design installation of additional utilities so that they do not interfere with site operations.
Heat producing / electrical equipment	Generators / drill rigs	Throughout site	Operate equipment away from vegetation and other materials that may ignite. Maintain fire-fighting equipment in the vicinity of operating equipment.
Heat / cold stress	Personnel working under extreme temperature are subject to adverse temperature related effects	Throughout site	Employ buddy system. Each worker is responsible for visually monitoring his/her partner for signs of heat / cold stress. Site safety personnel will also monitor worker's conditions and establish work/rest regimens and recommend appropriate diet.
Chemical exposure	Personnel can be exposed to various compounds associated with the site	Throughout site	Follow guidelines in Safety Plan. Be familiar with signs and symptoms of exposure and first aid procedures. Report suspected over-exposure to supervisor immediately.
Elevated noise	Operating heavy equipment and generators	Throughout site	Wear hearing protection. Avoid exposure.

Table 4. ***Air Monitoring***

Task	Environmental Monitoring for Personal Protection
Ground water sampling	PID
Subsurface investigations	PID
Deep well installation	PID, Explosive gases meter
Water level measurement	PID
Air sampling	PID, DusTrac air particulate monitor and Draeger tube quantification, if necessary

Note: Monitoring results will be recorded in a field log book.

Table 3. Action Levels

Benzene Not Present - Unknown Organic Vapor Concentrations	**Level of personal protection**
< 5 ppm	Level D and Modified Level D.
5 to 50 ppm	Level C clothing with fullface respirator and cartridges appropriate for organic vapors, dust, mists, and acid gases; engineering controls to decrease vapor levels.
>50 ppm	Cessation of Site activities until engineering controls are implemented to decrease vapor levels.

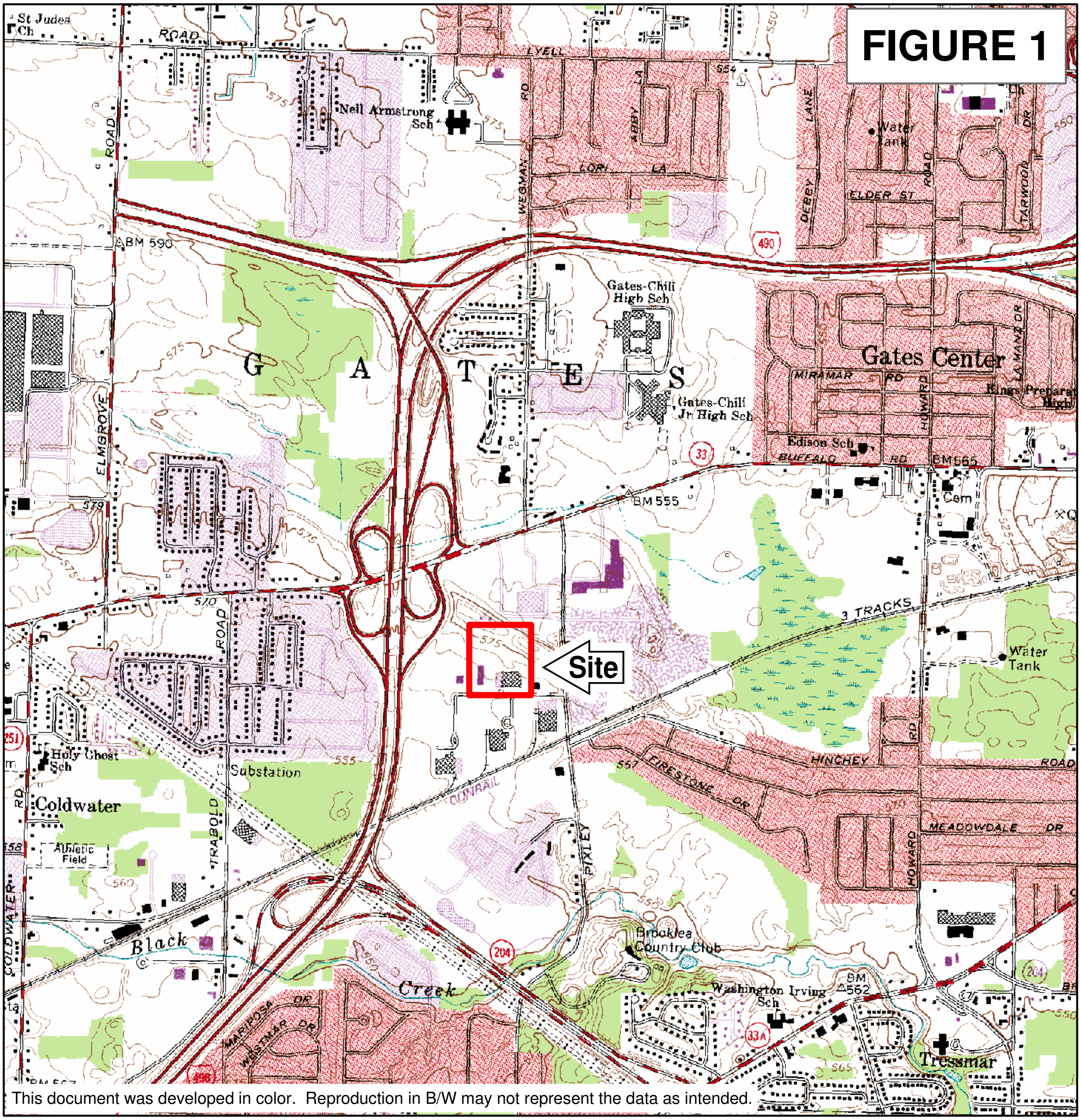
NOTE – Full Face respirators with qualitative fit testing are limited to a protection factor (PF) of 10 per 29CFR1910.134. Full face respirators with quantitative fit testing may be assigned the full OSHA PF of 50.

Table 5. ***Emergency Response Telephone Numbers.***

Agency	**Address**	**Telephone Number**
Fire Department	NA	911
Police	NA	911
ITT	Teresa Olmsted – ITT Remediation Management, Inc. 1054 North Tustin Avenue Anaheim, CA 92807-1724	201- 760-5768
Ambulance	NA	911
Strong Memorial Hospital	601 Elmwood Avenue Rochester, New York	716-275-2100 or 911
FF Thompson	350 Parish Street Canandaigua, New York	716-396-6000 or 911
New York State Department of Environmental Conservation	6274 East Avon-Lima Road Avon, New York	716-226-2466
New York State Department of Health	Bevier Building 42 South Washington Street Rochester, New York 14608	716-274-8071
O’Brien & Gere Engineers, Inc.	5000 Brittonfield Pkwy East Syracuse, NY 13057	315-391-0638 (Jeff Parsons – cell) 315-437-6100 (Jeff Parsons – office) 315-437-6100 (Guy Swenson – office)

Figures

FIGURE 1



This document was developed in color. Reproduction in B/W may not represent the data as intended.

ADAPTED FROM: ROCHESTER WEST USGS QUADRANGLE

ITT CORPORATION
FORMER ITT ROCHESTER FORM MACHINE FACILITY
TOWN OF GATES, NY
SITE #8-28-112

SITE LOCATION MAP

0 1,000 2,000 4,000 6,000 8,000

Feet

1:24,000

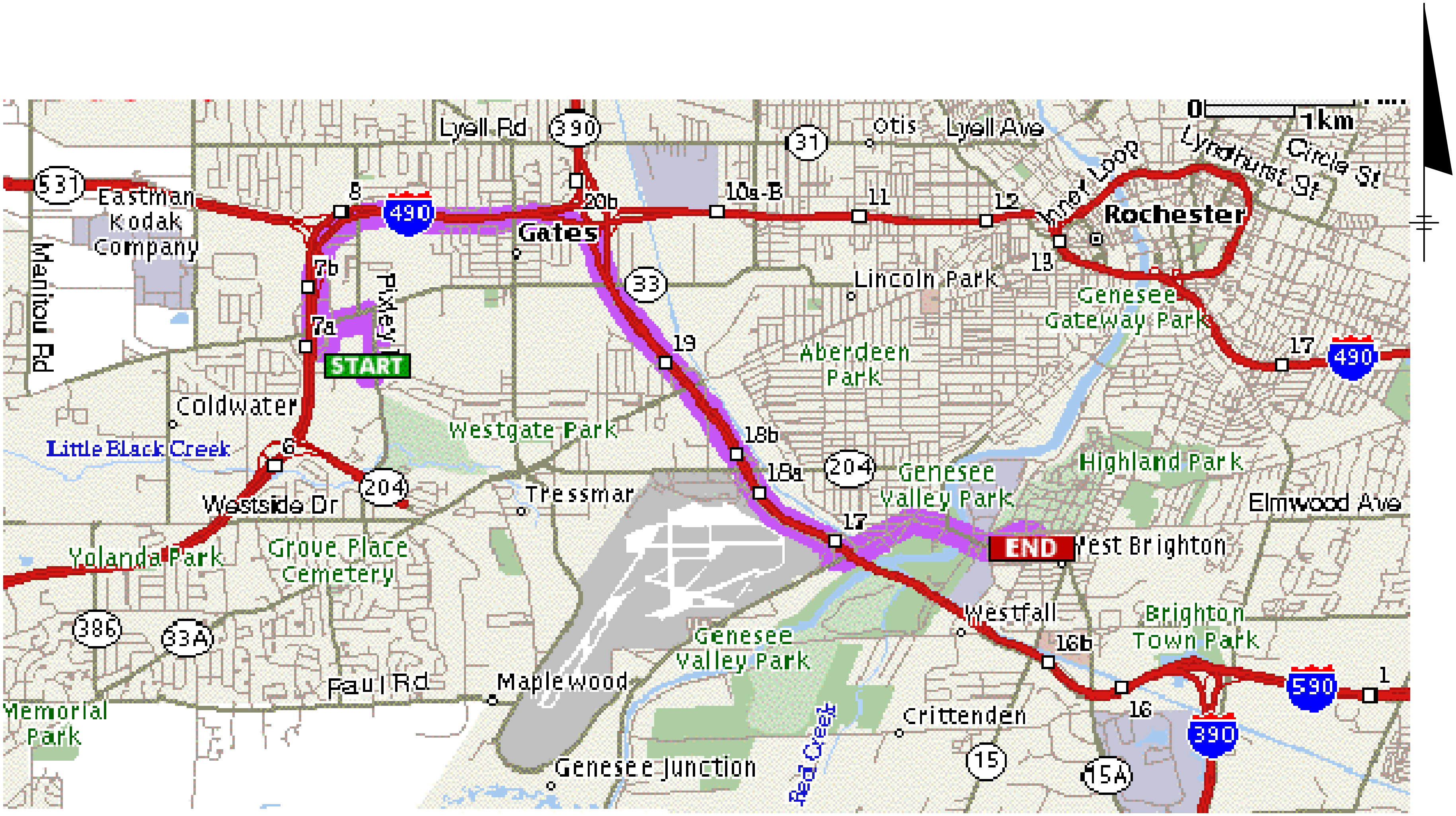
3356/35273
JANUARY 2007

O'BRIEN & GERE ENGINEERS, INC.

PLOT DATE: 2/1/07

PATH: I:\DIV71\PROJECTS\3356\35273\DWG\015.DWG SF:1

FIGURE 2



ITT CORPORATION
TOWN OF GATES, NEW YORK
SITE #8-28-112

HOSPITAL EVACUATION ROUTE MAP

FILE NO. 3356.35273.015
FEBRUARY 2007

O'BRIEN & GERE
ENGINEERS INC.

Exhibits

Exhibit 1

Subcontractor Occupational Safety and Health Certification

Health and Safety Plan
ITT Corporation
Town of Gates, NY

EXHIBIT 1

SUBCONTRACTOR OCCUPATIONAL SAFETY AND HEALTH CERTIFICATION

PROJECT: ____

SUBCONTRACTOR: ____

1. Contractor certifies that the following personnel to be employed during the Site Investigation (ITT and AMSF) have met the following requirements of the OSHA Hazardous Waste Operations Standard (29 CFR 1910.120) and other applicable OSHA standards, as required by O'Brien & Gere Engineers, Inc.

Subcontractor Personnel	Training	Respirator Certification	Medical Exam

2. Subcontractor certifies that it has received a copy of the Site Safety and Health Plan and will ensure that its employees are informed and will comply with its requirements.

3. Subcontractor further certifies that it has read and understands and will comply with all provisions of its contractual agreement.

Table 1. ***Potential Site Compounds and Associated Exposure Information.***

Contaminants	OSHA PEL	ACGIH TLV	Characteristics	Route of Exposure	Symptoms of Overexposure *	Target Organs
1,1-Dichloroethane	100 ppm	100 ppm	colorless, oily liquid	inhalation, ingestion, contact	1, 2, 3, 4	skin, liver, kidneys, lungs, central nervous system
Hydrogen Sulfide	10 ppm	10 ppm	Colorless gas, rotten egg odor	inhalation, contact	1, 2, 3, 4	eyes, respiratory system, central nervous system
Hexane	50 ppm	50 ppm	Colorless liquid with gasoline like odor	inhalation, ingestion, contact	1, 2, 3, 4, 6	eyes, skin, repiratory system, central nervous system, peripheral nervous system

NOTES:
PEL – Permissible exposure limits (OSHA) – 8 hour exposure
PELs were obtained from 29 CFR 1910 Subpart Z Tables Z-1 and Z-2 (last revised June 30, 1993), except for benzene which was obtained from 29 CFR 1910.1028.
TLV – Threshold limit value (ACGIH) – 8 hour exposure
TLVs were obtained from the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances and Physical Agents (2003)

Symptoms of Overexposure:
*Symptoms may include any or all listed depending upon concentration, duration and route of exposure
1) Eye, nose, throat, skin irritation or burns
2) Headache, fatigue, nausea
3) Lightheaded, some nausea, dull visual and audio response
4) CNS disorder, convulsions, sweating
5) CVS disorder
6) Potential or known carcinogens

Table 4. ***Air Monitoring***

Task	Environmental Monitoring for Personal Protection
Thermal Oxidation	Explosive gases meter
Air Sampling	Explosive gases meter and DusTrac

Note: Monitoring results will be recorded in a field log book or be electronically logged. Explosive gases meter will monitor lower explosive limit, oxygen, volatile organic compounds, and hydrogen sulfide.

Table 3. Action Levels

Hazard	Action Level	Level of personal protection
Volatile Organic Compounds (VOCs)	≥ 5 ppm over 15 minute average	1. Personnel must evacuate the work area to an upwind location. 2. Support Person in fire resistant Level B PPE will provide assistance to any site personnel who require it while evacuating the work area. 3. Support Persons in fire resistant Level B PPE will attempt to stop the natural gas release using existing controls. 4. Support Persons in fire resistant Level B PPE may assist the Site Safety Office by performing additional air monitoring along the perimeter of the Exclusion Zone to verify that the Exclusion Zone is sufficient to protect public safety. 5. Health and Safety Coordinator will adjust the Exclusion Zone perimeter as necessary for public safety. 6. Health and Safety Coordinator to notify ITT representative and other notifications as required in the 2004 RI/FS Work Plan HASP.
Lower Explosive Limit (LEL)	≥ 3%	
Oxygen	≤ 19.5%	
H_2S (hydrogen sulfide)	≥ 10 ppm over 15 minute average	

NOTE – Full Face respirators with qualitative fit testing are limited to a protection factor (PF) of 10 per 29CFR1910.134. Full face respirators with quantitative fit testing may be assigned the full OSHA PF of 50.

APPENDIX 3
COST ESTIMATE

ITT Corporation
Former RFM Facility
Town of Gates, New York
Feasibility Study

Table 7-4: Alternative 2; Institutional Controls/Limited Soil Excavation/Containment/Natural Attenuation/Groundwater Monitoring

	QTY	UNIT	UNIT COST	TOTAL COST (rounded)	Notes/Assumptions
DIRECT CAPITAL CONSTRUCTION COSTS					
Mobilization	1	ea	$6,500	$6,500	Job site trailer, tools equipment and materials
General Conditions	2	wk	$8,500	$17,000	Trailer, electrical and maintenance
Surveys and Permits	32	hr	$150	$4,800	
Institutional Controls					
Develop site management plan	1	LS	$25,000	$25,000	
Abandon Existing Stormwater Injection Well					
Abandon Well in accordance with CP-43	1	LS	$25,000	$25,000	Recharge well W-1 ; 137 ft deep and 6 inch diameter
Excavation of surface soils					
Excavation of impacted soil	14	cy	$35	$500	assume maximum cut = 1-ft
Impacted soil - transportation and disposal	18	ton	$80	$1,500	Assumes non-haz disposal; 1.3 tons per cy
Restoration	14	cy	$32	$400	suitable backfill to grade; topsoil and seed
Pavement Repair					
Excavation for pavement restoration	2	cy	$35	$70	removal to 6-inches
Impacted soil - transportation and disposal	3	ton	$80	$200	Assumes non-haz disposal; 1.3 tons per cy
Place asphalt repair	100	sf	$10.00	$1,000	stone subgrade and asphalt course; total 6-inches
TOTAL DIRECT CAPITAL COST				**$82,000**	
Engineering/Design/Field Oversight			10%	8,200	
Legal			2%	1,600	
Contingency			15%	12,300	
TOTAL ALTERNATIVE CAPITAL COST (rounded)				**$104,100**	

ITT Corporation
Former RFM Facility
Town of Gates, New York
Feasibility Study

Table 7-4: Alternative 2; Institutional Controls/Limited Soil Excavation/Containment/Natural Attenuation/Groundwater Monitoring

	QTY	UNIT	UNIT COST	TOTAL COST	Notes/Assumptions
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1-30)					
Natural Attenuation Monitoring (on-site and off-site) and Institutional Controls					
Groundwater Sampling and Analysis	20	ea	$1,700	$34,000	Annual; VOCs + TICS; Water level measurement; IDW disposal
Groundwater Reporting	1	LS	$10,000	$10,000	Annual; Validation and Reporting
Investigation Derived Waste	1	LS	$2,000	$2,000	Based on T& D of 8 drums of non-hazardous waste
Cover system maintenance					
Mowing	40	wk	$100	$4,000	
Pavement Repair	1	ea	$1,200	$1,000	
Vegetation Repair	1	ea	$1,200	$1,000	assumed 1 cy topsoil and seed repair per year
Site Inspection					
Annual Site Inspection	1	ea	$1,500	$1,500	2 persons, 2 days
Periodic Costs (Years 5, 10, 15, 20, 25, 30)					
Asphalt sealing	50,000	sf	$0.25	$12,500	assumes complete paved area sealing
5-yr reviews	1	ea	$5,000	$5,000	

PRESENT WORTH ANALYSIS (YEARS 1-30)

Cost Type	**Cost**	**Avg. Discount Factor (7%)**	**Present Value**
Capital Cost - Year 0	$104,100	1.000	$104,100
Annual O&M - Years 1-30	$53,500	0.4136	$664,000
Periodic Costs - Years 5, 10, 15, 20, 25, 30	$17,500	0.3596	$38,000
TOTAL PROJECT PRESENT WORTH (rounded)			**$ 806,000**

Note: CP-43 is NYSDEC Policy CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009