Site Characterization/ Remedial Investigation Work Plan

Tank 75 Site
4545 River Road
Tonawanda, New York
NYSDEC State Superfund Program
Site No. 915008B

Prepared For:

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Certification

I, Colin Wasteneys, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Site Characterization/ Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Respectfully submitted,

Colin Wasteneys, P.G. — October 11, 2023
Date

October 2023

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1. Introduction

This Site Characterization/Remedial Investigation Work Plan (SC/RIWP) has been prepared by AECOM Technical Services, Inc. (AECOM) on behalf of Ashland Inc. for the Tank 75 Site located at 4625 River Road, Tonawanda, New York (Site) (Figure 1-1).

The site is being managed under a Consent Order within the New York State Department of Environmental Conservation (NYSDEC) State Superfund Program (Site No. 915008B, Index No. R9-20190829-112), dated May 4, 2022. AECOM has developed this SC/RIWP for the proposed investigations at the Site to meet the requirements of Title 6 NYCRR Parts 375-1.6, -1.8 and 375-3.6, -3.8. This SC/RIWP has been prepared in accordance with NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC, 2010).

This SC/RIWP presents the project objectives, provides background information regarding historical Site use and current conditions, summarizes the results of previous investigations, and details the strategies and methodologies that will be implemented during the investigation. The following documents have been developed which support the procedures and protocols outlined in this SC/RIWP:

- The Quality Assurance Project Plan (QAPP) specifies the quality assurance/quality control procedures that will be implemented during the fieldwork and in the laboratory which performs the chemical analyses of the samples collected during the RI.
- A site-specific Health and Safety Plan (HASP) has been prepared to outline procedures that will be undertaken to protect Site workers and visitors, and the public in the areas adjacent to the Site, from potential hazards that may exist as a result of the fieldwork performed at the Site.

A Citizen Participation Plan (CPP) has been prepared as a separate document to provide information regarding community outreach activities for the Site. The CPP was submitted to the NYSDEC on August 10, 2022.

1.1 Project Objectives

Project objectives include:

- Conduct a Site survey and mark out the property lines, which will then be used in the determination of final Site investigation locations;
- Given the proximity to the adjacent Formerly Utilized Sites Remedial Action Program (FUSRAP) Seaway Landfill and former Ashland 1 Sites; perform radiological screening for potentially elevated gamma radiation levels during Tank 75 field investigation activities;
- Evaluate the nature and extent of potential soil impacts surrounding Tank 75 from past Site operations, including surface and subsurface soil sampling (i.e., volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs], metals, polychlorinated biphenyls [PCBs], pesticides and the emerging contaminants 1,4-dioxane and per-and polyfluoroalkyl substances [PFAS]);
- Determine if the Tank 75 contents have impacted soils beneath the gunite liner;
- Conduct chemical and physical characterization of the contents of Tank 75, including both the water and sludges. Quantify both the volume and nature of each phase of material, which will then be utilized in the determination of treatment and disposal options;
- Collect representative sediment/sludge samples from the structure to support design and implementation of possible future remedial actions;
- Review past treatability testing and evaluate the need for additional treatability tests to evaluate waste treatment technologies as part of an analysis of alternatives evaluation;

- Evaluate remedial alternatives according to the applicable program requirements. Propose remedial alternative for discussion that is protective of human health and environment based on data, technical feasibility, and cost.
- Evaluate the areal and vertical extent of contamination, including transport mechanisms to allow for fulfillment of DER-10 Appendix 3B Qualitative Human Health Exposure Assessment;
- Evaluate qualitatively the actual and potential exposures associated with site-related contaminants on and off-site
- Assess potential or actual threats to public health and the environment, including potential or complete exposure pathways for human health and fish and wildlife resources per DER-10.

To accomplish these objectives, the field subtasks described in this SC/RIWP will be utilized. Additional methodology information is provided in the QAPP.

1.2 Work Plan Organization

Following this introduction, the remainder of this SC/RIWP provides additional Site information and describes the proposed RI activities, as follows:

- Section 2 – provides a description of the Site, summary information regarding Site ownership and operational history, and the results of the previous investigation work performed at the Site.
- Section 3 – presents the objectives for the SC/RI followed by a description of the specific tasks that will be undertaken to gather sufficient information to meet the project objectives.
- Section 4 – describes the details of Radiological Screening Surveys that will be used to determine if there is elevated gamma radiation levels within the SC/RI work area boundaries.
- Section 5 – describes the details of the groundwater investigation activities that will be undertaken to meet the project objectives.
- Section 6 – describes the details of the soil investigation activities that will be undertaken to meet the project objectives.
- Section 7 – describes the details of the surface water and sediment/sludge investigation that will be undertaken to meet the project objectives.
- Section 8 – describes soil vapor intrusion studies and their applicability to meet the project objectives.
- Section 9 – details decontamination procedures for the RI and discusses how investigation derived waste will be handled.
- Section 10 – lists site-specific information in regard to the community air monitoring program (CAMP) that will be put in place during intrusive activities.
- Section 11 – describes the methodology for keeping records and field documentation during this RI.
- Section 12 – describes the companion documents that are included as appendices to this SC/RIWP, including the QAPP and HASP
- Section 13 – describes community participation activities in relation to the Site.
- Section 14 – presents the approximate project schedule, with key milestones.
- Section 15 – provides a list of the references cited in this SC/RIWP.

Appendices to this SC/RIWP include the following:

- Appendix A – Previous investigation soil and groundwater sample results and field data forms.
- Appendix B – DER-10 Fish and Wildlife Resources Impact Analysis Decision Key.

- Appendix C – Emerging Contaminant Sampling Supporting Documents.
- Appendix D –Standard Forms and Operating Procedures.
- Appendix E – NYSDOH Generic CAMP.
- Appendix F – Site-specific QAPP; and
- Appendix G – Site specific HASP.

2. Site Description and History

This section presents a description of the Site, summary information regarding Site ownership and operational history, and summarizes the results of previous investigations.

2.1 Site Description

Tank 75, located at 4625 River Road, Tonawanda, New York, is an in-ground petroleum storage structure owned by Ashland Inc. (Ashland) (Figure 2-1 – Site Plan). Tank 75 was constructed during World War II (WWII) for the storage of fuel oil. Because steel was scarce during WWII, the structure was constructed as a gunite-lined in-ground storage structure. The gunite liner is approximately 3 to 4 inches thick and is reinforced with steel mesh. At the ground surface, the structure measures approximately 200 feet wide by 300 feet long with sides that slope inward to a flat bottom approximately 26 feet below surrounding grade. Tank 75 was formerly equipped with two pumps, one for unloading oil and the second for removing accumulated rainfall. Steam coils (disconnected) are located on the bottom of the structure that were used to heat the fuel oil during cold weather. In addition to fuel oil, off-specification asphalt, other tank bottoms, soils, piping, and refinery sludge are believed to have been placed in Tank 75.

2.1.1 Adjacent Properties

Tank 75 is situated in the western portion of an approximate 20-acre parcel owned by Ashland. However, it currently sits within the perimeter fence of the United Refining terminal facility. The surrounding area is predominantly industrial. Adjacent properties include the FUSRAP Seaway Industrial Landfill site (to the north and east), Tonawanda Terminals Company (to the north-northwest), and United Refining petroleum terminal (to the west and south) (Figure 2-2 – Tax Parcels).

2.2 Site History

From 1933 to 1950, the property was owned and operated by Frontier Oil Refining Corporation (Frontier Oil). In 1950, Ashland acquired the refinery, including Tank 75, through its acquisition of Frontier Oil. Tank 75 was taken out of service in 1980. The refinery itself discontinued production in July 1982; however, the facility was then operated as a petroleum terminal and active petroleum tanks have remained in service. In 1992, the United Refining Company acquired the refinery/terminal facility from Ashland; however, Ashland retained the Tank 75 property.

From 1980 to 1985, the only activity involving Tank 75 was to pump out accumulated rainfall in the structure using one of the two pumps discussed above. The rainwater, or supernatant water, was pumped to the refinery's oily water sewer system. The sewer system discharges to the Tonawanda publicly owned treatment works (POTW). In 1985, approximately 120,000 barrels (bbl.) (approximately 5.04 million gallons [gal]) of floating No. 6 fuel oil was recovered and sent by barge to a reprocessor in Louisiana. During the summers of 1992 and 1993, approximately 34,000 bbl. (1,428,000 gal) of top oily layer was transported by tanker trucks to Ashland's Catlettsburg, Kentucky refining complex for reprocessing. Accumulated rainfall has occasionally been pumped to the facility's oil water separator to manage water levels.

Tank 75 is listed on the New York State Registry of Inactive Hazardous Waste Disposal Sites as Site # 915008B, Class 3 (does not represent a significant threat to the environment or to health). Because Tank 75 was taken out of service in 1980, wastes were not placed in the structure after the effective date of relevant RCRA regulations. The structure contents include both listed and characteristic hazardous wastes. Listed hazardous wastes consist of refinery wastes K049, K050, and K052. Contents also meet the criteria for the ignitability characteristic (D001), with a flash point less than 140˚F. Contaminants associated with these refinery wastes include petroleum related VOCs, SVOCs, and metals.

2.3 Previous Investigation Work

Environmental investigations at Tank 75 have been conducted since its termination of service since 1980. These investigations have included groundwater monitoring well installation and sampling and structure content characterization including the sludge, supernatant water, and top oily layer. A summary of these investigations is presented below. Locations are shown in Figure 2-3. Historical Boring Logs and a summary of the results from groundwater sampling data (1997, 1998, 2005 and 2018 in tabular format from their respective reports) are included in Appendix A.

2.3.1 1986 to 1987 Groundwater Monitoring Well Installation

From September 16 through September 18, 1986, Earth Dimensions, Inc. installed six groundwater monitoring wells at the site. Wells MW2S-86 and MW2D-86 were installed on the northwest side of the structure and are currently known as MW-2S and MW-2D. MW3-86, currently known as MW-3, was installed on the southwest side of the structure. MW-1/MW5-86, currently known as MW-5, was installed in the southeast portion of the Ashland property to serve as the upgradient well. MW4S-86 and MW4D-86 were installed on the northeast portion of the structure and are currently known as MW-4S and MW-4D.

Boring logs for borings 2-86 and 3-86 (Appendix A), located on the northwest and southwest sides of Tank 75, respectively, both indicate evidence of petroleum impacts in shallow fill. The boring log for 2-86 indicates black oily liquid was observed in fill from 0 to 0.5 feet below ground surface (bgs). The boring log for 3-86 indicates black oily liquid was observed in fill from 0 to 3.0 feet bgs. It is not known if the observed petroleum impacts are a result of the contents of Tank 75 or of historical general oil refinery operations.

Earth Dimensions, Inc. installed three additional monitoring wells in March 1987. These wells, 2-87 (MW2), 3-87 (MW3), and 4-87 (MW4), were all located in the northern portion of the Ashland refinery property at distances ranging from 2,000 to 2,700 feet northwest of Tank 75.

2.3.2 Annual Groundwater Monitoring from 1993 through 1998

From 1993 through 1998, annual groundwater sampling events were conducted. For each sampling event, groundwater samples were collected from monitoring wells MW-2S, MW-2D, MW-3, MW-4S, MW-4D, and MW-5 and analyzed for VOCs using United States Environmental Protection Agency (USEPA) Method 8240 or 8260, SVOCs using USEPA Method 8270, and metals using USEPA Method 6020 inductively coupled plasma (ICP) gas chromatography/mass spectrometry (GC/MS).

2.3.2.1 1993/1994

The 1993 annual sampling event was conducted on September 14 and 15, 1993. Results indicated that lead in one well was the only metal to exceed its Groundwater Standard. No VOCs or SVOCs were detected.

The 1994 annual sampling event was conducted on September 30, 1994. The analytical results indicated that iron was the only metal to exceed its Groundwater Standard. Phenol was also detected in one well above its Groundwater Standard. However, the well was resampled on January 24, 1995, and the result for phenol was below the method detection limit (MDL).

2.3.2.2 1995/1996

The 1995 sampling event was conducted on August 23, 1995. Only iron exceeded its Groundwater Standard in several of the site wells. No VOCs or SVOCs were detected.

The 1996 sampling event was conducted on August 27, 1996. Only cadmium exceeded its Groundwater Standard in one site well. No VOCs or SVOCs were detected.

2.3.2.3 1997/1998

The 1997 annual groundwater sampling event was conducted on August 19, 1997. Methylene chloride, the only VOC, was detected in one well above screening criteria. Three metals, cadmium, lead, and

manganese exceeded their respective Groundwater Standards in at least one site well. As for SVOCs, sulfolane was detected in one well, MW-4S, just above the MDL. Sulfolane, an extraction solvent used at the Catlettsburg, KY refinery, was never used at the Buffalo refinery. MW-4S was resampled and sulfolane was not detected. The initial detection was most likely caused by cross-contamination in the Ashland laboratory. There is no Groundwater Standard for sulfolane. No other SVOCs were detected in the site groundwater monitoring wells.

The 1998 annual groundwater sampling event was conducted on July 17, 1998. Analytical results indicated that VOCs were all non-detected and no metals were detected above their respective Groundwater Standards. Only one SVOC, sulfolane, was detected in MW-4S. The source of sulfolane is most likely an artifact from the Ashland laboratory (see discussion above for 1997 groundwater sampling results).

2.3.3 2005 Groundwater Monitoring Well Installation and Sampling Event

The site wells installed in 1986 are primarily screened in the deeper portion of the perched aquifer to intersect the elevation of the bottom of the structure. To determine if a floating layer of free product was present, URS Corporation (URS) installed four shallow groundwater monitoring wells at the site in September 2005: MW05-01, MW05-02, MW05-03, and MW05-04. Boring logs for three of these wells (Appendix A), MW05-01, MW05-03, and MW05-04, indicate observations of petroleum impacted soil at depths ranging from surface to 8 feet bgs. The boring log for MW05-01 indicates a slight gasoline odor observed in soil from 4 to 6 feet bgs. It is not known if the observed petroleum impacts are a result of the contents of Tank 75 or of historical general oil refinery operations.

On September 13, 2005, groundwater samples were collected from existing monitoring wells MW-2S, MW-2D, MW-3, MW-4S, MW-4D, and newly installed wells MW05-01, MW05-02, and MW05-04. Two site wells were not sampled: MW05-03, because it was dry and MW-5, because this background well is located in the southeastern portion of the Ashland property, not in proximity to Tank 75. The groundwater samples were analyzed for VOCs (USEPA Method 8260B), SVOCs (USEPA Method 8270C), and Target Analyte List (TAL) Metals (USEPA Method 6010B/7470A).

Two VOCs were detected, carbon disulfide and cis-1,2-dichloroethene. Carbon disulfide was detected in three wells. The second VOC, cis-1,2-dichloroethene, was detected in MW05-02. However, the concentration did not exceed its Groundwater Standard.

Two SVOCs, phenol and pentachlorophenol, were detected in one well each. Both exceeded their Groundwater Standard of 1 microgram per liter (ug/L). Pentachlorophenol has not been detected in the site groundwater during previous sampling events. Phenol was detected in one well in 1994; however, the well was resampled, and the result was below the MDL. Both SVOCs are manufactured and are not associated with refining operations. Thus, there appears to be no connection between these two SVOC detections and the contents of Tank 75.

Five metals were detected above their respective Groundwater Standards in at least one monitoring well: cadmium, iron, manganese, sodium, and nickel.

2.3.4 2018 Groundwater Sampling

The 2018 groundwater sampling event was conducted from January 29 to February 2, 2018. Metals detected during the 2018 sampling event at concentrations exceeding NYSDEC groundwater standards (iron, magnesium, manganese, and sodium) are all naturally occurring groundwater constituents, and concentrations detected in the Site wells have not changed significantly since the 2005 sampling event.

VOCs were detected at very low levels (generally around 1 µg/L or less) in only three Site wells. Detected VOCs were three chlorinated solvents (1,1-DCA, cis-1,2-DCE, and vinyl chloride), benzene, and acetone. Of these, only benzene, detected at 0.15 µg/L in well MW05-04, could be considered to be associated

with typical refinery sludge wastes. Only vinyl chloride, detected in well MW05-02 at a concentration of 3.2 µg/L, was detected at a concentration exceeding the NYSDEC groundwater standard of 2.0 µg/L.

Groundwater sample analytical results from January-February 2018 generally confirm historical data that indicate that petroleum refining wastes contained in Tank 75 are not impacting surrounding groundwater quality. A letter report presenting the 2018 groundwater sampling results was submitted in March 2018 (AECOM, 2018). A figure showing groundwater elevations measured during the 2018 sampling event are shown on Figure 2-4.

2.3.5 Tank 75 Contents Characterization

The contents of Tank 75 have been sampled for laboratory analysis to determine if the contents can be reprocessed or to evaluate disposal options. Past investigations have determined that the contents consisted of four layers: pumpable sludge, non-pumpable sludge, a top oily layer (no longer present), and a water layer. This section summarizes the characterization activities.

2.3.5.1 Sludge Characterization

On November 10, 1989, a sample of material from Tank 75 was submitted to the Ashland Environmental Support Group and Kemron laboratories for characterization. For total metals, arsenic, chromium, and cadmium were detected. For Extraction Procedure (EP) Toxicity, only barium was detected. The material passed the paint filter test and the flashpoint exceeded 230°F. The analytical results for sludge characterization samples are presented in Appendix A.

In 1990, a physical sampling program was undertaken to determine the inventory and physical characteristics of the materials in the structure. The sampling program identified four specific layers. From ground surface to the bottom of the structure, the four layers consisted of:

- A top oily layer from 10 to 30 inches in thickness (estimated as 550,000 gallons).
- A water layer varying from 9 to 18 feet in thickness (estimated as 4,289,000 gallons).
- A pumpable sludge layer from 1 to 5 feet thick (estimated as 500,000+ gallons) consisting of water, oil, and solids.
- A bottom layer of non-pumpable sludge ranging in thickness from 2 to 3 feet (estimated as 4,000 cubic yards).

On March 2, 1990, two samples were collected from Tank 75: top oil and hard bottom sludge. The samples were submitted to Buffalo Testing Laboratories Inc. for analysis. Results indicated that for the top oil, the flash point exceeded 294°F and contained 18.8% water distillates. For the hard bottom sludge, the flash point exceeded 212°F, and for EP Toxicity, only lead was detected. The result for lead of 1.5 ppm was below the EP toxicity criteria of 5.0 mg/L.

On June 18, 1998, two sludge samples were collected and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) SVOCs (USEPA Method 8270), TCLP VOCs (USEPA Method 8260A), TCLP metals, total metals, pH, ignitability, reactive cyanide, and reactive sulfide.

For further characterization purposes, an additional sample of sludge was collected on October 1, 1999, for laboratory analysis. The sample was analyzed for VOCs and metals to determine if the sludge met the definition of a hazardous waste. Benzene exceeded the land disposal restriction (LDR) standards for K049, K050, and K052.

Weavertown Environmental Group conducted bench scale separation and solidification testing on samples of sludge collected on May 26, 2005. Results indicated that filter pressing was not a viable option and was not recommended for achieving sludge volume reduction. Centrifuging and solidification were both found to be viable technologies, although with limitations due to cost. These results were discussed in a draft Remedial Work Plan that was never submitted or acted upon.

On May 26, 2005, four samples of treated sludge from the bench testing were analyzed for TCLP VOCs (USEPA Method 8260B), TCLP SVOCs (USEPA Method 8270C), TCLP pesticides and PCBs (USEPA

Method 8081A/8082), TCLP metals, and general chemistry. The results of the analyses were used to determine if the treated sludge, a K-listed RCRA waste, met LDRs, thereby allowing disposal in a hazardous waste landfill in place of incineration, a more costly disposal method. None of the standards for K049, K050, or K052 were exceeded.

As stated above, the bench scale testing also included centrifuging. To determine the appropriate method of disposal for the centrifuged solidified sludge, a sample was submitted for laboratory analysis on September 6, 2005. Analyses included TCLP VOCs and VOCs (USEPA Method 8260B), TCLP SVOCS and SVOCs, (USEPA Method 8270C), TCLP metals and metals (USEPA Method 6010B), and general chemistry. Because matrix interference prevented the laboratory from reaching quantification limits less that LDR treatment standards for many SVOCs, a sample was submitted to Meta Environmental, Inc. (Meta) on January 13, 2006, for further analysis. To achieve the required quantification limits, the sample was analyzed as a non-aqueous phase liquid by modified USEPA Method 8270 with selective ion monitoring. Five SVOCs from the centrifuged solidified sludge sample exceeded LDR universal treatment standards (UTSs).

2.3.5.2 Top Oily Layer Characterization

On October 1, 1992, a sample of top oil was submitted to the Ashland Environmental Support Group to determine if the material could be reprocessed in one of the Ashland refineries. The sample was analyzed for VOCs using USEPA Methods 8240 Mod and TCLP Extract, SVOCs using USEPA Methods 8270 and TCLP Extract, wax and asphalt fractions, high temperature Sim-D, and basic sediment and water. Results indicated that this material could be reprocessed. Therefore, during the summers of 1992 and 1993, approximately 34,000 bbl. (1,428,000 gallons) of this top oily layer was transported by tanker trucks to Ashland's Catlettsburg, Kentucky refining complex for reprocessing.

2.3.5.3 Supernatant Water Sampling and Analysis

In March 1990, wastewater type testing was conducted on a sample of the supernatant water pumped from the structure for laboratory analysis. The results resemble a weak domestic sewage. Based on the results, the supernatant water contents were acceptable for processing at the Tonawanda POTW. No past problems had been identified by the POTW.

During 2000, Ashland worked with United Refining to pump out nearly all of the water from Tank 75 to allow various companies to observe the structure and collect samples to prepare closure proposals. Ashland had previously thought that the material piled in the southeast corner of the structure was asphaltic in nature. Upon closer inspection and analysis, the southeast corner was determined to consist of a mixture of dirt and heavy molecular weight petroleum material. Since this material could not effectively be recycled, approximately 523 tons of the material was removed and transported to the Waste Management facility in Model City, NY, for treatment and disposal.

2.4 Consent Order

On May 4, 2022, NYSDEC and Ashland Inc. entered into an Order on Consent and Administrative Settlement (Index No. R9-20190829-112) for the Ashland Tank 75 Site (DEC Site No. 915008B). This SC/RIWP has been prepared to propose additional investigation activities to evaluate the possible presence and current state of contaminants within, around, and beneath Tank 75. This SC/RIWP includes gamma radiation surveys and collection of soil, groundwater, surface water, and sediment samples to be analyzed for VOCs, SVOCs, PCBs, pesticides, and metals across the Site. Soil vapor screening data does not currently exist for the Site; however, there are no occupied buildings within the property boundary or close to the Site. AECOM will further evaluate the possible need for an SVI study following review of the results of VOCs/SVOCs sampling proposed in this SC/RIWP.

2.5 Site Physical Characteristics

Information obtained during the previous investigations performed at the Site pertaining to topography, geology, and hydrogeology is summarized in the following sections.

2.5.1 Site Topography and Drainage

The Site is located in the Erie-Ontario Lowlands Physiographic Province. Topographical features in the lowlands were formed by glacial lakes formed during the last ice age as the continental ice sheet advanced and retreated over the area. Characteristic glacial lake deposits were left behind such as sand, silt, clay, and other ancient shoreline deposits. The U.S. Department of Agriculture's Soil Conservation Service (USDA, 2022) has limited data for the Site, designating Tank 75 and the surrounding area as Urban Land; however, the most common nearby soils include Cayuga silt loam with 3 to 8 percent slopes.

Topography at the Site is generally level, approximately 590 - 600 ft above mean sea level. Groundwater flow is generally north to the Niagara River which lies approximately 0.5 miles to the northwest.

2.5.2 Site Geology

The Site in the immediate vicinity of Tank 75 is underlain by brown to black clayey silt fill material to depths of up to 8 feet bgs. Historical boring logs indicate evidence of some petroleum impacts including black oily liquid and petroleum odors. Fill material is predominately underlain by reddish brown and gray varved glaciolacustrine silty clay and clayey silt. These deposits are known to be at least 40 feet thick and test borings indicate that the glaciolacustrine deposits contain desiccation cracks to depths of approximately 25 feet below ground surface. These desiccation cracks permit vertical groundwater recharge and may also provide the principal conduits for horizontal groundwater flow in this interval. The natural glaciolacustrine deposits have been disturbed and reworked by man to depths ranging between 0.3 to 7.0 feet (Earth Dimensions, Inc., 1990).

2.5.3 Site Hydrogeology

The site is underlain by 25 to 55 feet of Glacial Lacustrine clay with a hydraulic conductivity of approximately 1.6×10^{-8} centimeters per second (cm/sec). In the vicinity of Tank 75, the depth to groundwater ranges between 1.7 and 5.5 feet below ground surface and averages approximately 4.5 feet. This shallow groundwater is believed to represent a perched system that is intermittent and is associated with precipitation events. A shallow semi-confined hydrogeologic system has also been identified in the vicinity of Tank 75. The shallow semi-confined zone consists of sand lenses associated with glaciolacustrine deposits. The sand lenses can occur at depths of approximately 16 to 40 feet below ground surface and are considered to be semi-confined because of surrounding lower hydraulic conductivity material which allows the hydraulic head within the lenses to rise above the tops of the lenses.

Maximum horizontal groundwater velocities are estimated to be approximately 2.0×10^{-8} cm/sec. This value is based upon a maximum horizontal hydraulic gradient of 0.005, estimated horizontal hydraulic conductivity of 1.0×10^{-6} cm/sec (ten times vertical hydraulic conductivity) and a porosity of 25% for the silty clay glaciolacustrine deposits. This estimated value translates to a groundwater velocity on the order of 0.02 feet per year.

The estimated value of vertical groundwater flow is also fairly low. Using the vertical hydraulic gradient (0.115) measured between monitoring wells MW-2S and MW-2D, the maximum vertical hydraulic conductivity value (2.0×10^{-7} cm/s) based on falling head permeability test and same porosity value (25%), the vertical groundwater velocity is estimated at 1.0×10^{-7} cm/s. This estimated value translates to a vertical groundwater velocity of 0.10 feet per year (Earth Dimensions, Inc., 1990).

3. Remedial Investigation Objectives and Preparatory Field Activities

3.1 RI Objectives

Project objectives include:

- Confirm the exact property boundaries for the Site;
- Evaluate the presence of contaminants (i.e., VOCs, SVOCs, PCBs, pesticides, metals, and the emerging contaminants 1,4-dioxane, and PFAS) both within and around Tank 75;
- Evaluate the nature and extent of petroleum impacts observed in historical soil borings completed in the vicinity of Tank 75;
- Evaluate the presence of residual radioactive contamination in the surface and subsurface soils, sludges, and sediments using radiation surveys in the form of gamma walkover surveys (GWS);
- Evaluate the areal and vertical extent of contamination, including transport mechanisms;
- Evaluate actual and potential exposures related to contaminants on and off-site with a Qualitative Exposure Assessment;
- Assess potential or actual threats to public health and the environment, including potential or complete exposure pathways for human health and fish and wildlife resources per DER-10;
- Assess the source(s) of contamination and determine if this source(s) has impacted soils outside the structure; and
- Collect additional data to support the design and implementation of remedial actions.

To accomplish these objectives, the field subtasks described in this SC/RIWP will be utilized. Additional analytical methodology information is provided in the QAPP. Field and reporting activities are planned and will be conducted in general accordance with this SC/RIWP, the QAPP, and the following regulatory documents and standards:

- NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010);
- United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988);
- NYSDEC Division of Water Technical & Operational Guidance Series 1.1.1 Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1) (NYSDEC, 1998);
- NYSDEC 6 NYCRR 703.5(f) Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (NYSDEC, 2004); and
- NYSDEC, 6 NYCRR 375-6.8 Soil Cleanup Objectives (NYSDEC, 2006).

The following activities are proposed to be completed during the SC/RI to fulfill the project objectives and address existing data gaps. The locations of each of the proposed SC/RI sample points are presented in Table 3-1 and in Figure 3-1.

- Prior to other activities, complete a survey of the Site boundaries to confirm the spatial relationship between Site and surrounding parcels, and to better determine boring locations in relation to the property boundaries.

- Complete a gamma walkover survey (GWS) and other screening surveys in order to classify site soils and groundwater for the analysis of alternatives and future investigation-derived waste (IDW) management and disposal and to aid in establishing adequate health and safety protocols for personnel completing the SC/RI fieldwork.
- Complete 10 soil boring locations (SB-01 through SB-10) around the perimeter of Tank 75 for further characterization of soil. Locations will be drilled to just below the bottom depth of the structure (estimated 26 feet bgs). One boring on each side of Tank 75, SB-01, SB-04, SB-06, and SB-09, will be drilled at an angle to attempt to collect soil samples from beneath the bottom of the structure. Collect surface soil and subsurface soil samples at each of the new soil boring locations. Up to three soil samples will be collected from each boring locations and analyzed for VOCs, SVOCs, PCBs, Pesticides, and TAL metals at the Site. Select soil samples will be analyzed for 1,4-dioxane and PFAS.
- Complete eight additional hand auger borings (HA-01 through HA-08) at locations within the Site fence close to the edge of the structure. Collect surface sample and subsurface samples to a target depth of 4 feet bgs. Up to three soil samples will be collected from each hand auger location and analyzed for VOCs, SVOCs, PCBs, Pesticides, and TAL metals at the Site. Select soil samples will be analyzed for 1,4-dioxane and PFAS.
- Complete bathymetric survey of sediment/sludge surface using echo sounding instrumentation deployed using a remotely operated boat.
- Collect three Tank 75 water samples from a location at the center of the structure. Samples will be collected at three evenly distributed depth intervals (i.e., shallow, intermediate, deep) from the water surface to the top of the sludge. Analyze samples for TCL VOCs, SVOCs, PCBs, pesticides, and TAL metals. One surface water sample will also be analyzed for 1,4-dioxane and PFAS.
- Drill using a vibracore sampler at up to 15 locations within Tank 75 in order to characterize the contents of the structure, including thickness and consistency of sludges, presence of softer layers, presence of more solidified sludge. These borings will be used to estimate the volume of sludge, and other different types of material within the structure. Up to 15 sludge samples representative of the different sludge/sediment types will be retained for analysis of TCL VOCs, SVOCs, PCBs, pesticides, total organic carbon (TOC), TAL metals, and waste characterization parameters. The total number of sludge sample submitted for analyses will be discussed with NYSDEC at the time of collection. Five sediment samples will also be analyzed for 1,4-dioxane and PFAS. Laboratory analyses to be performed as part of this RI will be sufficient to determine whether or not the Tank 75 contents meet the Land Disposal Restrictions (LDRs).
- Complete redevelopment of the 9 existing monitoring wells surrounding Tank 75 using standard development methods.
- Collect groundwater levels from all wells to evaluate the direction of groundwater flow.
- Collect groundwater samples from 9 existing monitoring wells containing sufficient water and analyze samples for TCL VOCs, SVOCs, PCBs, pesticides, and TAL metals to address data gaps in groundwater. Select samples will be analyzed for 1,4-dioxane and PFAS.
- Perform aquifer characterization testing on four select monitoring wells to evaluate hydraulic properties in the overburden.
- Evaluate the results from the samplings collected from this SC/RI to investigate the future need for an SVI evaluation in relation to the Site.
- Survey monitoring well, soil boring, and surface water/sediment locations.
- Properly manage and dispose IDW.

3.2 Analytical Program

The laboratory samples for each media and the chemical analyses to be performed, including the quality assurance/quality control (QA/QC) samples are listed in Table 3-2. All samples will be analyzed by a NYSDOH Environmental Laboratory Approval Program (ELAP) certified laboratory.

Where environmental media samples (i.e., soil, groundwater, surface water, and sediment) are analyzed for USEPA Contract Laboratory Program Target Compound List (TCL) VOCs and SVOCs, the full TCL plus the 30 (i.e., 10 VOCs and 20 SVOCs) highest concentration tentatively identified compounds (TICs) will also be reported. References in this RIWP to VOC and SVOCs analyses to be performed are understood to include TICs as described above.

Field and laboratory quality control samples for the investigation will be collected and analyzed to document the accuracy and precision of the samples. The QA/QC samples, summarized in Table 3-2, include trip blanks, field equipment rinse blanks, ambient blanks (for PFAS only), field duplicates, matrix spikes, and matrix spike duplicates. The data quality level for the investigation will be consistent with procedures outlined in the NYSDEC Analytical Services Protocol (ASP) July 2005 methodologies. Full ASP Category B data packages will be prepared by the laboratory for all samples. The data will be reviewed, and a Data Usability Summary Report (DUSR) will be prepared by a qualified chemist. To meet NYSDEC electronic data deliverable (EDD) requirements, subcontract laboratories will be required to submit electronic deliverables in an EQuIS format consistent with AECOM standards. AECOM's database manager will be responsible for verifying that the file submitted meets these specifications including verifying that current NYSDEC Valid Values were used for sample coding; providing an Excel (or Access) file to the data validator; uploading the validated data into the database; overseeing the uploading of any other data (field data, boring log information, etc.), and submitting a final EQuIS deliverable to NYSDEC that meets NYSDEC EDD requirements.

Additional QA/QC information is provided in the QAPP.

3.3 General Planning and Preparatory Field Activities

3.3.1 Mobilization

Following authorization to proceed with the field investigation from NYSDEC, AECOM and its subcontractors will mobilize necessary materials and equipment to the Site. Because the project involves intrusive work (e.g., soil borings, monitoring well installations), a call will be placed to Underground Facilities Protection Organization (UFPO) by the subcontractor performing the intrusive work. Utility clearance is detailed in Section 3.3.2.

The Site is currently an in-ground storage structure and may contain associated heating coils and pumping equipment. A temporary decontamination pad and drum storage area will be established at a suitable area of the Site. Vehicle access routes to soil boring locations and the Tank 75 boundaries will be determined and cleared and grubbed prior to any field activities.

A project kick-off meeting will be held prior to initiating field work to orient field team members and subcontractors with the Site and to familiarize all Site workers with Site background; potential dangers; health and safety requirements; emergency contingencies; and other field procedures.

It is anticipated that the work will be performed in Level D personal protection with the potential to upgrade to Level C if required. Field workers will be instructed to keep Level C equipment available should it be needed. Should health and safety monitoring during field activities indicate a need to upgrade beyond Level C protection, work will stop and Site conditions will be re-evaluated by NYSDEC and AECOM. An upgrade to Level B protection will require modification of the HASP and review by the AECOM regional safety manager.

3.3.2 Underground Utility Clearance

Prior to commencing any intrusive activities, the drilling subcontractor will contact the UFPO to mark out utilities in proposed investigation areas. AECOM will mark the intended drilling locations with spray paint or flagging and hire an independent utility mark out subcontractor to locate utilities in drilling areas not covered by the UFPO. If necessary, based on utility locations, soil borings and monitoring well locations will be moved in consultation with NYSDEC.

Geophysical surveys will be conducted to obtain information on subsurface conditions or features, in addition to locating utilities or obstructions. It is anticipated that ground-penetrating radar (GPR) will be the method utilized in this investigation. GPR utilizes high frequency radio waves to acquire subsurface information. From a small antenna, which is moved slowly across the ground surface, energy is radiated downward into the subsurface. This energy is then reflected back to the receiving antenna, where variations in the return signal are continuously recorded. This produces a continuous cross-section of the shallow subsurface conditions. Radar responds well to the different electrical properties between rock units, soils, groundwater, and most importantly for this application, buried pipes, utilities, and foundations.

At the start of intrusive fieldwork, clearance of underground utilities will be performed using non-mechanical means. An air knife and vacuum, hand auger, or equivalent will be utilized to advance each boring from the ground surface to approximately 5 ft to prevent disruption of any potential underground utilities. Excavated soil will be containerized in either 55-gallon drums or a roll-off container and staged on-site until disposal.

3.3.3 Community Air Monitoring

Air monitoring will be performed as outlined in the AECOM site-specific HASP, NYSDOH Generic Community Air Monitoring Plan (CAMP), and NYSDEC DER-10 Guidance. AECOM's approach to implementing the Generic CAMP is provided in Section 10.0 of this SC/RIWP.

3.3.4 Site Survey

Before other field activities commence, a survey of the Site boundaries will be completed to confirm the spatial relationship between Site and surrounding parcels. The Site boundary survey will be completed by a NYS-licensed professional land surveyor. The horizontal positions will be tied into the North American Datum 1983 (NAD83) New York State Plane West. The vertical positions will be tied to the North American Vertical Datum 1988 (NAVD88). Any measuring points associated with the existing monitoring wells or other Site reference features will be recorded to a vertical accuracy of 0.01 ft. The final survey will be prepared in a digital computer assisted drafting (CAD) format (i.e., .dwg or .dxf files in the cited coordinate systems). The boundary survey will be used to refine boring locations for the SC/RI and confirm if new planned boring locations and existing wells are within or exterior to the property boundary.

Following (or during, as needed) the field data acquisition phase of work, the locations and elevations of all investigation points (soil borings, monitoring wells, surface water, or sediment samples) will be surveyed. Ground surface elevations will be measured to an accuracy of 0.1 feet and measuring point elevations for existing and new monitoring wells will be recorded to a vertical accuracy of 0.01 feet.

3.3.5 Fish and Wildlife Impact Assessment

The process for performing a fish and wildlife impact assessment (FWIA) is discussed in the NYSDEC document entitled "Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites", dated October 1994 [NYSDEC, 1994]. The NYSDEC requires a FWIA when there is a significant potential for fish and wildlife resources to be present at a Site, and there is a significant potential for the migration of residuals to these resources.

The DER-10 Appendix 3C Fish and Wildlife Resources Impact Analysis Decision Key has been completed as part of this SC/RIWP (see Appendix B). In accordance with DER-10 Appendix 3C,

performance of an FWIA is not planned for this Site. If significant impacts are identified, the need to perform a FWIA will be further discussed with NYSDEC.

3.3.6 Investigation-derived Waste Management

Soil cuttings will be containerized in drums, sampled, characterized, and properly disposed of off-site at a permitted disposal facility. Used disposable sampling equipment and personal protective equipment (PPE) will also be drummed and stored on-site pending proper disposal off-site at a permitted disposal facility. Decontamination and well development water will be containerized in 55-gallon steel drums. Drums of decontamination fluids and IDW will be stored on pallets covered with plastic sheeting in the decontamination area prior to being characterized and properly disposed of off-site at a permitted disposal facility. Soils and PPE exhibiting elevated radioactivity as determined by an on-site health physicist will be segregated and handled as described in Sections 3.3.7 and 9.2 below.

Sludge and water IDW generated from investigation of the Tank 75 contents, including rinse water generated during decontamination of sampling equipment, will be returned to the structure. Materials that may have come into contact with listed hazardous wastes, including used PPE, will be segregated, containerized, and stored separately pending waste characterization and off-site disposal.

Drums containing potentially hazardous waste will be temporarily staged on a pallet on the concrete pad located immediately northeast of Tank 75. The pad will first be covered with minimum 6-mil thick polyethylene plastic sheeting (Visqueen) equipped with 4”x4” lumber to create raised berms on all sides. Drums will be properly labeled with stickers located in the upper third of each drum. Labels will indicate “Hazardous Waste Pending Analysis” and include the Site information, accumulation date, waste characterization (i.e., toxic), and sample date. Any hazardous waste IDW generated during these RI activities will be properly characterized and disposed of at a permitted disposal facility. Hazardous waste will be removed from the site within 90 days of the start of waste accumulation.

The drums and drum storage area will be inspected weekly and waste container inventory will be updated weekly, and inspections will be documented on weekly inspection forms. Following removal of all containers from the accumulation area, the drum storage area will be properly closed in accordance with applicable state and Federal regulations.

3.3.7 Management of Potentially Radioactive Materials

The Site is adjacent to the Seaway Landfill and Ashland 1 Sites which are managed by the U.S. Army Corps of Engineers (USACE) under the Formerly Utilized Sites Remediation Action Program (FUSRAP). As part of the nation’s early atomic weapons program, the former Linde Air Products Division of Union Carbide Corporation processed uranium ore at its facility in Tonawanda, NY as part of a Manhattan Engineer District (MED) contract from 1942 to 1946. Subsequent disposal and relocation of the processing wastes from the Linde property resulted in radiologically impacted soil at three nearby properties in the Town of Tonawanda: the Ashland 1 property; the Seaway property; and the Ashland 2 property. From 1944 to 1946, waste from processing low-grade uranium ore were transported from Linde to the Ashland 1 Site. In 1975 the Ashland Oil Company constructed a drainage ditch and a bermed area for two petroleum product storage tanks on the Ashland 1 Site and soil with residual radioactive contamination was transported to the adjacent Seaway Landfill and Ashland 2 Sites for disposal. The primary radionuclides present in residual contamination at these locations are uranium-238 (U-238), thorium-230 (Th-230), radium-226 (Ra-226), and their decay products. Remediation for the Ashland 1 & 2 Sites was completed in 2003 and 1999 respectively. USACE is currently conducting remedial actions at the adjacent Seaway Industrial Park Site.

Tank 75 Site lies immediately adjacent and to the west of the Ashland 1 Site, a site that was remediated under the FUSRAP program which may contain areas of elevated radioactivity, and immediately adjacent and south of the Seaway Landfill, where some radioactive material from Ashland 1 was deposited. There is the potential to come in contact with radioactive material during field activities at the Tank 75 Site. Radioactive material at the site (if any) is anticipated to be FUSRAP-related material; however, Naturally Occurring Radioactive Materials (NORM) also could be located at the Site.

As the potential exists for encountering radiologically impacted soil during drilling and sampling activities, AECOM will implement its U.S. Nuclear Regulatory Commission radioactive materials license (License No. 39-35587-01) under reciprocity with the NYSDOH. In addition, a site-specific Radiation Protection Plan (RPP) will be provided with AECOM's reciprocity request. It is understood that licensing coverage under NYSDOH reciprocity is limited to 30 calendar days per year. However, the investigation activities covered under this work plan are anticipated to be completed in less than 30 days. For radiological waste management that may exceed the reciprocity time-limitations, AECOM will engage with a NY-licensed contractor to support such tasks. No intrusive investigation activities will be performed until reciprocity is granted by NYSDOH.

A Gamma Walkover Survey (GWS) will be completed around Tank 75 to survey the area for potentially elevated gamma radiation levels. The survey will be conducted with a 2-inch by 2-inch (2x2) sodium iodide (NaI) gamma scintillation detector and held about 15 centimeters (cm) (6 inches [in]) from the ground surface. Gamma count rates and position will be logged while traversing the area in systematic pattern. The surveyor will walk at a pace covering about 0.5 meters per second (m/s) covering the area around Tank 75 and all boring locations.

Additionally, continuous gamma radiation screening will be performed using the 2x2 NaI detector during drilling and soil sampling activities. This screening will involve scanning soil cuttings from drilling. These screening surveys, along with the professional judgement of the health physicist conducting the surveys, will be used to segregate excavated material for disposition. Soil considered radiologically impacted will be drummed separately from other soil, sampled, and transported to an on-site temporary waste staging area for future loading and transport to the disposal facility. Gamma scans will be taken in the area where impacted soil was removed to determine if there are still elevated gamma readings or not. If elevated gamma readings persist, the location will remain flagged, and the PM will be notified. Additional information is provided in Section 4.0.

Minimization of the quantity of radiologically impacted waste will be a high priority during the SC/RI investigation. Any radiologically impacted waste generated during this work will be temporarily staged within a designated area on-site until approved for disposition. This material will be managed in accordance with federal, state, local, and Site permitting requirements, consistent with project procedures and license requirements for handling, storage, and transportation (See Section 9.2).

3.3.8 Emerging Contaminants (1,4-Dioxane and PFAS) Sampling

PFAS and 1,4-dioxane are emerging contaminants of concern and required to be sampled in all environmental media in New York State (NYSDEC, 2019). Select samples collected during this SC/RI will be analyzed for the emerging contaminants. Field sampling protocols, laboratory criteria, and data quality review for these emerging contaminants are described in this SC/RIWP. To ensure consistency with protocols for PFAS, the NYSDEC developed a technical guidance document:

- NYSDEC Sampling, Analyses, and Assessment of Per-and Polyfluoroalkyl Substances (PFAS), under NYSDEC's Part 375 Remedial Programs (April 2023).

Additionally on March 15, 2023, NYSDEC released new water quality guidance values (GVs) that will advance the State's regulation of the emerging contaminants Perfluorooctanoic acid (PFOA), Perfluorooctanesulfonic acid (PFOS), and 1,4-Dioxane. The GVs for these contaminants are established in an addendum to TOGS 1.1.1 (NYSDEC 2023).

These guidance documents are provided as Appendix C to this Work Plan.

Since PFAS are to be analyzed, the following techniques will be used in conjunction with procedures cited in the QAPP and NYSDEC PFAS sampling guidance documents:

- Use only laboratory certified "PFAS-free" water for equipment decontamination.
- Use only Alconox® or Liquinox® soap for decontamination.
- No Sharpies will be used, only ball point pens.

- No waterproof field books/ laboratory notebooks, only loose paper on aluminum clipboards.
- Do not wear the following:
  - Personal hygiene items (cosmetics, lotions, moisturizers).
  - Sunscreens and insect repellants. Instead, wear long sleeve / light colored 100% cotton shirts and wide brimmed hats.
  - New or unwashed clothing.
  - Clothing washed with fabric softeners.
  - Treated clothing (i.e., waterproof, water resistant, stain-resistant, etc.).
  - Treated boots (i.e., waterproof, water resistant, stain-resistant, etc.).
  - Coated Tyvek® suits.
- Do not handle prepackaged food products immediately prior to sampling.
- Wear a new pair of disposable powderless nitrile gloves prior to sample collection.
- Do not use fluoropolymer bailers, pump bladders, tubing, valves, and other pump parts.
- Do not use anything with Teflon®.
- Use HDPE and silicon materials only.
- Do not use glass containers for sampling. Use only bottle ware provided by the laboratory (i.e., polypropylene or HDPE sample bottles with unlined [no Teflon®] polypropylene or HDPE screw caps).
- Do not use aluminum foil.
- Do not filter samples in the field.

4. Radiological Screening Surveys

Radiological screening field activities will include the following:

- Gamma walkover survey (GWS);
- Screening of soil cuttings/samples and Tank 75 sediment/sludge cores; and
- Segregation and temporary storage of radioactive materials.

4.1 Gamma Walkover Survey (GWS)

Prior to the start of other fieldwork, a radiological screening survey in the form a GWS will be completed within the site boundary and around the perimeter of Tank 75 in areas where intrusive investigation activities will be completed. A GWS is a screening technique useful for identifying locations worthy of additional study and also for identifying locations that likely contain little or no radioactive contamination from gamma radiation emitting radionuclides. For the Tank 75 Site, there is no prior knowledge of historical radiological release directly on the Site; however, there have been documented wastes containing uranium ore tailings deposited at the adjacent Seaway Landfill and Ashland 1 sites immediately to the north and east of Tank 75. Due to this close proximity to sites with known radiological contaminants, the surface soils around Tank 75 will be scanned to rule out radiological impacts. The results of the GWS will be evaluated prior to additional drilling, groundwater, soil, and sediment handling activities and the results of the survey will determine if additional sampling precautions are needed. Should gamma walkover measurements exceed the action levels as described in Section 4.1.2, the radiation surveyor will pause to investigate if NORM or TENORM materials (e.g., gravel or porcelain) are visually present . Should the detector response then exceed the USACE correlation gross count rate of 16,000 cpm (described in Section 4.1.2), the impacted area would be flagged, work will temporarily stop, and the Ashland Project Manager will be notified. The Ashland Project Manager will then notify the NYSDEC Project Manager and NYSDEC RMM Section as soon as possible to communicate the discovery of potential FUSRAP materials. Surface soil sampling and analysis may be needed to confirm the materials are FUSRAP-related, naturally occurring radioactive materials (NORM), or technologically enhanced NORM (TENORM).

To determine the mean background and standard deviation of the background data set, a GWS will be conducted in an area that is known to contain native soil, to have previously been remediated, or likely to contain non-radioactive fill materials. The background GWS will be performed in the same manner as the Tank 75 perimeter GWS. A background GWS of 5 to 10 minutes will provide a sufficient number of data points for statistical evaluations. If a data logger is not used, 10 one-minute measurements can be used to determine the mean background count rate.

4.1.1 Gamma Walkover Survey Considerations

Prior to other fieldwork or sampling the GWS will be completed. Thick and high groundcover may prevent using the specified detector at the prescribed height above grade and interfere with the ability to conduct a consistent gamma scan of the ground. Therefore, before the GWS, the site will be prepared as part of the mobilization to include clearing of vegetation for the survey access.

4.1.2 Gamma Walkover Survey Protocols

The GWS process will involve slowly scanning the soil with an unshielded 2x2 NaI gamma scintillation detector (Ludlum Model 44-10 [or equivalent] paired with a Ludlum Model 2221 [or equivalent]) at a height of 15 cm (6 in) above the ground surface and at a speed of not greater than 0.5 m/s. An area will be considered radiologically impacted if the gross detector response exceeds USACE pre-determined value of 16,000 cpm and no NORM or TENORM materials (e.g., gravel or porcelain) are visually present.

In earlier work performed for the USACE, an action level of 16,000 counts per minute (cpm) for a 2x2 NaI detector was established for the Ashland 1 Site. USACE agreed that soils found above this value may indicate FUSRAP material and analytical testing of soil samples will be necessary to determine the exact radionuclides present and the isotopic ratios. Should the detector response exceed the USACE correlation gross count rate of 16,000 cpm, the impacted area would be flagged, work will temporarily stop, and the Ashland Project Manager will be notified. The Ashland Project Manager will then notify the NYSDEC Project Manager and NYSDEC RMM Section. Likely responses to readings above 16,000 cpm may include removal of impacted soil and or collection of surface soil samples for analysis. If samples are collected, they will be submitted to a laboratory for analysis of the parameters listed below in Section 4.3.

AECOM will also establish a lower investigation level (IL) for GWS and radiation screening of the soil. The IL will be equated to the detector's minimum detectable count rate (MDCR). A detector's MDCR is defined by Equations 6-8 and 6-9 from the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), where additional information on calculating the MDCR for specific field instruments is provided in Sections 4.1.2 and 4.2.

If a detector response exceeds the minimum detectable count rate (MDCR) (i.e., > IL), the radiation surveyor will pause to investigate if NORM or TENORM materials (e.g., gravel or porcelain) are visually present. If there are no materials present that, in the opinion of the surveyor, are likely TENORM or NORM materials, the surveyor will survey the area around the location where the IL was exceeded to determine if there are areas of higher radiation. For measurements between the IL and 16,000 cpm, no additional sampling precautions are required; however, the surveyor should make note of all locations with measurements greater than the IL. If there is flexibility in choosing sample locations, then areas above the IL will be avoided.

The IL or the MDCR is calculated using the following equations from MARSSIM:

$$s_i = d' \sqrt{b_i}$$

$$MDCR = s_i \times (60/i)$$

Where:

s_i = minimum number of detectable source counts in a scan interval of *i* seconds

d' = statistical value related to acceptable true and false positive rates = 1.38 (from MARSIM Table 6.5)

b_i = expected background counts in a scan interval of *i* seconds

i = scan interval = 2 seconds

MDCR = minimum detectable count rate in cpm

The ideal setup would include using a pushcart mounted gamma detector assembly with 1m field of view. Based on the field of the view of the 2x2 NaI detector and a scan rate of 0.5 m/s, this results in a scan interval (*i*) of about 2 seconds. Alternatively, a man-carried gamma detector is slowly scanned near the ground surface back and forth across the survey path to create a specified scanning pattern.

All standard instruments used shall be calibrated by a qualified calibration/repair facility at least annually in accordance with manufacturer's instructions. Each instrument shall be checked with radioactive check sources to verify proper instrument response. For mapping purposes, it is efficient if the gamma detector is directly interfaced with a GPS unit with a data logger that automatically records the location and the gamma reading on a prescribed frequency (i.e., logging rate of once per second while the surveyor walks at 0.5 m/s). Soils will be scanned along a series of adjacent lanes to obtain full coverage of the land area around Tank 75 (within the limits of safe access).

All field surveying and screening procedures will be in accordance with SOPs RS-TPG-SOP-001, *Portable Detection Equipment* and RS-TPG-SOP-011, *Radiological Surveys* (Appendix D).

4.2 Soil Cuttings/Samples and Tank 75 Sludge/ Sediment Cores Screening

During the SC/RI, intrusive activities will include soil boring and sampling as well as Tank 75 sediment core sampling. For health and safety and contamination control only, soil cuttings will be scanned as described in Section 4.1.2. All collected samples/cores will be scanned using a “pancake” style Geiger-Mueller (GM) detector such as a Ludlum Model 44-9 connected to a Ludlum Model 3 ratemeter, or equivalent. Sample jars/bottles containing sludge, sediment, and water samples will also be scanned with a GM detector prior to packing samples for shipment to the laboratory. Soil sampling activities will be performed under the guidance of SOP RS-TPG-SOP-012, R1, *Soil Sampling* (Appendix D).

The MDCR is calculated for the GM detector as described in Section 4.1.2. The MDCR for the GM detector will be a different value from the MDCR for the 2x2 NaI detector, as the scan speed for the G-M detector is typically one detector width per second resulting in a scan interval (*i*) of 1 second. Similar to the GWS, the IL for soil cuttings and soil samples will be the MDCR calculated for the GM detector. If the IL is exceeded, the radiation surveyor will first examine the soil cores to determine presence of any material that is likely from a natural material (e.g., gravel) or other common material (e.g., porcelain). If scans of cores demonstrate radiation above the IL (i.e., MDCR from the GM detector), no soil samples from the core will be collected and the sample cores will be set aside for further investigation and controlled to limit the possible spread of contamination.

Soil cores will also be screened using a shielded 2x2 NaI detector. The shielded detector will be stationed on a benchtop and placed on a stand such that the detector is positioned approximately 0.5 inch above the soil core. The surveyor will place each core on the benchtop and slide the core under the detector at a scan time of approximately 1 inch per second. During the scanning of the core, should the scan exceed a count rate representing a Ra-226 concentration of 3 pCi/g above background an additional 1-minute static count will be taken on contact to distinguish any potential hot-spot areas of the core.

According to a 1999 report (Argonne National Laboratory, 1999) on work sponsored by USACE for Seaway Area A, NY, the 16,000 cpm threshold for surface soils corresponds to about 3 pCi/g Ra-226. As such, MicroShield® modeling to approximate 3 pCi/g of Ra-226 into counts per minute (cpm) was used to determine whether subsurface soils are considered radiologically impacted. Based on MicroShield® modeling and the NUREG 1507 conversion for Ra-226+C of 841 cpm/µR/h, a soil core will be considered radiologically impacted if the detector response is 200 cpm above background and no NORM or TENORM materials (e.g., gravel or porcelain) are visually present.

The Ashland Project Manager will be notified upon the discovery of radiologically impacted soil cores. The Ashland Project Manager will then notify the NYSDEC Project Manager and NYSDEC RMM Section and samples will be collected for radiological analysis . Impacted subsurface samples will be submitted to a laboratory for analysis of the parameters listed below in Section 4.3. In the event that the soil core screening does not identify any radiologically impacted soils, two subsurface soil samples will still be collected and submitted for analysis by gamma spectroscopy only. The submission of these two samples are for quality control purposes and to compare the results to the MicroShield® modeling analysis.

Daily source checks and background measurements for the GM detector will be made in an area believed to be representative of background. As the Ludlum Model 3 rate meter is an analog meter, an average background should be calculated by observing the background response in 10 locations in a larger background area. If a digital rate meter is used, 10 individual one-minute measurements can be collected to determine the average.

4.3 Separation of Radioactive Materials

As noted previously, soil with potential residual radioactive contamination identified during the core/sample screening will be segregated from other samples and waste materials. Locations identified with elevated radiation during the GWS will be delineated with pin flags. Radioactive materials may either be NORM, TENORM, or potentially FUSRAP-related materials. Laboratory analysis must be performed to

characterize the materials for proper waste disposal. Laboratory analysis of soils will include either gamma spectroscopy or alpha spectroscopy for thorium isotopes, radium-226 and radium-228 (DOE HASL 300, 4.5.2.3/Ga-01, EPA Method 901.1, or equivalent quality) and alpha spectroscopy for uranium isotopes uranium-238, uranium-235, and uranium-234 (DOE EML HASL 300 U-02-RC or equivalent quality). The laboratory must hold a current Department of Defense (DOD) Environmental Laboratory Accreditation Program (ELAP) or equivalent certification for all appropriate analytical methods, analytes, and matrices. Samples will be screened to ensure proper shipping to the laboratory. Preparation of samples including selection of sample containers, shipping container, chain-of-custody, container seals, carrier selection, documentation, and package labeling will all be overseen by a health physicist and performed in accordance with applicable state and federal regulations. Samples collected from soil cores that exceed the radiological field screening criteria will not be sent to a separate laboratory for non-radiological analysis.

5. Groundwater Investigation

Groundwater investigation field activities will include the following:

- Groundwater Elevation Survey;
- Existing Monitoring Well Development;
- Groundwater Sampling from Monitoring Wells; and
- Aquifer Properties Testing (hydraulic conductivity “slug” testing).

5.1 Groundwater Elevation Survey

In order to better understand the hydrogeologic conditions, one or more rounds of synoptic water level readings will be collected by AECOM. A groundwater elevation survey will be taken prior to sampling existing wells.

Each well will be gauged using an electronic oil-water interface probe to determine the depth to water and the possible presence of any light non-aqueous phase liquids (LNAPL). The oil water interface probe will then be lowered to the bottom of each well to measure depth to bottom and evaluate for the presence of any dense non-aqueous phase liquids (DNAPL). Levels will be recorded on an appropriate log to the nearest 0.01 ft. The oil-water interface probe will be field decontaminated between monitoring locations.

Field data will be converted into elevations using available survey reference data. These elevations will be used to prepare a groundwater contour map for each synoptic event which will be included in the SC/RI report.

5.2 Well Development

Prior to groundwater sampling for this SC/RI, any dedicated tubing or equipment in the nine existing Site wells will be removed and the wells will be redeveloped as part of this SC/RI. Redeveloping clears accumulated sediments and improves hydraulic connection between the formation and the well screen. The following protocols will be followed for development:

- An electric submersible pump or a positive displacement pump (e.g., Waterra) will be used for development at each well. Pump selection will depend upon anticipated drawdown, volume of water required to be removed, and access to well or electric power supply.
- During development, the field supervisor will record development information on the well development form. Periodic readings (every 0.5 to 1 well volume) will include depth to water, pumping rate, temperature, pH, conductivity, dissolved oxygen, oxidation reduction potential (ORP) and turbidity. The well development goals will be to:

  1) remove at least five casing volumes of water,

  2) achieve stabilized water quality parameters (i.e., temperature, pH, conductivity), and

  3) achieve a turbidity reading of 50 nephelometric units (NTU) or less.

- If these development goals have not been achieved after two hours of development, the field supervisor will contact the AECOM Project Manager who will contact the NYSDEC Project Manager for further instructions.

- Should any well go dry during development, the well will be monitored for recharge, and then purged dry up to three times after which well development will be considered complete. Should any well go dry and not recover, the field supervisor will contact the AECOM Project Manager who will contact the NYSDEC Project Manager for further instructions.

5.3 Groundwater Sampling from Existing Monitoring Wells

Following completion of the any well development, the wells will be allowed to stabilize for at least 72 hours, prior to sampling. Groundwater samples will be collected using low-flow sampling techniques (described below) to the extent practicable. Groundwater samples will be submitted for analysis of TCL VOCs, TCL SVOCs, pesticides, PCBs, TAL metals, and cyanide. Select groundwater samples will also be analyzed for 1,4-dioxane and PFAS. Wells for PFAS analysis were selected to provide uniform distribution across the site and to include shallow and deep sample intervals. If there is insufficient water in a well for low-flow sampling or the well goes dry during purging, a grab sample may be obtained after the well recharges. Table 3-2 provides summary information for the groundwater samples to be collected including the laboratory analyses to be completed. Additional information regarding analytical parameters is discussed in the QAPP.

Groundwater sampling equipment will be free of PFAS materials. Sampling methods will be in accordance with the NYSDEC guidance documents listed in Section 3.3.8.

5.3.1 Low Flow Sampling Technique

Groundwater sampling will be completed in accordance with Groundwater Sampling Guidelines for Superfund and RCRA Project Managers (USEPA OSWER 542-S-02-001). The default groundwater sampling method will be in accordance with EPA's low stress (often referred to as low flow) sampling technique (EPA, 1998).

A peristaltic pump (or other suitable pump) will be used to purge the well. The pump intake will be set at the midpoint of the screened interval, or as dictated by field conditions if there is minimal water in the well. The pump will be operated at a target flow rate of 300 to 500 milliliters per minute (mL/min). New dedicated HDPE tubing will be used for groundwater sample collection. Field parameters from water quality instruments will be recorded on the well sampling form (see Appendix D) every five minutes during purging and will include:

- flow rate (mL/min);
- depth to water (0.01 ft);
- temperature (degrees Celsius);
- pH (S.U.);
- specific conductance (millisiemens per centimeter [ms/cm]);
- dissolved oxygen (DO) (milligrams per liter [mg/L]);
- oxidation-reduction potential (ORP) (millivolts [mV]); and
- turbidity (NTU).

A flow-through cell will be used to obtain temperature, pH, specific conductance, DO, and ORP, and a turbidity meter will be used to measure turbidity. The water quality instruments will be checked daily prior to the start of sampling to ensure proper calibration is maintained. Purging will be considered complete when the indicator parameters have stabilized over three consecutive readings. Stabilization parameters are:

- purge rate: between 300 and 500 mL/min;
- depth to water less than 0.3 ft drawdown during purging;
- pH ± 0.1;
- conductivity: ± 3%;

- DO: ± 10 % (mg/L);
- ORP: ±10 mV; and
- Turbidity: less than 50 NTU.

If stabilization is not achieved after two hours of purging, or if the well goes dry due to insufficient recharge, a grab sample will be collected after the well has had time to recharge.

During sample collection, the flow-through cell will be disconnected and the sample tubing discharge will be directed into the laboratory supplied sample containers. The flow rate will be decreased to approximately 100 mL/min during sample collection for VOC analysis. Groundwater samples will be packaged in accordance with Section 11.6 and submitted to the laboratory for analysis.

5.4 Aquifer Property Testing - Slug Tests

Aquifer tests will be performed to determine various hydrogeologic parameters (aquifer characteristics) such as permeability, transmissivity, and storativity. The method that will be used will be short-term permeability tests (often referred to as “slug” tests). Slug tests are proposed to be conducted at four locations three shallow and one deep (MW-2S, MW-2D, MW-3, and MW-4).

For shallow wells under unconfined conditions, as are present at this Site, in-situ permeability tests will be conducted using both the “slug in” or falling head test method and the “slug out” or rising head test method for partially penetrating unconfined aquifers. Slug tests will be performed in a similar manner as described in ASTM D-4044 to determine the hydraulic characteristics of the groundwater aquifer(s) within the area of newly constructed wells. For shallow wells under unconfined conditions, it is anticipated that the permeability test data will be interpreted based on the Bouwer and Rice Method (Bouwer and Rice, 1976; Bouwer, 1989). The procedures to be followed during the slug testing are described below.

5.4.1 Slug In Method:

- A stainless steel or PVC slug will be lowered into the water column to raise the water level in the well. The recovery of the water table will be measured using a water level meter or a pressure transducer.
- The water level will be permitted to recover to at least 90 percent of the original static water level. Following recovery, a “Slug Out” test will be completed.

5.4.2 Slug Out Method:

- The slug will then be quickly removed from the water column. The recovery of the water table will be measured using a water level meter or a pressure transducer.
- The water level will be permitted to recover to at least 90 percent of the original static water level.
- The equipment (slug, water level meter, transducer) used in the test will be decontaminated prior to use at the next well. A new length of nylon cord will be used at each well to suspend the slug.

If used, the electronic transducer will be set to collect water levels at appropriate logarithmic intervals to provide adequate data to determine the hydraulic conductivity of the monitoring well. Data collected by the data logger will be checked in the field immediately following each test. If the data is not adequate (incorrect timing, transducer cable moved or disturbed, etc.) from the judgement of the field geologist, then the test will be re-run so that adequate data may be collected.

Should there be insufficient water in the well to run the slug in and/or slug out test method, the Project Manager shall be contacted and alternative testing methods discussed.

5.5 Monitoring Well Decommissioning and Borehole Abandonment

It is not currently anticipated that monitoring well decommissioning will be required. If a monitoring well or boring requires abandonment, decommissioning will be performed in accordance with NYSDEC Policy CP-43 (NYSDEC, 2009). Several methods are available such as grouting in place, casing perforation/grouting in place, or over-drilling followed by grouting. The best method is dependent on the type of well and construction details.

Soil borings will be backfilled with a combination of soil cuttings that are not visibly contaminated (i.e. olfactory signs, elevated PID, staining, and/or visible product) and hydrated bentonite chips. Angled borings will be sealed from the bottom–up with cement-bentonite grout using tremie-pipe methods. All soil cuttings generated by soil boring or well abandonment activities not returned to the borehole will be containerized pending final disposition as detailed in Section 9.2.

6. Soil Sampling

Soil sampling activities will include surface and subsurface soil sampling. Procedures for these activities are described below.

6.1 Surface Soil Sampling

Surface soil samples (defined as soil samples from the first 2 inches of native soil or fill) will be collected at each of the locations shown on Figure 3-1. Each surface soil sample will be analyzed for the TCL SVOCs, pesticides, PCBs, TAL metals, and cyanide. Select soil samples will additionally be analyzed for 1,4-dioxane and PFAS. Additional information regarding the laboratory analyses is presented in the QAPP.

The following method will be the primary method for collecting surface soil samples. Surface soil samples are planned to be collected at each new soil boring and monitoring well installation to assess the nature of the soil cover.

- Using a decontaminated stainless steel trowel or by hand (protected by a chemically resistant PFAS sampling approved glove), remove rocks, stone, grass, and debris to gain access to the surface soils.
- Using dedicated equipment or a decontaminated stainless device (teaspoon, trowel, “scoopula,” or similar), transfer the exposed soils directly into the laboratory-provided sample containers. Sampling width is estimated to be 2.0 inches and sampling depth typically should not exceed 2.0 inches.
- Complete the label on the sample container and transfer the sample container(s) to an iced cooler.
- After collection of the sample, screen the hole with a PID for volatile organic vapors. Record the readings and any significant observations such as staining, oily sheen, or odors.
- If the location is to be surveyed, place a stake in the center of the hole after backfilling the hole. Otherwise, measure the location from fixed (permanent) objects using a tape measure.
- PFAS samples will be collected prior to other samples, and segregated from other samples in a separate cooler, to avoid contact with any other type of sample container, bottles or packaging material that may have PFAS-related content. All equipment will be decontaminated with water from a PFAS-free source.

6.2 Subsurface Soil Sampling

Subsurface soil borings will be advanced in order to obtain additional information regarding the thickness and composition of fill and native materials at the Site; to determine the depth to the water table; to observe and screen subsurface soil in order to identify conditions that may be indicative of impacts from past operations.

Soil borings will be advanced at the locations shown on Figure 3-1. Table 2-1 provides a summary of information regarding existing borings and monitoring wells; it is anticipated that new borings will be completed to approximately the same depths with a maximum depth of approximately 2 feet below the bottom of the Tank 75 gunite liner. The anticipated diameter of the core will be 1.5 inches. One boring on each side of Tank 75, SB-01, SB-04, SB-06, and SB-09, will be drilled at an angle to attempt to collect soil samples from beneath the bottom of the structure. Table 3-2 summarizes the soil samples to be collected including the laboratory analyses to be completed (TCL VOCs, TCL SVOCs, PCBs, pesticides, 1,4-dioxane, PFAS, TAL metals, and cyanide). Additional information regarding analytical parameters is discussed in the QAPP.

Borings will be advanced manually (during pre-clearing and for borings where the expected sample depth will not exceed hand augering depth) or by direct-push technology (DPT) methods or by HSA drilling. Soils will be continuously logged during subsurface sampling, regardless of the method selected. Typical procedures for DPT sampling, sampling from HSA borings, and soil logging are presented below.

Up to three subsurface soil samples for laboratory analysis will be collected from each new soil boring. Sample intervals for the borings include:

- A surface soil sample (0-2”);
- The interval exhibiting greatest indication of contamination (e.g., elevated PID reading, odor, staining) above the water table. If no visible sign of contamination is present above the water table, the interval just above the water table will be sampled;
- A depth at or below the bottom of the structure (estimated 26-30 feet bgs – to be confirmed from the bathymetry survey and sediment probe work described in Section 7.0).

If both historical fill material and native material are present in a soil boring, a sample from each type of material will be collected if not already covered from the above samples. An additional soil sample for laboratory analysis may be collected from any interval exhibiting signs of gross contamination below the water table upon consultation with the Project Manager.

6.2.1 Subsurface Soil Sampling Procedures

Vertical borings will be advanced to a depth of approximately 30 feet bgs to evaluate soil conditions below the bottom elevation of Tank 75 (estimated at 26 feet deep), or to refusal. Angled soil borings will be advanced at angles up to 45 degrees from vertical. The exact angle, total length along the borehole, and final depth of the borehole will be calculated in the field based on borehole start location and ground surface elevation in relation to the edge of the Tank 75 structure. The goal of the angled boring will be to collect soil samples from a maximum of five feet below the bottom of the flat portion of the structure. The soil samples will be collected using a 4 foot long dedicated acetate liner (DPT) or split-spoon sampler (HSA). The general procedure for subsurface sampling from DPT samplers is described below.

- Record the soil boring location on the soil boring log.
- Put on a new pair of disposable gloves.
- Prepare a clean surface (e.g., using a plastic sheet) onto which sampling equipment, meters, and the like can be placed; clean the equipment prior to placing on the clean surface.
- Retrieve the sampler from the borehole (i.e., accept the sampler from the drilling subcontractor).
- If HSA, remove the shoe and head attachments from the sampler and place the sampler on a clean surface.
- If DPT, remove the Macrocore liner/split-spoon from the sampler and place on the clean surface.
  - Score the Macrocore liner along two sides to open the liner in two nearly equal halves or open the split-spoon to expose the sample.
- Immediately screen for organic vapors using a PID and record the results.
- Measure the recovery (in inches) of soil.
- Determine which intervals are to be collected for laboratory analysis.
- If a sample is to be analyzed for PFAS, collect before all other samples, place into the designated PFAS approved sample jar, bag in a Ziploc bag and remove from the sampling area to a separate “PFAS only” cooler.
- If a sample is to be analyzed for VOCs, take an immediate grab sample and place into the designated container (EnCore or 4-oz glass jar).

- Collect the remainder of the interval selected for sample analysis, homogenizing the sample prior to jarring if not taken from a discrete depth interval. Homogenization will involve thorough mixing in order to provide a well-mixed, representative sample to the laboratory.
- If not using dedicated sampling equipment, decontaminate any tools used for homogenization before use and between samples (i.e., stainless-steel bowls, spoons, or spatulas) as described in Section 9.1.
- Once homogenized, transfer the soil sample directly to the appropriate sample containers, slightly tamp-down, fill to near the top of the container, and seal with the appropriate cap.
- After the last sample has been collected, record the date and time; place the sample bottles in the cooler, on ice.
- Decontamination of DPT/split-spoon sampling equipment following the decontamination procedures in Section 9.1.

6.2.2 Subsurface Soil Logging

Subsurface soil logging will be conducted for borings advanced by DPT methods or by HSAs. Soil boring logs will be prepared in the field by a qualified, experienced geologist or engineer, as borings are drilled. Boring logs will be prepared on a standard drilling log form on loose paper with aluminum clip boards appropriate for use with PFAS sampling, an example of which is provided in Appendix D. The final logs will be typed into an electronic boring log format in the office.

Soil borings will be logged, with each type of material encountered being described on the log form. All relevant information in the log heading and body will be completed. If surveyed horizontal control is not available at the time of drilling, location sketches referenced by distances to permanent surface features will be entered into the field log forms.

Each material type encountered will be described on the log form. Descriptions of unconsolidated materials will include Unified Soil Classification System (USCS) in accordance with ASTM D-2487- 00, consistency of cohesive materials or apparent density of non-cohesive materials, moisture content assessment, color, other descriptive features such as bedding characteristics, organic materials, macrostructure of fine-grained soils, and depositional type.

Depth information will be from direct measurements accurate to ±0.1 ft. Stratigraphic/lithologic changes will be identified by a solid horizontal line at the appropriate scale depth on the log that corresponds to changes at the measured borehole depth. Gradational changes identified from cuttings will be identified by a horizontal dashed line at the appropriate scale depth based on the best judgment of the logger. Lines will be drawn with a straight edge. Boring logs will clearly show the depth interval from which all samples are obtained. Logs will also indicate the presence or absence of water in boreholes, the depth at which water is first encountered, the depth to water at the completion of drilling, the stabilized water depth, and the time allowed for the levels to stabilize.

Boring logs will show drilling detail, including borehole and sample diameters, the depth at which changes occur in drilling or sampling methods or equipment, and the total depth of penetration and sampling. The bottom of the borehole will be identified by “Bottom of Borehole” clearly on the log. Any drilling or sampling problems will be noted on the logs, including descriptions of resolutions. Logs will include other information relevant to the investigation, including odors, field screening and test results (e.g., PID readings), and any evidence of contamination of samples, cuttings, or drilling fluids. Scans of the original field boring logs, in addition to the final electronic boring logs will be submitted in the RI Report.

7. Tank 75 Contents Investigation

The following subsections describe the field methods proposed to characterize Tank 75 contents including: 1) conducting a bathymetric survey to estimate the total volume of sludge and location within the structure; 2) collecting surface water samples from Tank 75 for chemical parameters; and 3) collecting sediment cores to determine the relative proportions of the different material types and conduct analysis of various physical properties and chemical constituents of the different material types. Data collected during this phase will also be used to more precisely verify the dimensions and total depth of Tank 75.

7.1 Tank 75 Bathymetric Survey

A bathymetric survey of the Tank 75 bottom will be completed to accurately estimate the volume of submerged sediment/sludge and to verify the depths of the sloping sides and bottom of Tank 75. The survey will be performed with a remotely-controlled catamaran platform using a single-beam acoustical echosounder capable of recording depth data with an error tolerance of 0.1 feet, plus/minus 0.1% of the actual depth. Prior to performing the survey, sound velocity in the water column will be determined by lowering a tethered Odom Digibar Pro acoustic velocimeter into the water. Recorded sound velocities will be used to calibrate the echosounder to field conditions. The survey boat will be navigated along grid transects spaced at approximately 10 feet intervals. The geographic location or position of each sounding will be recorded with a Trimble R8 or similar GPS unit. The GPS unit will also be used to collect terrain (topographic) data near the water line along the same transect lines used for the bathymetric survey. Top of sludge elevations developed from echosounding will be field verified using results of vibracoring or manual poling.

Upon completion of the field work, the raw survey data will be post-processed and converted into a comma-delimited ASCII text file. A hydrographic survey contour map of the sediment/sludge surface will be generated with AutoCAD Civil3d. The resulting terrain surface will be compared against the structure bottom elevation to develop an estimate of the volume of submerged sediment/sludge and to determine optimum sediment/sludge coring locations.

7.2 Surface Water Sampling

Surface water samples will be collected from a point near the center of Tank 75 (Figure 3-1). Three vertically distributed samples will be collected at this location. The uppermost sample will be collected from approximately one foot below the surface. The second sample will be collected from the approximate middle of the water column. The third water sample will be collected from approximately two feet above the sediment/sludge surface. Surface water samples will be collected for both chemical and waste characterization parameters according to Table 3-2. The surface water samples will be collected using a peristaltic pump with weighted HDPE tubing. Samples will be submitted for analyses of the following parameters:

- TCL VOC, TCL SVOC, PCBs, pesticides, TAL metals, and cyanide;
- 1,4-dioxane and PFAS (one sample only);
- Total Extractable Petroleum Hydrocarbons (TEPH);
- Ethylene glycol;
- RCRA waste characterization parameters corrosivity, ignitability, flashpoint, reactivity (sulfide/cyanide);
- Viscosity;
- TOC; and
- pH.

PFAS samples will be collected first using HDPE sample equipment and bottle ware and segregated into a separate cooler from other samples.

The following readings will be obtained from a co-located aliquot after the surface water sample is collected using a water quality multimeter:

- pH;
- DO;
- Specific conductance;
- ORP;
- Temperature; and
- Turbidity.

7.2.1 Peristaltic Pump Sampler Method

A peristaltic pump will be used to collect surface water samples. HDPE tubing will be attached to a stainless steel weight and water level meter. The water level meter/tubing assembly will be lowered into the water column to the desired depth and then the pump will be turned on at a steady rate of flow suitable for VOCs and other analyses. Water will be purged directly into clean laboratory provided sample jars.

7.3 Sediment/Sludge Sampling

Historical information and previous sediment and sludge sampling indicates that the sediment/sludge will consist of both a pumpable sludge layer from one to five feet thick consisting of water, oil, and solids and a layer of non-pumpable sludge ranging in thickness from two to three feet on the bottom of the structure. Sediment cores will be collected at approximately 15 locations using vibracore sampling methods from a pontoon boat or other stable floating platform. Vibracoring is a method of vibrating a core tube into underwater sediment or wetlands. The vibration causes liquefaction of sediments along the exterior of the core tube and reduces friction, allowing easier core-barrel penetration into sediments. When the core is driven fully into the sediments, the vibration is stopped and the core-barrel pulled out. A core-catcher is at the end of the barrel to prevent sediments from slipping back out.

Figure 3-1 shows proposed sediment sample locations based on a uniform 25-foot grid pattern. However, final sediment sampling locations will be selected based on evaluation of the bathymetric survey data described above. A health physicist will scan sediment cores for elevated gamma radiation as they are retrieved. A geologist will then perform core descriptions and measurements for the different sediment layers and select intervals different sediment intervals to be submitted for analytical testing.

Sediment cores will be evaluated to identify each type of sludge or other sediment material that is currently present and describe the nature of each phase of material. Thicknesses of each material in different areas of Tank 75 will be recorded and used to quantify the volume of sludges and sediment layers. Total depth to the gunite bottom of Tank 75 will be gauged at each of the locations to provide the estimated structure bottom elevation/topography.

Select sediment/sludge samples will be submitted for laboratory analysis at an approximate rate of one sample per 500 cubic yards (as estimated from bathymetric survey data). Several samples that are representative of each type of sludge or sediment will be collected and submitted for analysis of chemical and physical parameters. Up to 15 samples total will be packaged and shipped for analysis by the following methods:

- TCL VOC, SVOC, PCBs, pesticides, TAL metals, and cyanide;
- 1,4-dioxane and PFAS (select samples only – five locations, evenly distributed across the sampling area);

- RCRA TCLP waste characterization, including corrosivity, ignitability, flashpoint, reactivity (sulfide/cyanide);
- Total Extractable Petroleum Hydrocarbons (TEPH);
- Ethylene glycol;
- % Moisture;
- Heating Value (BTU);
- Viscosity;
- Paint filter test;
- TOC; and
- pH.

Table 3-2 summarizes all samples to be collected and all analytical methods for this RI.

8. Soil Vapor Intrusion Studies

Soil vapor is considered an environmental medium that must be characterized when the presence of volatile chemical contamination from VOCs and select SVOCs in soil and groundwater could result in SVI. The pathway for soil vapor will be investigated in buildings where a source of VOC contamination in subsurface soil or groundwater is identified or suspected near buildings. At this time no such study will be undertaken given the anticipated future site use and limited proximity of the site to any existing or planned buildings nearby. Should a future SVI study be determined as necessary, a supplemental SC/RIWP will be prepared to address the SVI pathway, select sampling locations, and perform the SVI investigation in accordance with DER-10 (NYDEC, 2010) and the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006).

9. Decontamination and Management of Investigation Derived Waste

9.1 Equipment Decontamination

To avoid cross-contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the following procedures specified in this section. Field equipment rinsate blanks are generated and analyzed to monitor the effectiveness of field decontamination procedures.

Additionally, and in accordance with the site-specific RPP, contamination surveys will be conducted using an alpha/beta scintillation detector (e.g., Ludlum 43-93 coupled to a Ludlum 2224 or equivalent). Personnel surveys and contamination surveys must indicate readings that are indistinguishable from background before being released from the site. The details on “non-detect” release limits and detector’s minimum detectable activity (MDA) will be provided in the RPP.

Cross-contamination is minimized by the use of vendor-decontaminated, location-dedicated materials or through the use of disposable equipment to the extent practical.

9.1.1 Decontamination Procedures

A temporary decontamination pad for subsurface drilling tools will be constructed on the Site. Additionally, the pad will be used for small equipment decontamination as well as personnel decontamination. The pad will be constructed near the Site entrance (or at another location TBD) to decontaminate vehicles (i.e., Geoprobe) and drilling tools entering and leaving the Site. The pad will be sized to be large enough to handle the equipment used on-site (e.g., drill rig) and to allow storage of cleaned equipment and materials prior to use. Drums of decontamination fluids and investigation derived wastes will be stored on pallets covered with plastic sheeting in the decontamination area.

9.1.2 Small Equipment Decontamination

Small equipment decontamination for non-disposable equipment such as sample tools, transducer probes and cables, etc. will be accomplished using the following procedures:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse; and
- PFAS -free water rinse.

Solvents will not be used in the field decontamination of such equipment. Decontamination will include scrubbing/washing with a PFAS approved laboratory grade detergent (e.g., Alconox) and PFAS-free polyethylene or PVC plastic brush to remove visible contamination, followed by PFAS-free water rinses. Tap water may be used from any treated municipal water system if it can be certified PFAS-free; the use of an untreated potable water supply is not an acceptable substitute. PFAS –free water may need to be trucked on-site by the driller or provided by the laboratory.

Equipment should be allowed to dry prior to use. Steam cleaning or high-pressure hot water cleaning may be used in the initial removal of gross, visible contamination.

Submersible sample pumps, if used, will be decontaminated using the above steps followed by running a large volume (several gallons) of PFAS-free water through the pump, followed by a PFAS- free water rinse. Tubing will not be re-used (new tubing will be used for each well or surface water sample location). Submersible pumps and supporting lines and cables will be placed in a plastic bucket filled with Liquinox and PFAS-free water and then run for several minutes (to decontaminate both exterior and interior parts).

The process will be repeated with PFAS-free water. Reusable sampling equipment (e.g., soil sampler, submersible pump, water level tape, etc.) will also be given a final PFAS-free water rinse of both interior and exterior parts.

9.1.3 Heavy Equipment Decontamination

Drilling equipment will be decontaminated before the first use, between boreholes, and prior to demobilization using a hot water pressure washer. A PFAS-free water source will be used and prior to use, ensure all equipment used for decontamination (i.e. pressure washers) do not contain parts that may be sources of PFAS cross-contamination. Decontamination, including larger equip such as drill rigs, boats, pontoons etc., will be conducted at a dedicated decontamination pad constructed for the project. Decontamination fluids will be containerized (drummed) pending final disposition.

9.1.4 Personnel Decontamination

Wash buckets and potable water will be set up at the decontamination pad or as indicated in the HASP. This includes washing hands and a boot wash. Before leaving the site, personnel hands and bottom of boots will be frisked with the alpha/beta scintillation detector. The release criteria for personnel survey will be indistinguishable from background levels. Details of personnel survey will be provided in the site-specific RPP. Details of the personnel decontamination procedures are provided in the HASP.

9.2 Management of Investigation Derived Waste

IDW management will be in accordance with Section 3.3(e) of DER-10 (NYSDEC, 2010). The sampling methods and equipment will be selected to limit both the need for decontamination and the volume of IDW. Personal protective equipment and disposable sampling equipment will be drummed for disposal as a solid waste. Types of IDW typically generated include soil cuttings from soil borings installation; development and purge water from the wells; excess sample material from sludge and sediment vibracore samples, and decontamination water from the drill rigs, DPT rigs, and equipment.

Any material that is identified as radiologically impacted (i.e., radiation measured above minimum detectable levels) will be segregated into separate drums. Well development, purge water from sampling, and decontamination water will be containerized and handled in accordance with the provisions of DER-10. Wastewater containing non-aqueous phase liquids, sheens, olfactory or visible evidence of contamination will be characterized for proper disposal based on hazardous or non-hazardous designation. Soil boring holes may be backfilled with soil cuttings that are not visibly contaminated (i.e., olfactory signs, elevated PID, staining, and/or visible product). Visibly contaminated soils and water will be containerized in either new or reconditioned drums and stored within the designated IDW staging area. Drummed material will be characterized and disposed of in accordance with all applicable state and federal regulations.

Radioactive material encountered during this work will be temporarily staged within a designated area on-site until approved for disposition. This material will be managed under AECOM's NRC radioactive material license, under reciprocity with the State of New York in accordance with the site-specific RPP. Other applicable federal, state, local, and Site permitting requirements will be adhered to, while being consistent with project procedures and license requirements for handling, storage, and transportation.

No mixing of clean soil with waste streams will be used to achieve non-impacted status. Containerized waste soil potentially containing residual radioactive contamination will be appropriately characterized to identify radionuclide concentrations to address the requirements in Title 10 Code of Federal Regulations (10 CFR) Part 61, as well as non-radiological hazardous waste characteristics as required by New York Codes, Rules and Regulations (NYCRR) Title 6, Parts 370 and 373.3, and for disposal characterization. Characterization of waste for radiological and non-radiological constituents will assure waste can be accepted and disposed off-site.

9.3 Transportation and Disposal

All IDW not managed on Site will be characterized and shipped for off-site disposal. AECOM will collect characterization samples to classify the IDW and solicit bids for disposal at appropriate licensed facilities. Prior to off-site shipment and disposal of any IDW, the permits for the proposed waste transporter and disposal facility will be provided to the Department for review. A Hazardous Waste Manifest that documents shipping information, including transporter and disposal facility names and locations, will accompany all hazardous waste shipments. An Ashland-approved waste contractor will coordinate all waste disposal, transportation, treatment, and disposal.

10. Community Air Monitoring

A Community Air Monitoring Plan (CAMP) is used to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities.

The protocols cited below are based on the NYSDOH Generic Community Air Monitoring Plan (May, 2010; Appendix 1A to DER-10 [NYSDEC, 2010]) (Appendix E) which is typically utilized by NYSDEC as guidance for work conducted under these contracts.

10.1 Monitoring

Real-time air monitoring for VOCs, vapors and/or particulate levels at the perimeter and surrounding community of the work area will be conducted. Monitoring activities will consist of a combination of continuous and periodic monitoring, which will be performed dependent upon the type of activity being conducted at the Site, as discussed below.

The specific types of monitoring necessary and appropriate for any particular project are determined by NYSDEC and AECOM and specified in this SC/RIWP.

10.1.1 Continuous Air Monitoring

Continuous monitoring for VOCs and particulates will be performed for ground intrusive activities associated with the Site, including, but not limited to, the installation of soil borings and groundwater monitoring wells and future excavations. Continuous upwind and downwind VOC monitoring will also be performed during sediment/sludge sampling.

VOC monitoring will be conducted at the upwind and downwind perimeter of the immediate work area on a continuous basis. VOC monitoring will be performed using a MiniRAE 3000 or equivalent, which is appropriate to detect a wide range of contaminants typically encountered. The MiniRAE 3000 will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The MiniRAE 3000 is capable of calculating 15-minute running average concentrations, which will be compared to the action levels specified below.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the work area at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) such as a DustTrak 8530 or equivalent. The DustTrak 8530 is a real-time monitoring equipment capable of measuring particulate matter less than 10 microns (µm) in size [PM-10] and capable of integrating over a period of 15 minutes for comparison to the airborne particulate action level. In addition to using the particulate monitors, fugitive dust migration will be visually assessed during work activities. If particulate concentrations at the upwind station are higher or equivalent to concentrations at or downwind of work areas, then continuous air monitoring may be discontinued, as approved by NYSDEC.

The particulate and VOC monitors can be equipped with an audible alarm or integrated with a cellular modem as part of a monitoring station that is capable of sending text messages to Site personnel's cell phone to indicate exceedance of the action level.

Upwind and downwind stations will not be used during sediment/sludge sampling activities as the materials will be saturated and therefore particulate dust will be non-existent. The recovered materials will be continuously scanned with a PID and the number of cores open at any one time will be controlled to minimize potential vapors. The work zone perimeter will be monitored periodically with the PID to confirm vapors are not leaving the work area.

10.1.2Periodic (As-Needed) Air Monitoring

Periodic or as-needed air monitoring for VOCs will also be performed during intrusive and non-intrusive activities associated with this SC/RIWP. Intrusive activities include soil borings and monitoring well drilling. Non-intrusive activities may include the collection of soil and sediment samples, the collection of groundwater samples from existing monitoring wells, and the collection of surface water and sediment samples. Periodic air monitoring during sample collection will consist of taking a reading upon arrival at a work or sample location, monitoring at the work area during drilling and sampling activities, and taking a reading prior to leaving a sample location. VOCs will be measured using a PID.

10.2 Action Levels and Response

This subsection identifies the action levels and corresponding responses for concentrations of VOCs and particulates detected during the field activities associated with a site.

10.2.1Volatile Organic Compounds

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 ppm above background for the 15-minute average, work activities will be temporarily halted and monitoring will continue. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be stopped, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 ft downwind of the work zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 ft), is below 5 ppm over background for the 15-minute average. If the organic vapor level is above 25 ppm at the perimeter of the work area, field activities will be shut down.

All 15-minute readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. Instantaneous readings (if any) used for decision purposes will also be recorded.

10.2.2Particulates

If the downwind PM-10 particulate level is 100 µg/m3 greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression measures will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 µg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression measures the downwind PM-10 particulate levels are greater than 150 µg/m3 above the upwind level, work will be stopped, and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 µg/m3 of the upwind level and in preventing visible dust migration.

Similar to the VOC readings, particulate readings will be recorded and be available for state (NYSDEC and NYSDOH) and county health personnel to review.

11. Field Records and Documentation

The objective of this subsection is to provide consistent procedures and formats by which field records will be kept and activities documented, and a methodology by which field records will be managed. Field records and documentation to be used during field activities include field notes and standard forms. Standard Forms may include chain-of-custody (COC) forms, Drilling Logs, Well Development Forms, Well Sampling Forms, Aquifer Testing Forms, Well Condition Forms, and IDW Log Sheets.

11.1 Field Notes

Field notes will be prepared and maintained throughout the course of the investigation. Due to PFAS sampling only loose paper and forms on metal clipboards will be used for field notes. Weatherproof field log books are a PFAS concern and will not be used. The field notes will be maintained as a permanent part of the project file.

Notes will be labeled on the first page in ink with the following designation: “Site Name, Project Type (e.g., RI), NYSDEC Site No. 915008B, and AECOM Project Number”.

Entries will be recorded in ballpoint pen. If errors are made in any field log book, field record (form), COC form, or any other field record document, corrections will be made by crossing a single line through the error, entering the correct information, and initialing and dating the correction.

Standard Forms have been adopted to facilitate the collection of consistent data (Appendix D). This will preclude detailed documentation of, for example, lithologic descriptions in the field notes. A reference, however, to use of each specific form must be made in the field notes.

The date, project name, and project number will be entered left to right, respectively, along the top of the page. Entries should be dated, and time of entry recorded. At the beginning of each day, the first two entries will be “Personnel/Contractors on Site” and “Weather.” At the end of each day's entry or particular event, if appropriate, the person entering the field notes should draw a diagonal line originating from the bottom left corner of the page to the conclusion of the entry and sign along the line indicating the conclusion of the entry or the day's activity.

Entries in field log notes will be legible (printing is preferable) and will contain accurate and inclusive documentation of project activities (investigation, monitoring remediation, closure, maintenance, etc.). Information pertaining to health and safety aspects, personnel on Site, visitor’s names, association, and time of arrival/departure, etc., should also be recorded.

Language should be objective, factual, and free of personal feelings or other terminology that might prove inappropriate, since field records are the basis for later written reports. Once completed, these field log notes become accountable documents and must be maintained as part of the project files.

Sample collection and handling activities, as well as visual observations, will be documented in the field log notes. Additionally field personnel will note time and material expenditures for later verification of contractor invoices (i.e. bags of bentonite, number of drums etc.). The sample collection equipment (where appropriate), field analytical equipment, and equipment used to make physical measurements will be identified in the fieldnotes. Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment will also be recorded in the field notes, except where these are referenced as being recorded on approved field forms. Field analyses and measurements must be traceable to the specific piece of field equipment utilized and to the field investigator collecting the sample, making the measurement, or conducting analyses. Log notes will be updated as field work progresses.

When the RI is complete, the notes will be submitted to the AECOM Project Manager for final cataloging and filing. Field notes will be stored in the Project File and included as an appendix to the RI report.

11.2 Standard Forms

All non-bound field records (e.g., drilling logs, well construction forms, sampling records, COCs, aquifer testing forms, well development and sampling logs) will be completed the day the associated activity occurs. Field data collected using electronic data loggers or computer entry forms, will be downloaded as soon as practical onto CDs or uploaded to office servers. If possible, the person collecting the data will download electronic data on a daily basis. This person will be responsible for verifying that the data collected are adequately represented in electronic media and in the file. A hard copy of the data, and any graphical representation produced by logging software, will also be printed out and duplicated. Select examples of commonly used forms are provided in Appendix D.

11.3 Sample Identification

During this project, a unique sample identifier will designate each sample collected. The following system may be used to assign unique sample identification numbers; however, modifications should be made as needed to clearly and appropriate identify samples for each site or project. Each sample will be identified by an alphanumeric character identifier, as described below.

The following codes will be used for identifying other sample types:

CODE	Sample Type
MW	Monitoring well
SB	Soil boring
SS	Surface Soil
SW	Surface water
VCB	Vibracore boring
SED	Sediment
EB	Equipment (Rinsate) Blank
FD-MMDDYY-N	Field Duplicate
TB	Trip Blank
MS/MSD	Matrix Spike/ Matrix Spike Duplicate

Field blanks, duplicates, and trip blanks will be labeled for the day of collection. For MS/MSD samples, the MS/MSD will be added to the sample ID and included on the COC as a note.

An example of the sample numbering system is provided below.

Sample Identifier	Description
MW-1S	Shallow well MW-1S
SB-02 – 4-6	Soil sample from 4 to 6 ft interval from boring SB-02.
SB-02 – SS	Surface Soil Sample (0-2”) at SB-02.
FD-060322-1	First field duplicate taken on 6/3/22.
FB-W-050222	Field blank associated with water samples collected on 5/2/22
TB-050311-2	Second Trip blank associated with samples shipped 5/3/11.

11.4 Sample Labeling

A non-removable label will be affixed to each sample container. Labels will be marked with permanent marker pens. The following information will be contained on each label:

- Project name;
- Sample identifier;
- Company (AECOM);
- Sample date and time;
- Sampler's initials;
- Sample preservation; and
- Analysis required.

11.5 Sample Chain of Custody

At the time of the sampling, a field team member will record the sample information in the field log book, well sampling form or drilling log, and on a COC form. The sample information recorded in the log books will be at least as detailed as that recorded on labels, and should indicate the type of sample (e.g., groundwater, soil), sample preservation, and sampling location, in sufficient detail as to allow re-sampling at the same location. Errors on forms or logbook entries will be stricken with a single line and corrected, with the date and initials of the person making the correction.

After samples are collected, the field team member will immediately place the filled containers in coolers and iced to 4 degrees Celsius (^{o}C). Samples will be preserved as required and specified in the QAPP. The field team will maintain custody of the samples until they are shipped to the laboratory. The entries on the COC form will correspond to the field logbook, standard forms, and sample labels.

Original copies of COCs will be forwarded to the laboratory. A copy (or photo) of the COC and associated shipping air bills will be maintained by the Field Supervisor with all other documentation until provided to the Project Manager. Copies will be filed by the Project Manager or designated representative on a weekly basis (at a minimum) in the project file for permanent storage.

11.6 Sample Packaging and Shipping

Samples collected for laboratory analysis will be shipped by a commercial overnight delivery service to the laboratory on the day of collection (if possible; otherwise, samples will be shipped on the day after collection), following proper identification, COC, preservation, and packaging procedures. Samples which require maintenance at 4^{o} C (essentially all aqueous and non-aqueous samples submitted for chemical analysis) which are collected and shipped on a Friday must be delivered to, and accepted by, the laboratory on Saturday; note that it may be necessary to arrange this in advance.

Sample packaging and shipping procedures are summarized as follows:

A properly completed COC form will be placed in a Ziplock bag and taped inside the cooler to accompany each sample shipment. The sample identifiers will be listed on the COC form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. The field team leader will retain a copy or photo of the completed COC. This record documents transfer of custody of samples from the sampler to another person, to the laboratory, or to/from a secure storage area.

Shipping containers will have any drains taped shut and be lined with a lab provided plastic bag or garbage bag for secondary containment. Samples will be properly packaged to avoid breakage, stored on ice at 4^{o} C for shipment and dispatched to the appropriate laboratory for analysis. (In the event that

samples must be held overnight prior to shipment, the temperature of the cooler and presence of sufficient ice will be checked, and new ice added prior to shipment.) Once the shipping container is packed, signed custody seals will be affixed in two locations to the cooler and covered with clear plastic tape. The cooler will be taped shut with strapping tape in at least two locations.

Samples will be transported to the laboratory by a commercial overnight carrier (e.g., FedEx) unless other arrangements are made on a project-specific basis (e.g., laboratory courier sample pickup; or hand delivery of samples to the laboratory by AECOM personnel).

11.7 Emerging Contaminant Packaging, Shipping, and Laboratory Considerations

PFAS samples will be sampled first, using only HDPE bottles and lids and then segregated in a separate cooler and delivered to Eurofins Laboratories, Inc. (Eurofins) a NYSDOH ELAP approved analytical laboratory. Standard laboratory turn-around time [28 business days] will be requested.

EPA Draft Method 1633 is the method that will be used during this investigation for environmental samples due to its ability to achieve very low detection limits. A list of the 40 PFAS compounds that will be reported and their associated soil and groundwater reporting limits and method detection limits is presented in Table 2-2 of the QAPP (Appendix F).

The reporting limit for 1,4, dioxane in groundwater should be no higher than 0.35 ug/l (ppb) and no higher than 0.1 mg/kg (ppm) in soil. EPA Method 8270 SIM will be used for samples to be analyzed for 1,4-dioxane during this SC/RI. Additionally, Eurofins has stated that they can achieve a method detection limit of 0.28 µg/L for 1,4-dioxane in groundwater. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane and in soil and already has an established SCO.

Quality control samples e.g., equipment blank, ambient blank, will be collected as summarized in Table 3-2. Equipment and ambient blanks will be collected with PFAS-free water supplied by the laboratory.

The laboratory will provide the results in an ASP Category B equivalent data deliverable. A DUSR will be prepared by a qualified data validator for all data acquired and included with the SC/RI Report. All data from this sampling event will be uploaded to the NYSDEC EQuIS database.

12. Additional Work Plan Documents

Two companion documents have been prepared to detail the methods and procedures to be used during the RI. Each of the documents is included as an Appendix to this SC/RIWP.

12.1 Quality Assurance Project Plan

In addition to this SC/RIWP, a Site-specific QAPP has been developed for use on this project (Appendix F). The QAPP identifies the quality assurance objectives for the measurement data, the QA/QC procedures to be used in the field, the sample COC methods to be used, and the analytical procedures to be followed. The QAPP will also include a description of the manner in which each type of data is to be used.

12.2 Site-specific Health and Safety Plan

An updated site-specific HASP will be prepared to outline health and safety risks and procedures for all Site workers and visitors. The HASP will include information regarding physical, chemical, and radiological hazards at the Site, emergency procedures and contact information, incident reporting procedures, and the route to the hospital. An example HASP including the minimum requirements to be followed for this investigation project is provided in Appendix G. At a minimum, the HASP will be updated annually throughout the duration of the project or as warranted based on any new information. As an addendum to the HASP, the site-specific RPP will be provided with AECOM's reciprocity request.

13. Community Participation Activities

Citizen participation activities will be completed in accordance with DER-23 Citizen Participation Handbook for Remedial Programs (2010). A Site Contact List has been developed (provided to NYSDEC under separate cover) and a local document repository has been established.

A CPP for the Site has been developed and issued to NYSDEC under separate cover.

Community outreach efforts will be initiated as directed by the NYSDEC, or if interest from the public suggests the need. The outreach efforts may consist of the issuance of Fact Sheets and Public Meetings. The community outreach activities will be patterned to meet the needs of the community.

14. Project Schedule and Deliverables

14.1 Schedule

The initial RI activities described in this SC/RIWP will begin following acceptance of the final draft SC/RIWP by the NYSDEC and NYSDOH. Planning and coordination of RI activities will be initiated within 30 days following work plan approval. RI field activities are anticipated to commence in fall/winter 2023. Every effort will be made to complete all field sampling activities before winter weather conditions prevent continued work. Analytical laboratory data for work completed in 2023 are anticipated to be received by the spring of 2023, with submittal of an SC/RI Report within approximately 60 days thereafter. Changes to the schedule may occur due to unforeseen circumstances, weather delays, etc.

14.2 Remedial Investigation Report

Upon completion of the field activities, an RI Report will be prepared to document the findings of the investigations performed at the Site. The report will be consistent with the requirements presented in DER-10 [NYSDEC, 2011] and will include:

- An executive summary;
- A Site description and history;
- Summary information regarding previous investigations performed at the Site;
- Descriptions of all field activities performed;
- A summary of all field observations, field measurements, and laboratory analytical data summarized in tabular format;
- Plan view and cross-section figures presenting laboratory analytical data and field observations of surface and subsurface soil and groundwater impacts;
- Sediment volume estimates (quantities, and thickness) for each identified material within the Tank
- An integration of field observations and measurements with laboratory analytical data to evaluate the nature and extent of impacts;
- An updated conceptual site model;
- A set of conclusions for the investigation; and
- Recommendations.

The RI Report will be reviewed and approved by a qualified environmental professional. The report and Site data will be prepared and organized such that it can be used for the evaluation of remedial alternatives for the Site, as necessary. If appropriate, recommendations for additional Site activities will be furnished.

15. References

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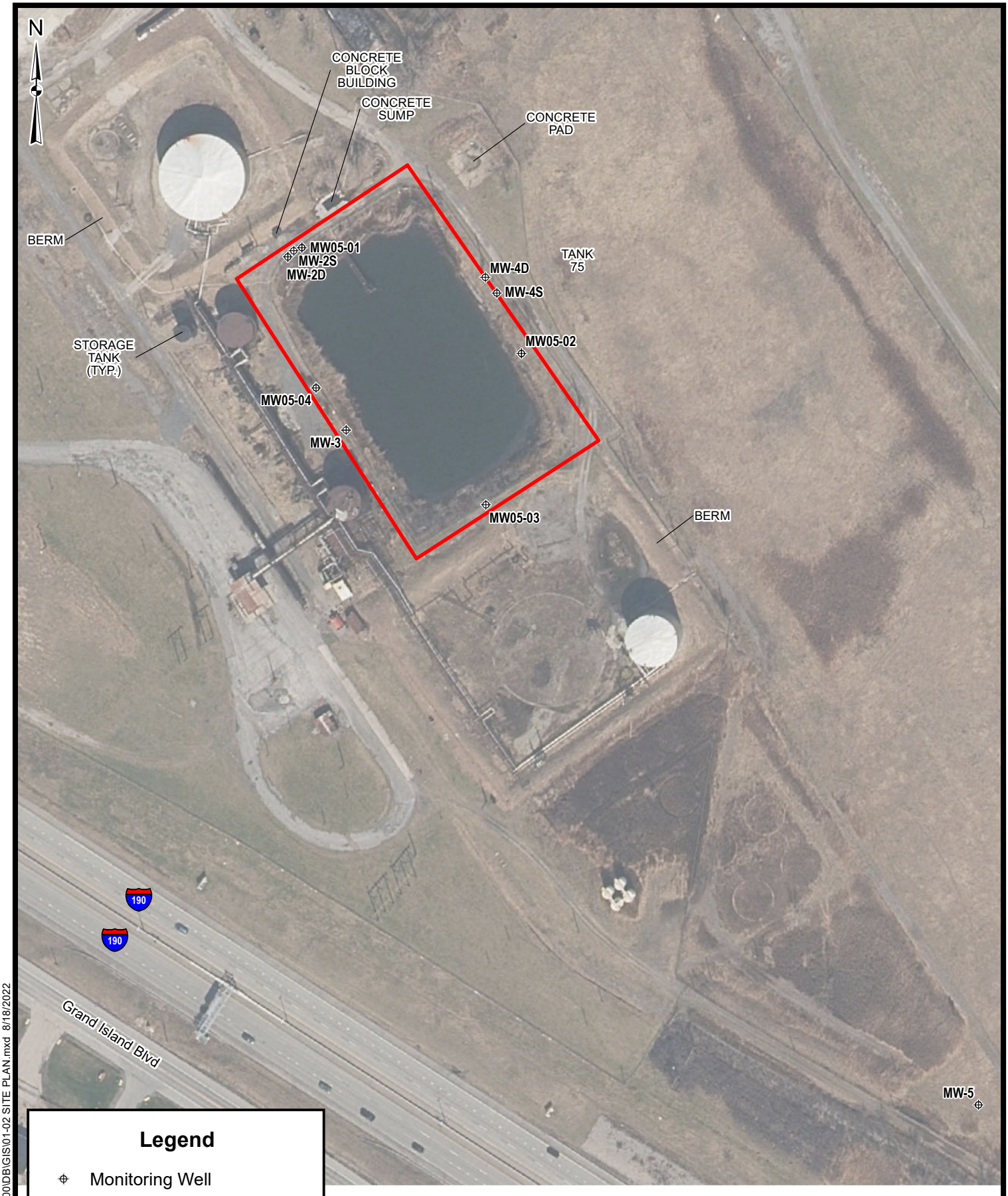
FIGURES

L:\DCS\Projects\37679411.00000\DB\GIS\01-01 SITE LOCATION.mxd 7/19/2022

AECOM

ASHLAND TANK 75
TOWN OF TONAWANDA, NEW YORK
SITE LOCATION

FIGURE 1-1



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AECOM

ASHLAND TANK 75
TOWN OF TONAWANDA, NEW YORK
SITE PLAN

FIGURE 2-1

Source:
NYS ITS GIS Program Office, 2021

1,000 0 1,000 Feet

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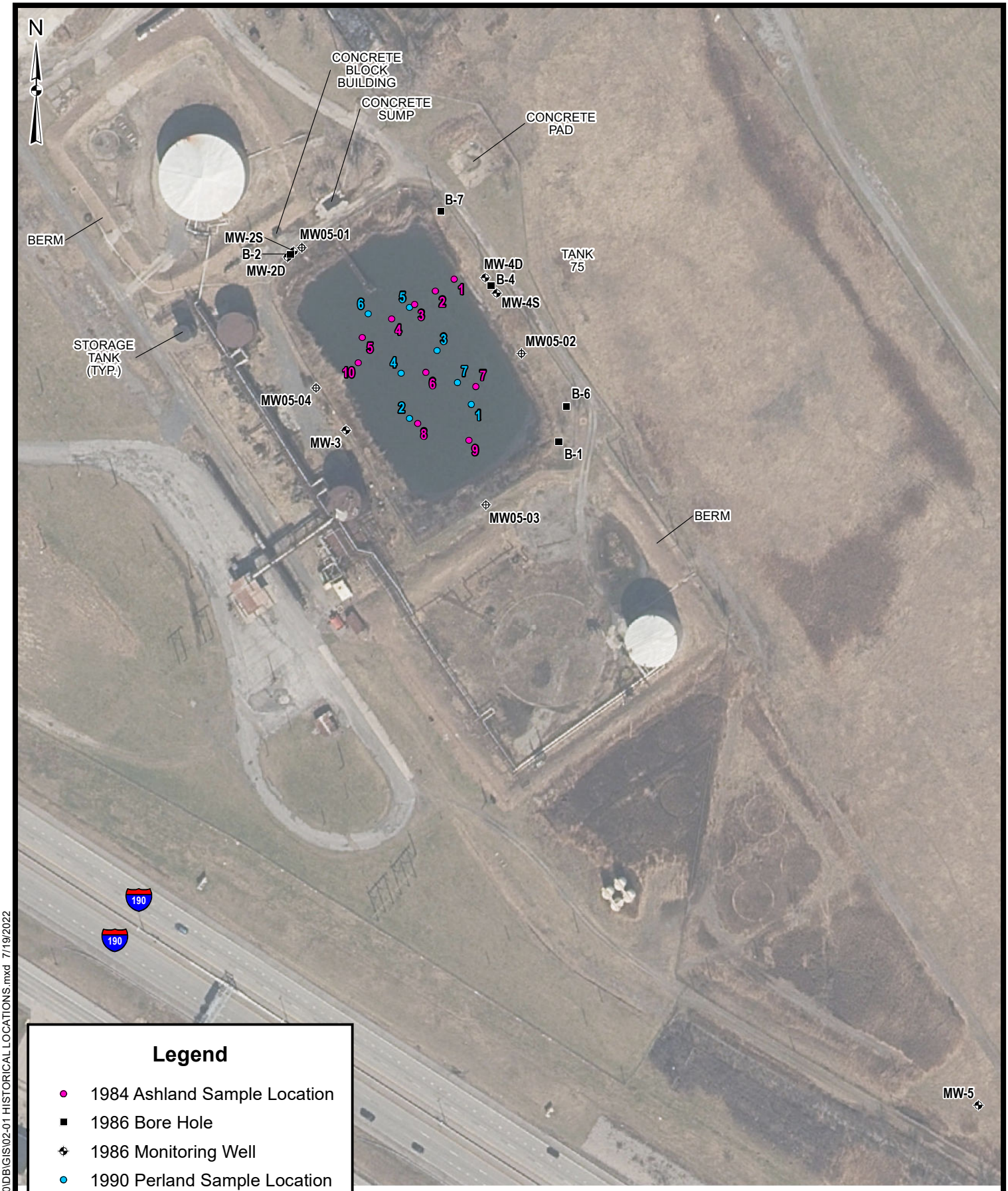
AECOM

ASHLAND TANK 75
TOWN OF TONAWANDA, NEW YORK
TAX PARCELS

FIGURE 2-2



AECOM

ASHLAND TANK 75
TOWN OF TONAWANDA, NEW YORK
HISTORICAL LOCATIONS

FIGURE 2-3

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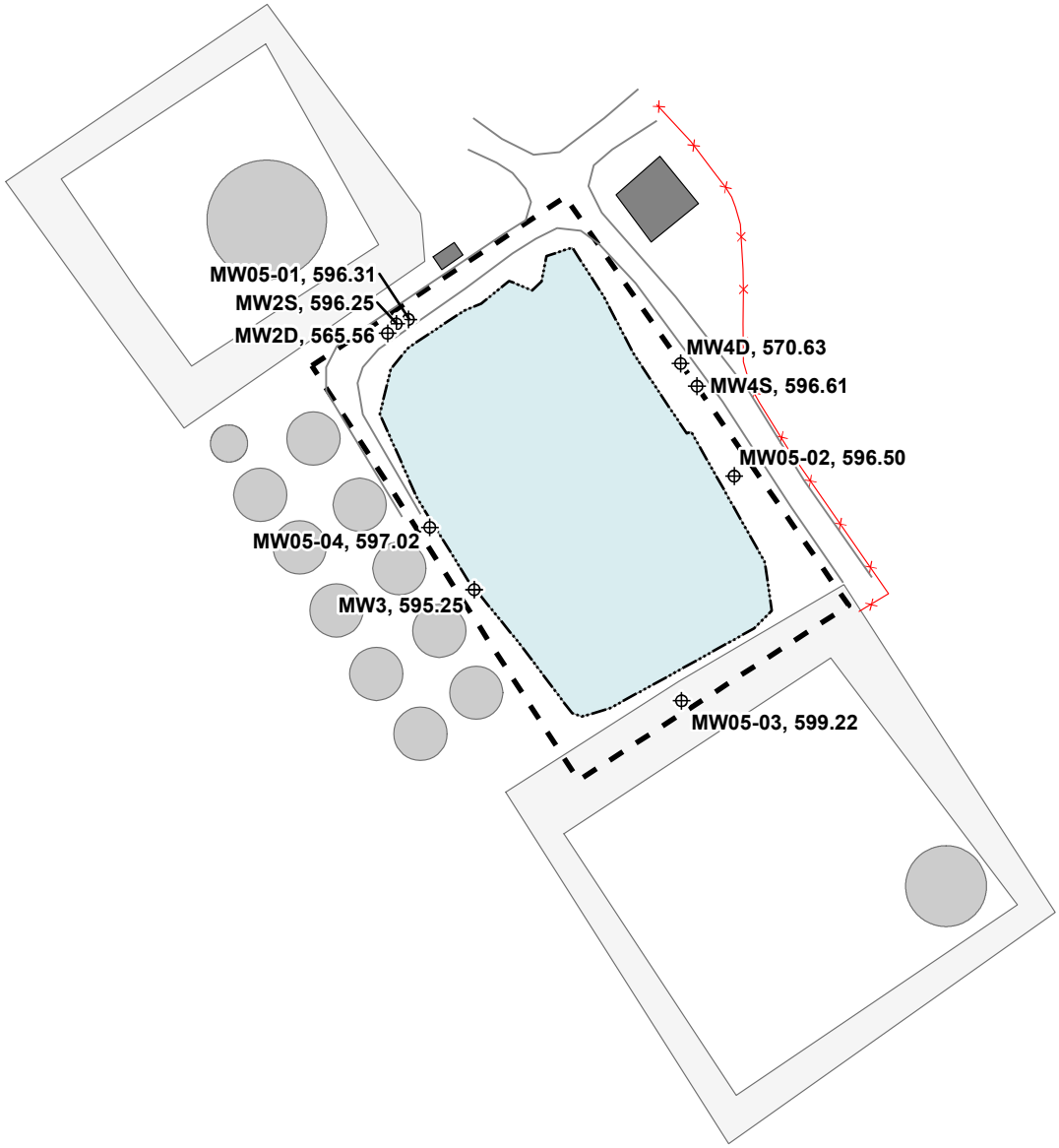

Legend

Monitoring Well

MW4D, 570.63

Location ID

Groundwater Elevation (ft amsl)

Notes:
ft amsl = feet above mean sea level

150 0 150 Feet

AECOM

ASHLAND TANK 75
TOWN OF TONAWANDA, NEW YORK
GROUNDWATER ELEVATIONS
(JANUARY 29, 2018)

FIGURE 2-4

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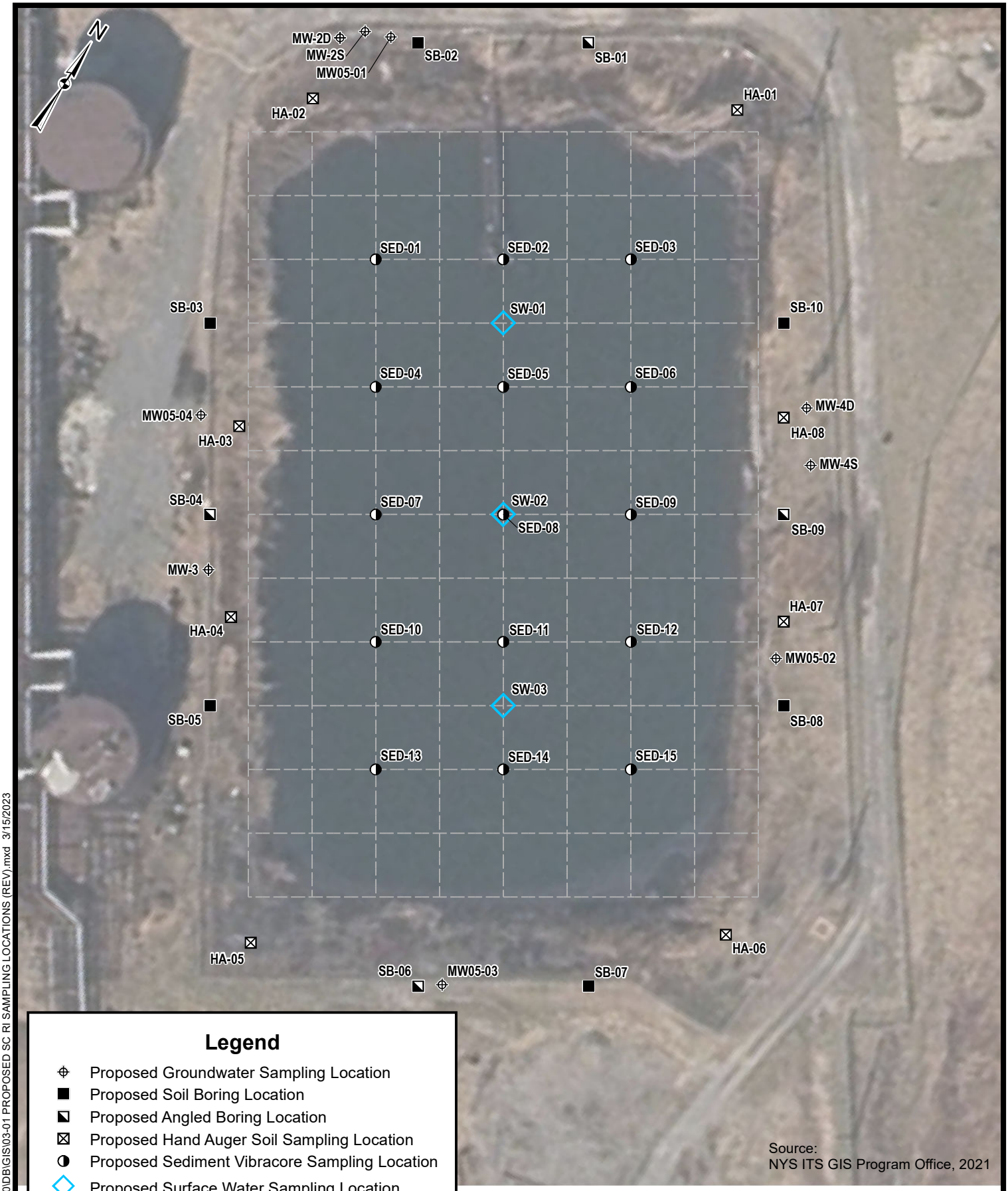

L:\DCS\Projects\376794110.00000\DB\GIS\03-01 PROPOSED SC RI SAMPLING LOCATIONS (REV).mxd 3/15/2023

AECOM

ASHLAND TANK 75
TOWN OF TONAWANDA, NEW YORK
PROPOSED SC/RI SAMPLING LOCATIONS

FIGURE 3-1

TABLES

Table 2-1
Groundwater Monitoring Well Construction Details
Ashland Tank 75 Site
Tonawanda, NY

Well Name	Well Installer	EDI Well Name	Date Installed	Top of Casing (amsl)	Ground Surface (amsl)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Boring Depth (ft bgs)
MW-2S	EDI	MW-2-86-S	9/17/1986	600.44	597.3	19.0	29.0	32.8
MW-2D	EDI	MW-2-86-D	9/17/1986	598.08	597.2	30.5	35.5	35.5
MW-3	EDI	MW-3-86	9/18/1986	599.20	596.9	17.5	27.5	29.9
MW-4S	EDI	MW-4-86	NL	600.01	599.0	14.0	24.0	25.6
MW-4D	EDI	NL	NL	598.82	598.1	29.0	34.0	NL
MW-5	EDI	MW-5-86, MW-1 upgradient	9/18/1986	604.98	603.1	17.0	27.0	29.0
MW05-01	URS/EDI	NA	9/2/2005	600.32	597.5	2.8	22.8	22.8
MW05-02	URS/EDI	NA	9/6/2005	600.83	598.1	3.0	23.0	24.3
MW05-03	URS/EDI	NA	9/2/2005	606.98	604.1	3.0	28.0	29.0
MW05-04	URS/EDI	NA	9/6/2005	599.50	596.5	3.0	23.0	23.5

EDI - Earth Dimensions, Inc.
ft - feet
amsl - above mean sea level
bgs - below ground surface
NA - Not Applicable
NL - Not Located
URS - URS Corporation

Table 3-1

Proposed Sampling Locations and Rationale
Ashland Tank 75 Site
Tonawanda, NY

Locations/Sample IDs	Type of Samples to be Collected	Area of Sample	Rationale
SB-1 through SB-10	surface soil/subsurface soil	North, South, East, and West of Tank 75 around the perimeter of the tank, with 3 soil borings each on the long (300') sides of the tank and 2 soil borings each on the short (200') sides of the tank. One boring on each side of the tank will be attempted as an angle boring to collect samples from as near the bottom of the structure as possible.	Collect soil information from surface and subsurface outside the gunite liner as close to the tank as a Geoprobe can access safely. Drill to the approximate bottom depth of the tank and confirm the presence/absence of constituents of concern. Four soil borings will be attempted as angled borings to target soil sample collection immediately below the bottom of the flat portion of the gunite lined structure. Evaluate the areal and vertical extent of contamination.
HA-1 through HA-8	surface soil/subsurface soil	North, South, East, and West of Tank 75 around the perimeter of the tank, with 2 locations on each side	Collect additional soil information from surface soil and attempt additional information from the shallow subsurface (i.e., 1-4 ft) immediately outside the gunite liner and closer to the edge of the gunite liner than the geoprobe may be able to access. Evaluate the areal and vertical extent of contamination.
MW-2S; MW-2D; MW-3; MW-4S; MW-4D; MW05-01; MW05-02; MW05-03; MW05-04	groundwater	Around the perimeter of Tank 75	Collect a new round of groundwater samples from the wells around the perimeter of Tank 75 to assess the current state of groundwater at the Site. The last time these wells were sampled was in 2018.
SW-1 (shallow, intermediate, deep)	surface water	Three evenly spaced sample depths (i.e., shallow, intermediate, deep) collected from the center of Tank 75.	Collect additional surface water data to characterize water in the structure.
SED-1 through SED-15	sludge/sediment	A grid of 15 locations spaced approximately 25 feet apart and covering the bottom of the tank, one sample from each type of sediment material encountered, estimated 1 per location.	Collect additional sludge and sediment information to characterize the tank settlement materials for both investigation and waste characterization purposes. Information collected will be used to support the design and implementation of remedial actions.

SB - Soil Boring
HA - Hand Auger
MW - Monitoring Well
SW - Surface Water
SED - Sediment

Table 3-2
Proposed Sampling Matrix
Ashland Tank 75 Site
Tonawanda, NY

	Parameters																																												
	Soils(3) (4)							Groundwater								Surface Water								Sediment								Sediment Waste Characterization													
	TCL VOCs + TICs (8260C)	TCL SVOCs + TICs (8270D)	PFAS(5) (1633)	1,4-Dioxane(5) (8270D)	PCBs (8082A)	Pesticides (8081A)	TAL Metals + Cn (6010C, 7471B, 9012B)	TCL VOCs +TICs (8260C)	TCL SVOCs +TICs (8270D)	PFAS (1633)	1,4-Dioxane (8270D SIM)	PCBs (8082A)	Pesticides (8081A)	TAL Metals + Cn (6010C, 7471B, 9010C)	Dissolved TAL Metals + Cn (6010C, 7471B, 9012B)	TCL VOCs +TICs (8260C)	TCL SVOCs +TICs (8270D)	PFAS (1633)	1,4-Dioxane (8270D SIM)	PCBs (8082A)	Pesticides (8081A)	TAL Metals + cyanide (6010C, 7471B, 9012B)	Disolved TAL Metals + Cn (6010C & 7470A)	TCL VOCs +TICs (8260C)	TCL SVOCs +TICs (8270D)	PFAS (1633)	1,4-Dioxane (8270D)	PCBs (8082A)	Pesticides (8081A)	TAL Metals + Cn (6010C, 9010C, & 7471B)	TOC (9060A)	TCLP VOCs (8260C)	TCLP SVOCs (8270D)	TCLP Metals (6010C & 7470A)	TCLP Pesticides (8081A)	TCLP Herbicides (8151)	Corrosivity (9045)	Ignitability/ Burn Rate (1030)	Reactivity (Cyanide/ Sulfide) (9012A/ 9034)	Ethylene Glycol (8015)	BTU	TEPH	pH (SM 4500)	Paint Filter Test	Viscosity
MW-2S								1	1	1	1	1	1	1	1																														
MW-2D								1	1	1	1	1	1	1	1																														
MW-3								1	1			1	1	1	1																														
MW-4S								1	1			1	1	1	1																														
MW-4D								1	1			1	1	1	1																														
MW05-01								1	1	1	1	1	1	1	1																														
MW05-02								1	1			1	1	1	1																														
MW05-03								1	1			1	1	1	1																														
MW05-04								1	1	1	1	1	1	1	1																														
SB-01	2	3	2	2	3	3	3																																						
SB-02	2	3			3	3	3																																						
SB-03	2	3			3	3	3																																						
SB-04	2	3	2	2	3	3	3																																						
SB-05	2	3			3	3	3																																						
SB-06	2	3			3	3	3																																						
SB-07	2	3	2	2	3	3	3																																						
SB-08	2	3			3	3	3																																						
SB-09	2	3			3	3	3																																						
SB-10	3	3			3	3	3																																						
HA-01	1	2	1	1	2	2	2																																						
HA-02	1	2			2	2	2																																						
HA-03	1	2			2	2	2																																						
HA-04	1	2			2	2	2																																						
HA-05	1	2	1	1	2	2	2																																						
HA-06	1	2			2	2	2																																						
HA-07	1	2			2	2	2																																						
HA-08	1	2			2	2	2																																						
SED - 01																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 02																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 03																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 04																								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 05																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 06																								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 07																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 08																								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 09																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 10																								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 11																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 12																								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 13																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 14																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SED - 15																								1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SW-01																3	3	1	1	3	3	3	3														3	3	3	3	3	3	3		3
Monitoring Subtotal	**29**	**46**	**8**	**8**	**46**	**46**	**46**	**9**	**9**	**4**	**4**	**9**	**9**	**9**	**9**	**3**	**3**	**1**	**1**	**3**	**3**	**3**	**3**	**15**	**15**	**5**	**5**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**15**	**18**
QA/QC																																													
Duplicates (1)	3	5	1	1	5	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Matrix Spike (1)	2	3	1	1	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Matrix Spike Duplicate (1)	2	3	1	1	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trip Blanks	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rinse Blank (2)	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Per Sampling Event	**38**	**59**	**13**	**13**	**59**	**59**	**59**	**15**	**13**	**8**	**8**	**13**	**13**	**13**	**13**	**8**	**7**	**5**	**6**	**7**	**7**	**7**	**7**	**20**	**20**	**9**	**9**	**20**	**20**	**20**	**18**	**15**	**15**	**15**	**15**	**15**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**15**	**18**

Notes:

(1) Duplicates will be collected at a rate of 1 per 10 samples. Matrix Spike and Matrix Spike Duplicate samples will be collected at a rate of 1 per 20 samples.

(2) Rinse Blanks for PFAs will be taken on a basis of once per day per media or 1 per 20 samples. Other rinse blanks will be taken on a basis of 1 per week per media or 1 per 20 samples.

(3) Sample intervals for SB-01 through SB-10:
- a. Surface Soil sample: 0-2" (excluding VOCs analysis)
- b. 1 from Subsurface Soil samples: Interval above water table exhibiting greatest indication of contamination. If no visible sign of contamination is present, collect sample from interval directly above the water table.
- c. 1 from Interval directly below the bottom of the gunnite layer (estimated 26 ft bgs).

(4) Sample intervals for HA-01 through HA-08:
- a. Surface Soil sample: 0-2"
- b. 1 from Subsurface Soil samples: Interval above water table exhibiting greatest indication of contamination. If no visible sign of contamination is present, collect sample from 3-4 ft bgs.

(5) For select sampling locations, one surface soil and one subsurface soil sample will be analyzed for PFAS and 1,4-dioxane.

MW - Monitoring Well
SB - Soil Boring
SW - Surface Water
SED - Sediment
TCL - Target Compound List
TAL - Target Analyte List

TICs - tentatively identified compounds
PFAS - per-and polyfluoroalkyl substances
PCB - polychlorinated biphenyls
TCLP - Toxicity Characteristic Leaching Procedure
bgs - below ground surface
CN - cyanide

TOC - total organic carbon
QA/QC - quality assurance/quality control
BTU - British Thermal Unit
TEPH - Total Extractable Petroleum Hydrocarbons
TCL VOC + TICs - Target Compound List volatile organic compounds plus 10 highest TICs
TCL SVOC + TICs - Target Compound List semi-volatile organic compound plus 20 highest TICs

APPENDICES

APPENDIX A

Summary of Historical Analytical Data, Field Forms, and Reference Information

DIMENSIONS, INC.

Test Borings and Logs
East Aurora, New York 14052 • (716) 655-1717

MONITORING WELL 2-86 SURF. ELEV. _____

PROJECT Sampling & monitoring well installation LOCATION Northwest side of lagoon #75
3I86 Lagoon #75, Town of Tonawanda, NY facility
CLIENT ASHLAND PETROLEUM COMPANY DATE STARTED 9/16/86 COMPLETED 9/17/86

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL 2D	WATER TABLE & REMARKS	WELL 2S
	1	4	4	4	5	8	Extremely moist mixed black and brown (SILTY-CLAY) fill, soil pores filled with black oily liquid, firm, (CL) 0.5	Four (4) inch inside diameter PVC riser pipe	Clayey soil fill to 5.0 feet over clayey soil fill and possibly topsoil to 6.5 feet over clayey lake sediment to end of boring.	Four (4) inch inside diameter PVC riser pipe
	2	4	6	7	10	13	Moist brown (SILTY-CLAY) fill with 2 to 5% fine size gravel, stiff, massive soil structure, (CL)			
							- - - clear transition to - 4.0			
5	3	2	2	4	7	6	Extremely moist brown (SILTY-CLAY) fill with 2 to 5% fine size gravel, firm, massive soil structure, (CL) 5.0			
	4	5	7	12	20	19	Extremely moist dark gray silty clay loam (CLAYEY-SILTY) fill and possibly topsoil, stiff, few fine nearly vertical roots, granular soil structure, (CL) 6.5			
									8.0	Cement-bentonite grout
	5	6	13	19	25	32	Moist faintly mottled brown (SILTY-CLAY) with 2 to 5% mostly weathered gravel, very stiff, with nearly vertical gray desiccation cracks, (CL)		(1) Bentonite pellet seal	(1
10							- - - grades downward to - 8.5		10.0	
	6	10	20	30	38	50	Moist faintly mottled brown (SILTY-CLAY) with 2 to 5% mostly fine size gravel, hard, weak thinly laminated with nearly vertical gray desiccation cracks, (CL)			
	7	6	15	18	37	33				
							- - - grades downward to - - 14.0			
	8	3								
15		11				27	Moist faintly mottled brown (SILTY-CLAY) with 2 to 5% mostly fine size gravel, very stiff, weak thinly laminated with nearly vertical gray desiccation cracks, (CL)			
			16	21						
	9	4	8	15		23				#2 size sand

Continued on sheet 2.

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

bs LOGGED BY Dale M. Gramza/Geologist
Donald W. Owens/Soil Scientist

DIMENSIONS, INC.

Test Borings and Logs
East Aurora, New York 14052 • (716) 655-1717

MONITORING WELL 2-86 continued

SURF. ELEV. _____

PROJECT Sampling & monitoring well installation LOCATION Northwest side of lagoon #75
3I86 Lagoon #75, Town of Tonawanda, NY facility

CLIENT ASHLAND PETROLEUM COMPANY DATE STARTED 9/16/86 COMPLETED 9/17/86

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	16/24	N	DESCRIPTION & CLASSIFICATION
	9				18		Moist faintly mottled brown (SILTY-CLAY) with 2 to 5% mostly fine size gravel, very stiff, weak thinly laminated with nearly vertical gray desiccation cracks, (CL)
	10	3					
			8				
				15		23	
20					17		
	11	3					
			7				
				14		21	
					16		- - - - - grades downward to -22.0
	12	4					
			8				
				18		26	Extremely moist grayish brown (SILTY-CLAY) with 2 to 5% fine size gravel, very stiff, thinly laminated with nearly vertical gray desiccation cracks, (CL)
					21		
	13	4					
25			8				
				14		22	
					16		- - - - - grades downward to -26.0
	14	4					Wet alternating pink and brownish gray (SILTY-CLAY), stiff, thinly laminated with very thin coarse silt lenses, (CL)
			7				
				7		14	
					8		
	15	5					- - - - - grades downward to -28.0
			4				
				4		8	
30					7		
	16	2					Wet alternating pink and brownish gray (SILTY-CLAY), firm, thinly laminated with very thin coarse silt lenses, (CL)
			4				
				4		8	
					5		
	17	2					
			2				
				3		5	
					3		
	18	2					
35			3				

WELL 2D: #10 slotted PVC screen; #2 size sand; Four (4) inch inside diameter PVC riser pipe; Cement-bentonite grout; (1)

WATER TABLE & REMARKS: 25.9; 28.2; 30.5

(1) Bentonite pellet seal.

(2) Four (4) inch inside diameter PVC riser pipe

WELL 2S: (2); 19.0; #10 slotted PVC screen; 29.0; #2 size sand; 30.0

Continued on sheet 3.

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

Dale M. Gramza/Geologist
bs LOGGED BY Donald W. Owens/Soil Scientist

DIMENSIONS, INC.

Test Borings and Logs
East Aurora, New York 14052 • (716) 655-1717

MONITORING WELL 2-86 continued SURF. ELEV. _____

PROJECT Sampling & monitoring well installation LOCATION Northwest side of lagoon #75
3I86 Lagoon #75, Town of Tonawanda, NY facility

CLIENT ASHLAND PETROLEUM COMPANY DATE STARTED 9/16/86 COMPLETED 9/16/86

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL 2D	WATER TABLE & REMARKS
	18			2		5	Wet alternating pink and brownish gray (SILTY-CLAY), firm, thinly laminated with very thin coarse silt lenses, (CL)	(3)	35.5
					2			(4)	36.0
							Boring completed at 36.0 feet.		
40									
45									
50									

(3) #10 slotted PVC screen

(4) #2 size sand

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

bs LOGGED BY Dale M. Gramza/Geologist
Donald W. Owens/Soil Scientist

SHEET 3 OF 3

EARTH DIMENSIONS, INC.

Test Borings and Logs
East Aurora, New York 14052 • (716) 655-1717

MONITORING WELL 3-86 SURF. ELEV. _____

PROJECT Sampling & monitoring well installation LOCATION Southwest side of lagoon #75
3I86 Lagoon #75, Town of Tonawanda, NY facility

CLIENT ASHLAND PETROLEUM COMPANY DATE STARTED 9/17/86 COMPLETED 9/18/86

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
	1	3	4	5	4	9	Moist mixed black and brown (SILTY-CLAY) fill, stiff, blocky soil structure, black oily liquid outlining soil structure, (CL)		Clayey soil fill to 6.0 feet over clayey lake sediment to end of boring.
	2	3	2	5	5	7	3.0		
5	3	4	4	5	8	9	Moist faintly mottled reddish brown (SILTY-CLAY) fill with 2 to 5% gravel, stiff, weak blocky soil structure, (CL) 6.0		
	4	4	8	12	20	20		Cement-bentonite grout	8.0
	5	4	9	13	17	22	Moist brown (SILTY-CLAY) with 5 to 10% gravel, very stiff with nearly vertical gray desiccation cracks, noticed black residue in desiccation crack between 6.0-8.0 foot depth, (CL)	(1)	(1) Bentonite pellet seal
10	6	4	8	13	17	21			10.0
	7	2	7	14	18	21		Four (4) inch inside diameter PVC riser pipe	
15	8	3	8	11	19	19		#2 size sand	
	9	5	9	13	19	22			Continued on sheet 2. 17.5

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

bs LOGGED BY Dale M. Gramza/Geologist
Donald W. Owens/Soil Scientist

SHEET 1 OF 2

EARTH DIMENSIONS, INC.

Test Borings and Logs
East Aurora, New York 14052 • (716) 655-1717

MONITORING WELL 3-86 continued SURF. ELEV. _____

PROJECT Sampling & monitoring well installation LOCATION Southwest side of lagoon #75
3I86 Lagoon #75, Town of Tonawanda, NY facility
CLIENT ASHLAND PETROLEUM COMPANY DATE STARTED 9/17/86 COMPLETED 9/18/86

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
	9				20		Moist brown (SILTY-CLAY) with 5 to 10% gravel, very stiff with nearly vertical gray desiccation cracks, (CL)		17.5
	10	4							
			8			16			
				8					
20					15				
	11	3					- - - grades downward to -20.0		
			5				Moist brown (SILTY-CLAY) with 5 to 15% gravel, stiff, weak thinly laminated, (CL)		
				8		13			
					12				
	12	2					- - - grades downward to -22.0		
			3				Extremely moist grayish brown (SILTY-CLAY) with 2 to 5% fine size gravel, firm, thinly laminated, (CL)		
				5		8			
					6				
	13	2					- - -grades downward to - 24.0		
25			2				Wet alternating pink and grayish brown (SILTY-CLAY), firm, thinly laminated, with very thin coarse silt lense, (CL)		
				3		5			
					5				
	14	1					- - - grades downward to -26.0		
			2				Wet alternating pink and grayish brown (SILTY-CLAY), soft, thinly laminated with very thin coarse silt lenses, (CL)		
				2		4			
					4				
	15	2							
			2						
				2		4			
30					3				30.0
							Boring completed at 30.0 feet.		No water at completion.
35									

#10 slotted PVC screen
#2 size sand
27.5

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

bs LOGGED BY Dale M. Gramza/Geologist
Donald W. Owens/Soil Scientist

SHEET 2 OF 2

EARTH DIMENSIONS, INC.

Test Borings and Logs
East Aurora, New York 14052 • (716) 655-1717

MONITORING WELL MW1 5-86

SURF. ELEV. _____

PROJECT 3I86 Sampling & monitoring well installation Lagoon #75, Town of Tonawanda, NY

LOCATION Southeast portion of Ashland property facility

CLIENT ASHLAND PETROLEUM COMPANY

DATE STARTED 9/18/86 COMPLETED 9/18/86

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
	1	2	6	7	17	13	Moist brown gravelly (SILTY-CLAY) fill with 15 to 40% gravel and 5 to 15% slag, stiff to 2.0 feet, very stiff below, blocky soil structure to 1.0 feet, massive soil structure below, (CL)		Clayey soil fill to 3.5 feet over flyash to 4.0 feet over mostly clayey soil with flyash to 8.0 feet over clayey soil fill to 10.0 feet over clayey lake sediments to end of boring.
	2	8	10	17	18	27	3.5		
5	3	3	5	4	7	9	Extremely moist dark gray flyash, coarse silt and very fine sand size, dense, loose when disturbed 4.0		
	4	3	3	4	6	7	Extremely moist brown (SILTY-CLAY) fill with 2 to 5% fine size gravel, mixed with dark gray flyash, stiff, (CL) 8.0		
	5	2	5	11	19	16	Extremely moist faintly mottled brown gravelly (SILTY-CLAY) fill with 15 to 40% gravel, very stiff, mixed with <5% black (SILTY-CLAY), (CL) 10.0		
10	6	4	12	21	31	33	Moist faintly mottled brown (SILTY-CLAY) with 2 to 5% mostly fine size weathered gravel, hard with nearly vertical gray desiccation cracks, (CL)		
	7	5	16	24	29	40	- - - grades downward to - 12.0		
15	8	5	11	15	16	26	Moist reddish brown (SILTY-CLAY) with 2 to 5% fine size subangular gravel, hard to 14.0 feet, very stiff below, thinly laminated with nearly vertical desiccation cracks, (CL)		
	9	3	6	8		14	- - - grades downward to - 16.0		
							Extremely moist brown (SILTY-CLAY) with 2 to 5% fine size subangular gravel, stiff, thinly laminated with nearly vertical desiccation cracks, (CL)		

WELL: Four (4) inch inside diameter PVC riser pipe; Cement-bentonite grout; (1); #2 size sand; (2)

WATER TABLE & REMARKS: 8.0; 10.0; 17.0

(1) Bentonite pellets.

(2) 4" slotted screen

Continued on sheet 2.

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

Dale M. Gramza/Geologist

bs LOGGED BY Donald W. Owens/Soil Scientist

SHEET 1 OF 2

EARTH DIMENSIONS, INC.

Test Borings and Logs
East Aurora, New York 14052 • (716) 655-1717

MONITORING WELL MW1
5-86 continued

SURF. ELEV. _____

PROJECT 3I86 Sampling & monitoring well installation Lagoon #75, Town of Tonawanda, NY
LOCATION Southeast portion of Ashland property facility
CLIENT ASHLAND PETROLEUM COMPANY
DATE STARTED 9/18/86 COMPLETED 9/18/86

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
	9				11		Extremely moist brown (SILTY-CLAY) with 2 to 5% fine size subangular gravel, stiff, thinly laminated with nearly vertical desiccation cracks, (CL)		
	10	3							
			6			14			
				8					
20					11				
	11	1					- - - grades downward to - 20.0		
			3						
				4		7			
					5				
	12	3					Extremely moist alternaing pink and grayish brown (SILTY-CLAY), firm, thinly laminated with very thin coarse silt lenses, (CL)		Augered to 28.0 foot depth, sampled to 30.0 feet.
			4			7			
				3					WR- Sampler penetration wit weight of NW rods only.
					5				
	13	1							
25			2			5			
				3					WH- Sampler penetration with weight of NW rods and hammer.
					4				
							- - - grades downward to - 26.0		
	14	1					Wet alternating pink and grayish brown (SILTY-CLAY), firm, thinly laminated with very thin coarse silt lenses, (CL)		
			2			5			
				3					
					3				
							- - - grades downward to - 28.0		
	15	WR					Wet alternating pink and grayish brown (SILTY-CLAY), very soft, thinly laminated with very thin coarse silt lenses, (CL)		
			WH			WH			
				WH					
30					WH				
							Boring completed at 30.0 feet.		Water level at 29.0 feet below surface at completion.
35									

#10 slotted PVC screen
#2 size sand
30.0

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

bs LOGGED BY Dale M. Gramza/Geologist
Donald W. Owens/Soil Scientist

SHEET 2 OF 2

EARTH DIMENSIONS, INC.
Soil Investigations and Natural Resource Assessments
Roycroft Campus, 31 S. Grove St. • East Aurora, NY 14052 • (716) 655-1717

MONITORING WELL
HOLE NO. 2-87 continued SURF. ELEV. _____

PROJECT Monitoring well installation 3I86a Town of Tonawanda, New York
LOCATION Northern boring near River Road
CLIENT ASHLAND PETROLEUM COMPANY
DATE STARTED 3/6/87 COMPLETED 3/6/87

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
	9				1		Extremely moist, becoming faintly mottled below 16.0 foot depth olive gray silt loam (CLAYEY-SILT) with little fine size sand, occasional root with root channel coated black, very soft and soft, weak thinly laminated	4" PVC riser pipe	Note - Sample #5 petroleum discoloration and odor.
	10	WH							
			2			6			
				4					
20					4				
	11	1							20.5
			3			7			
				4					
					4				
	12	1							
			2			5			
				3					WH-Sampler penetration with weight of rods and hammer.
					6				
	13	WH							
25			1			3			
				2					WR-Sampler penetration with weight of rods only.
					2				
	14	WR							
			WH			WH			
				WH					
					2				
	15	WH							
			1			3			
				2					
30					2				
	16	WH							30.5
			1			2			
				1					
					2				32.0
							Boring completed at 32.0 feet.		
35									

4 inch PVC screen
Mixed #2 and #4 size sand

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

bls LOGGED BY Dale M. Gramza/Geologist
Donald W. Owens/Soil Scientist

SHEET 2 OF 2

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Soil Investigations and Natural Resource Assessments
Roycroft Campus, 31 S. Grove St. • East Aurora, NY 14052 • (716) 655-1717

MONITORING WELL #3
HOLE NO. 3-87 SURF. ELEV. _____

PROJECT Monitoring well installation LOCATION Northwest of tank 100
3I86a Town of Tonawanda, New York
CLIENT ASHLAND PETROLEUM COMPANY DATE STARTED 3/3/87 COMPLETED 3/4/87

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N
	1	2	3	5	7	8
2	2	2	8	13	22	21
5	3	6	13	20	22	33
	4	6	12	19	22	31
	5	5	10	15	18	25
10	6	5	11	16	19	27
	7	8	11	18	21	29
15	8	6	11	16	21	27
	9	3	7	11		18

DESCRIPTION & CLASSIFICATION

Wet dark gray gravelly silt loam (CLAYEY-SILT) fill with 15 to 40% crushed angular gravel, stiff 0.3

Moist distinctly mottled reddish brown (SILTY-CLAY) with 2 to 5% gravel, stiff, blocky soil structure

- - - grades downward to - 1.5

Moist faintly mottled reddish brown (SILTY-CLAY) with 2 to 5% fine size gravel, very stiff, with nearly vertical gray desiccation cracks, nearly vertical gray desiccation cracks are coated with silt, few fine roots in desiccation cracks

- - - grades downward to - 4.5

Moist reddish brown silty clay (CLAYEY-SILT) with 2 to 5% fine size gravel, hard with nearly vertical gray desiccation cracks, nearly vertical gray desiccation cracks are coated with silt, few fine roots in desiccation cracks

- - - grades downward to - 9.0

Moist reddish brown silty clay loam (CLAYEY-SILT) with 5 to 15% fine size subangular gravel, very stiff, weak thinly laminated with nearly vertical gray desiccation cracks, nearly vertical gray desiccation cracks are coated with silt, few fine roots in desiccation cracks

WELL

4 inch PVC riser pipe
Cement-bentonite grout 13.5
(1)
#2 size sand 15.0

WATER TABLE & REMARKS

Mostly soil fill to 0.3 feet over clayey lake sediments to 9.0 feet over silty reworked lake sediment to 22.0 feet over clayey lake sediments to end of boring.

(1) Bentonite pellet seal

Continued on sheet 2.

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

bls LOGGED BY Donald W. Owens/Soil Scientist SHEET 1 OF 2

EARTH DIMENSIONS, INC.
Soil Investigations and Natural Resource Assessments
Roycroft Campus, 31 S. Grove St. • East Aurora, NY 14052 • (716) 655-1717

MONITORING WELL

HOLE NO. 3-87 continued SURF. ELEV. _____

PROJECT Monitoring well installation LOCATION Northwest of tank 100
3I86a Town of Tonawanda, New York

CLIENT ASHLAND PETROLEUM COMPANY DATE STARTED 3/3/87 COMPLETED 3/4/87

DEPTH feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
	9				15		Moist reddish brown silty clay loam (CLAYEY-SILT) with 5 to 15% fine size subangular gravel, very stiff, weak thinly laminated with nearly vertical gray desiccation cracks, nearly gray desiccation cracks are coated with silt, few fine roots in desiccation crack	4 inch PVC riser pipe	
	10	4							
			6			19			
				13					
20					17				
	11	15							
			15			35			
				20					
					22				
	12	5					- - - - grades downward to -22.0		20.9
			6			14	Extremely moist in layers pink and grayish brown (SILTY-CLAY) stiff becoming firm below 26.0 foot depth, thinly laminated with very thin coarse silt lenses with one (1) nearly vertical gray desiccation crack between 22.0 to 23.0 foot depth, with fine to moderate size roots along desiccation crack		
				8					
					10				
	13	3							
25			5			10			
				5					
					6				
	14	3							
			4			8			
				4					
					8			4 inch slotted PVC screen	
	15	2							
			3			6			
				3					
30					4		- - - - - - grades downward to -30.0		
	16	1					Wet pink (SILTY-CLAY) with 2 to 5% mostly fine size subangular gravel, soft, thinly laminated with very thin coarse silt lenses		30.9
			2			4			
				2					
					4				
	17	WH							
			3			7			
				4					
					4				34.0
35							Boring completed at 34.0 feet.		

#2 size sand

WH - Sampler penetration with weight of the rods and hammer

Water level at 25.0 feet below ground surface at ~~8:30 AM on~~ 3/4/87 after augering to 27.0 feet on 3/3/8

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

blsLOGGED BY Donald W. Owens/Soil Scientist SHEET 2 OF 2

EARTH DIMENSIONS, INC.

Soil Investigations and Monitoring Well Installations

Roycroft Campus, 31 S. Grove St. • East Aurora, NY 14052 • (716) 655-1717

MONITORING WELL 4

HOLE NO. 4-87

SURF. ELV. _____

PROJECT Monitoring well installation

LOCATION Approximately 250' northwest of round tank structure #47

3I86a Town of Tonawanda, New York

CLIENT ASHLAND PETROLEUM COMPANY

DATE STARTED 3/5/87 COMPLETED 3/5/87

DEPTH FEET	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
	1	1	3	5	6	8	Frozen becoming wet below 0.2 foot depth gravelly silty clay loam (CLAYEY-SILT) fill with 15 to 40% crushed angular gravel, stiff, with abundant fine to coarse size roots 0.4		Mostly soil fill to 5.5 feet over clayey lake sediment to 12.0 feet over silty reworked lake sediment to 18.0 feet over clayey lake sediment to end of boring.
	2	2	5	6	8	11	Moist reddish brown (SILTY-CLAY) fill with 3 to 5% gravel, stiff, massive soil structure		
5	3	5	6	13	16	19	5.5		(1) Bentonite pellet seal
	4	4	9	16	21	25	Moist reddish brown silty clay (CLAYEY-SILT) with 2 to 5% mostly fine size gravel, very stiff, weak blocky soil structure	4 inch PVC riser pipe Cement-bentonite grout	
	5	5	12	15	21	27			
10	6	5	10	15	15	25	- - - - grades downward to - - - 12.0		
	7	4	6	11	12	17	Moist reddish brown silty clay loam (CLAYEY-SILT) with 5 to 15% mostly fine size gravel, very stiff, weak thinly laminated with apparent nearly vertical gray desiccation cracks, (none seen in samples 7-9)		13.5
15	8	2	6	11	13	17	- - - - grades downward to - - - 18.0	(1)	15.0
	9	2	5	10	15	15	Moist reddish brown silty clay (CLAYEY-SILT) with 3 to 5% mostly fine size gravel, stiff, weakly thinly laminated with silt coated nearly vertical gray desiccation cracks with some fine size roots, (CL)	#4 size sand	
	10	2	4	6	9	10	- - - - grades downward to - - - 20.0		
20									Continued on sheet 2.

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

LOGGED BY Donald W. Owens/Soil Scientist
Dale M. Gramza/Geologist

SHEET 1 OF 2

EARTH DIMENSIONS, INC.

Soil Investigations and Monitoring Well Installations

Roycroft Campus, 31 S. Grove St. • East Aurora, NY 14052 • (716) 655-1717

MONITORING WELL HOLE NO. 4-87 continued

SURF. ELV. _____

PROJECT Monitoring well installation

LOCATION Approximately 250' northwest of round tank structure #47

3I86a Town of Tonawanda, New York

CLIENT ASHLAND PETROLEUM COMPANY

DATE STARTED 3/5/87 COMPLETED 3/5/87

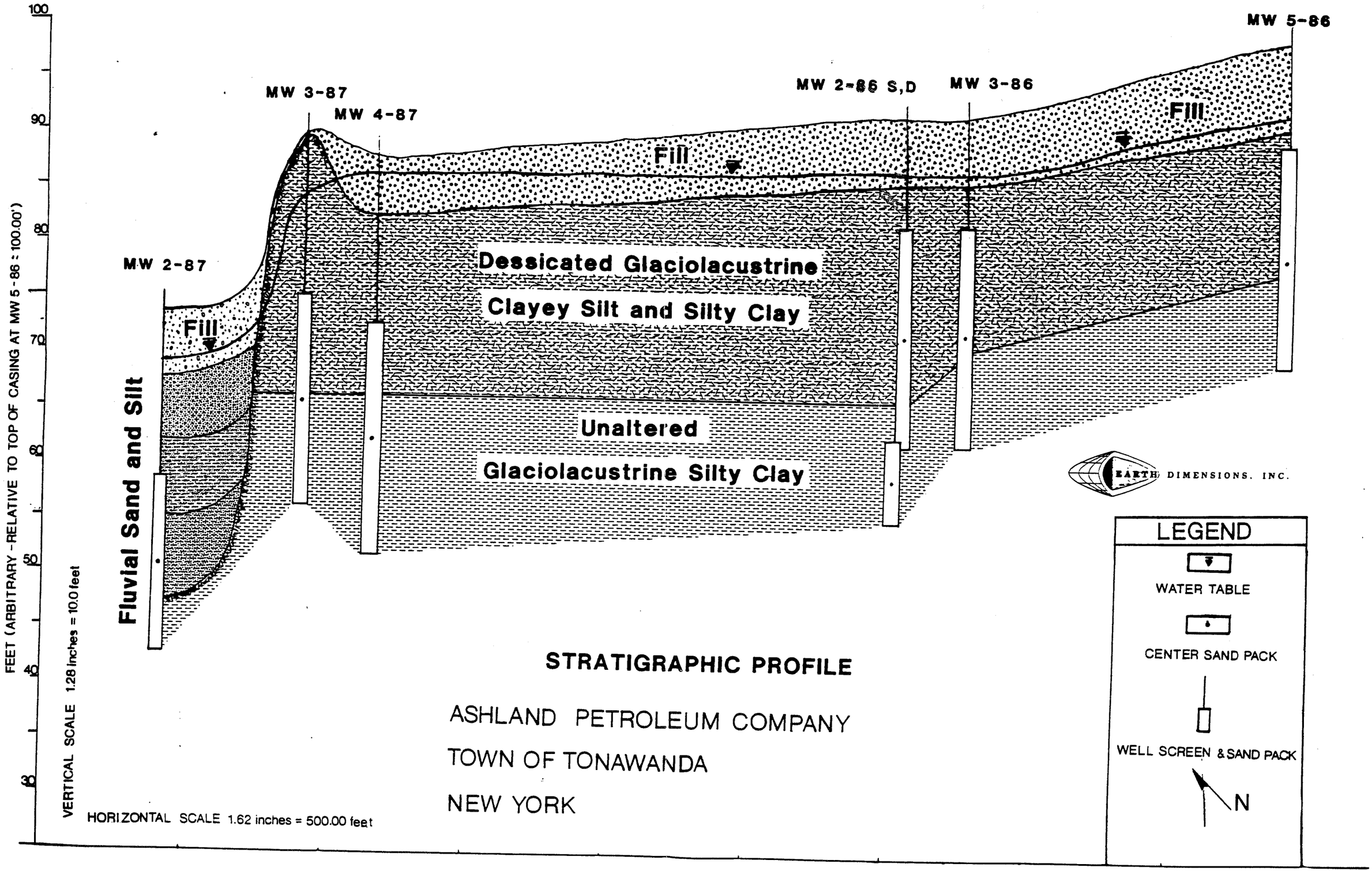
DEPTH FEET	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WELL	WATER TABLE & REMARKS
	11	3	3	6	6	9	Extremely moist in layers pink and grayish brown (SILTY-CLAY), noticed several fine size gravels below 24.0 foot depth, stiff becoming firm below 22.0 foot depth, thinly laminated with very thin coarse silt lenses, (CL)	4 inch riser pipe; #4 size sand	22.5
	12	3	3	4	6	7			24.0
25	13	4	3	4	6	7			
							- - - - - grades downward to - - - - - 26.0		
	14	7	6	5	6	11	Extremely moist in layers pink and grayish brown (SILTY-CLAY) with 2 to 5% mostly subrounded fine size gravel, stiff, thinly laminated with very thin coarse silt lenses, (CL)		
	15	3	4	4	6	8	- - - - - grades downward to - - - - - 29.0		
30	16	3	3	4	7	7	Extremely moist to wet alternating layers pink and grayish brown (SILTY-CLAY) with 2 to 5% mostly fine size subrounded gravel, firm, thinly laminated with very thin coarse silt lenses, (CL)	4 inch PVC screen; #2 size sand	
	17	2	2	3	4	5			34.0
35	18	2	3	3	4	6			
									36.0
							Boring completed at 36.0 feet.		
40									

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

eal

LOGGED BY Donald W. Owens/Soil Scientist
Dale M. Gramza/Geologist

SHEET 2 OF 2

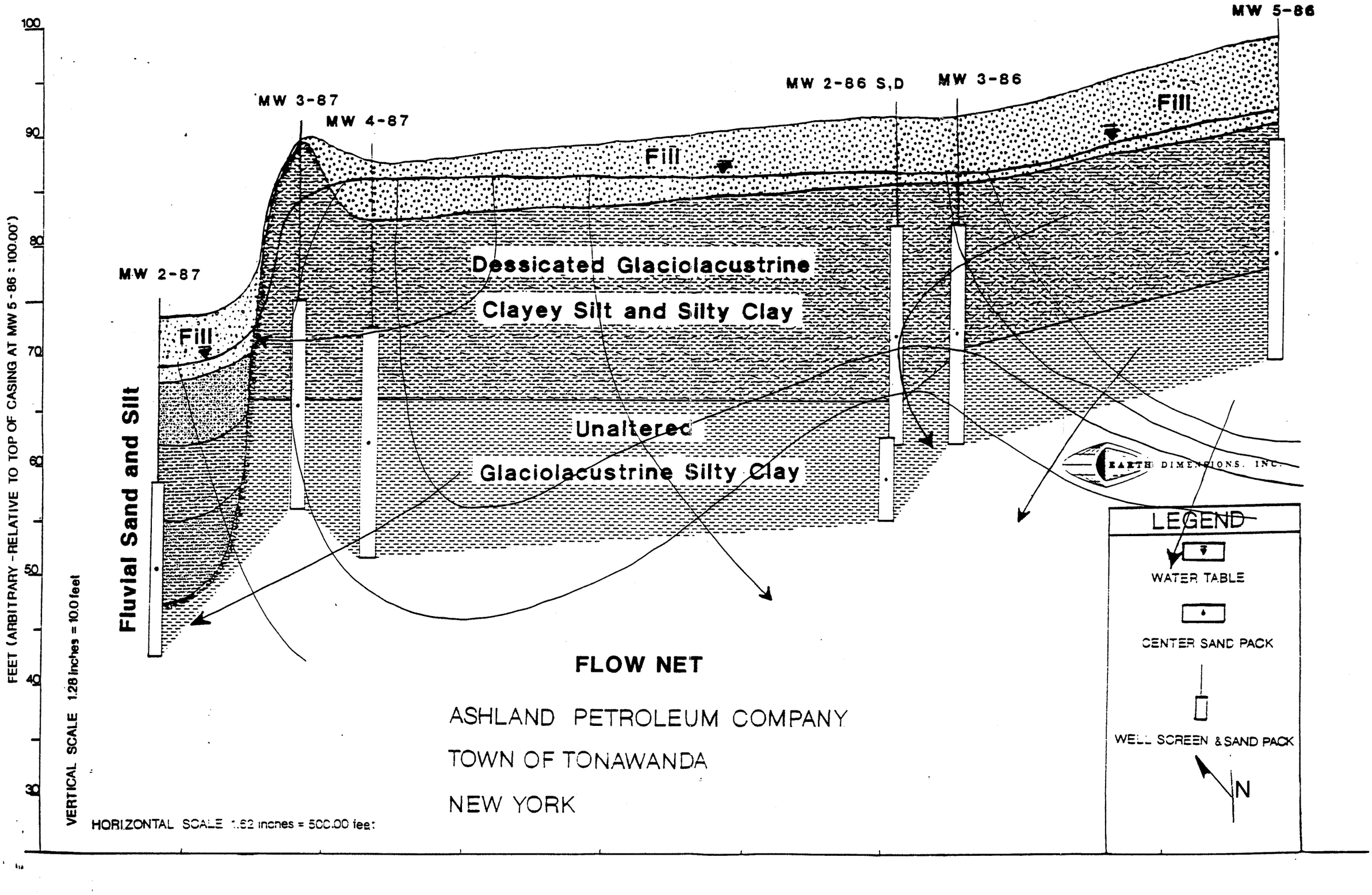


STRATIGRAPHIC PROFILE

ASHLAND PETROLEUM COMPANY

TOWN OF TONAWANDA

NEW YORK



FLOW NET

ASHLAND PETROLEUM COMPANY

TOWN OF TONAWANDA

NEW YORK

URS Corporation

TEST BORING LOG

BORING NO. : MW05-01

PROJECT/PROJECT LOCATION: Tank 75

SHEET: 1 **OF** 1

CLIENT: Ashland

JOB NO. : 37679571.06400

BORING CONTRACTOR: Earth Dimensions

NORTHING: 1090859.6 **EASTING:** 409297.8

GROUNDWATER:

DATE	TIME	LEVEL	TYPE

	CAS.	SAMPLER	CORE	TUBE
TYPE		Split Spoon		
DIA.		2"		
WT.				
LENGTH				

* POCKET PENETROMETER READING

GROUND ELEVATION: 597.5

DATE STARTED: 09/01/05

DATE FINISHED: 09/01/05

DRILLER: B. Bartron

GEOLOGIST: J. Doerr

REVIEWED BY: C. Wasteneys

DEPTH FEET	STRATA	SAMPLE NO.	SAMPLE BLOW COUNT	REC% / RQD%	COLOR	SOIL CONSISTENCY / ROCK HARDNESS	MATERIAL DESCRIPTION	USCS	PID	REMARKS
0		1	4/4/8/15	75%	Gray Red Brn	Stiff	Silt and fine to coarse slag gravel, some glass	FILL	0.0	Moist
		2	6/11/15/23	80%		Very Stiff	Silty clay, trace coarse angular gravel.	CL	0.0	Dry
		3	5/5/5/7	60%		Stiff	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel. Slight gasoline odor 4'-6'. Spoon wet 6'-8'.		0.0	Moist
-5		4	11/12/13/22	100%		Very Stiff			0.0	Dry
		5	5/9/16/31	80%					0.0	Dry
-10		6	3/11/20/31	70%		Hard			0.0	Dry
		7	6/13/19/33	90%					0.0	Dry
		8	3/7/10/20	80%		Very Stiff			0.0	Dry
-15		9	17/19/21/29	100%		Hard			0.0	Dry
		10	5/7/10/17	90%		Very Stiff			0.0	Dry
-20		11	4/5/8/12	85%		Stiff			0.0	Slightly Moist
		12	13/13/15/21	100%		Very Stiff			0.0	Slightly Moist
-25							End of boring at 23' BGS			

COMMENTS:
Boring advanced with a truck mounted Diedrich D-50 rig utilizing 4-1/4" ID HSA with 2" split spoon sampler.

BORING NO. : MW05-01

DRILLING SUMMARY

Geologist:
J. Doerr

Drilling Company:

Earth Dimensions

Driller:
B. Bartron

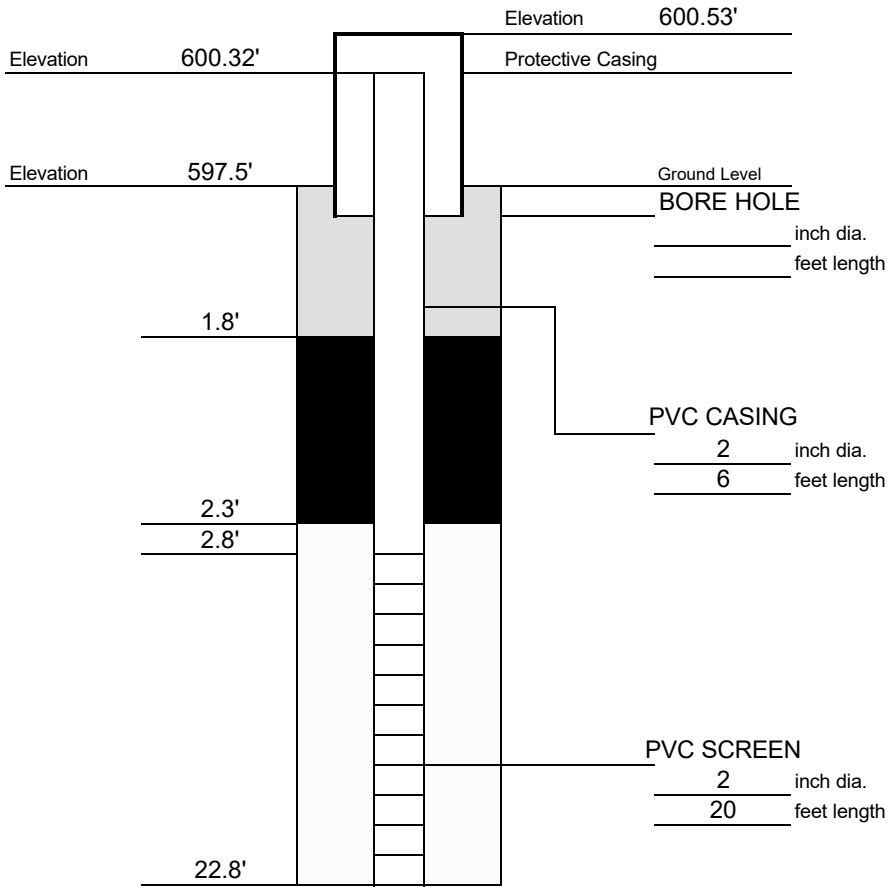
Rig Make/Model:
Diedrich D-50

Date:
9/2/2005

GEOLOGIC LOG

Depth(ft.)	Description
0.0-0.3	FILL: Silt and fine to coarse angular gravel
0.3-2.0	FILL: Silty clay, some fine to coarse angular gravel
2.0-22.8	SILTY CLAY, trace fine subangular to subrounded gravel

DEPTH



WELL DESIGN

CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface: Steel Protective Casing	Type: 2" PVC	Type: #00 sand Setting:2.8'-22.8'
Monitor: 2" PVC	Slot Size: 0.010	*SEAL MATERIAL* Type: Bentonite Setting:2.3'-2.8'

COMMENTS:

LEGEND

- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

Client:Ashland Oil	**Location: Tank 75**	**Project No.: 37679411.05100**
URS Corporation	**MONITORING WELL CONSTRUCTION DETAILS**	**Well Number: MW05-01**

URS Corporation

TEST BORING LOG

BORING NO. : MW05-02

PROJECT/PROJECT LOCATION: Tank 75

SHEET: 1 **OF** 1

CLIENT: Ashland

JOB NO. : 37679571.06400

BORING CONTRACTOR: Earth Dimensions

NORTHING: 1090735.3 **EASTING:** 409556.1

GROUNDWATER:

DATE	TIME	LEVEL	TYPE

	CAS.	SAMPLER	CORE	TUBE
TYPE		Split Spoon		
DIA.		2"		
WT.				
LENGTH				

* POCKET PENETROMETER READING

GROUND ELEVATION: 598.1

DATE STARTED: 09/01/05

DATE FINISHED: 09/01/05

DRILLER: B. Bartron

GEOLOGIST: J. Doerr

REVIEWED BY: C. Wasteneys

DEPTH FEET	STRATA	SAMPLE NO.	SAMPLE BLOW COUNT	REC% / RQD%	COLOR	SOIL CONSISTENCY / ROCK HARDNESS	MATERIAL DESCRIPTION	USCS	PID	REMARKS
0		1	4/4/6/8	60%	Gray / Red Brn	Stiff	Silt , some clay, roots and organic detritus.	FILL	0.0	Dry
		2	5/9/14/26	85%		Very Stiff	Silty clay, trace coarse angular gravel.	CL	0.0	Dry
		3	10/14/18/28	90%			SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel. Prominent white/light gray filled dessication cracks.		0.0	Dry
-5		4	20/25/28/36	75%		Hard			0.0	Dry
		5	8/10/14/24	90%		Very Stiff			0.0	Dry
-10		6	19/21/27/33	80%		Hard			0.0	Dry
		7	6/8/14/23	90%		Very Stiff	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel.		0.0	Dry
		8	3/7/12/17	80%					0.0	Dry
-15		9	15/13/17/24	100%					0.0	Slightly Moist
		10	4/9/10/14	100%					0.0	Slightly Moist
-20		11	4/5/8/12	100%		Stiff			0.0	Slightly Moist
		12	11/11/11/15	100%		Very Stiff			0.0	Moist
-25							End of boring at 24' BGS			

COMMENTS:
Boring advanced with a truck mounted Diedrich D-50 rig utilizing 4-1/4" ID HSA with 2" split spoon sampler.

BORING NO. : MW05-02

DRILLING SUMMARY

Geologist:
J. Doerr

Drilling Company:

Earth Dimensions

Driller:
B. Bartron

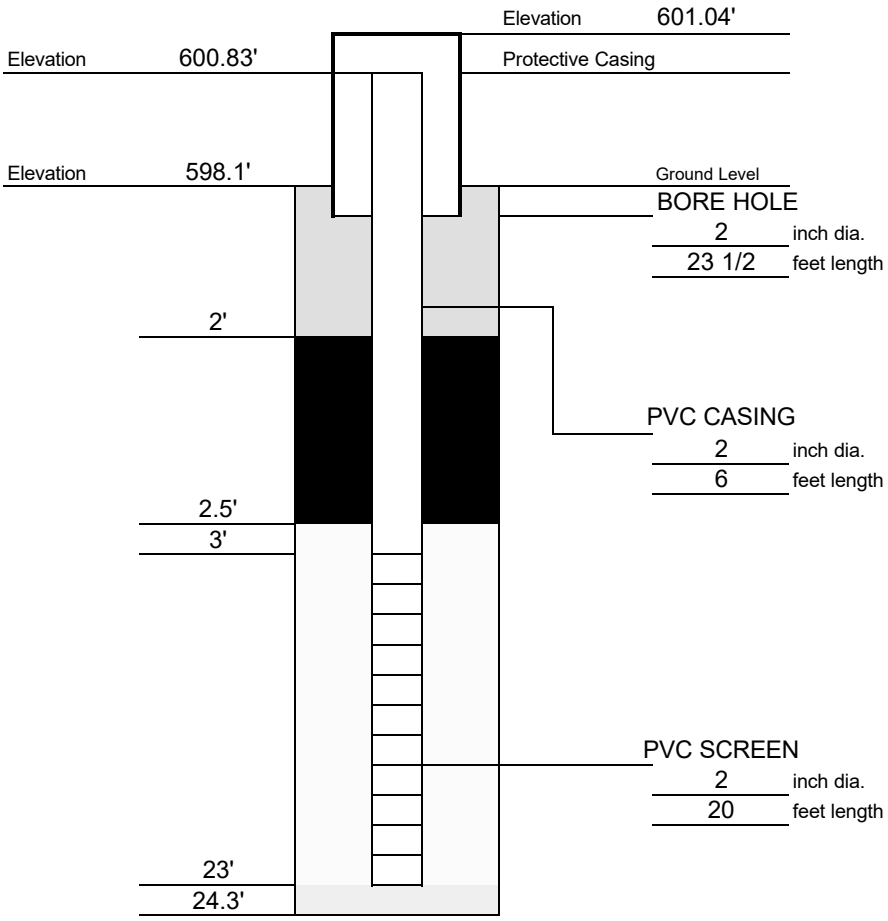
Rig Make/Model:
Diedrich D-50

Date:
9/6/2005

GEOLOGIC LOG

Depth(ft.)	Description
0.0-0.2	FILL: Silt and fine to coarse angular gravel
0.3-4.0	FILL: Silty clay, trace fine to coarse angular gravel
2.0-24.3	SILTY CLAY, trace fine subangular to subrounded gravel

D
E
P
T
H



WELL DESIGN

CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface: Steel Protective Casing	Type: 2" PVC	Type: #00 sand Setting: 2.5'-24.3'
Monitor: 2" PVC	Slot Size: 0.010	*SEAL MATERIAL* Type: Bentonite Setting: 2.0'-2.5'

COMMENTS:

LEGEND

- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

Client:Ashland Oil	**Location: Tank 75**	**Project No.: 37679411.05100**
URS Corporation	**MONITORING WELL CONSTRUCTION DETAILS**	**Well Number: MW05-02**

URS Corporation

TEST BORING LOG

BORING NO. :	**MW05-03**
PROJECT/PROJECT LOCATION:	**Tank 75**
SHEET:	**1 OF 1**
CLIENT:	**Ashland**
JOB NO. :	37679571.06400
BORING CONTRACTOR:	**Earth Dimensions**
NORTHING:	1090557.1 **EASTING:** 409514.4
GROUNDWATER:	
GROUND ELEVATION:	604.1
DATE STARTED:	09/01/05
DATE FINISHED:	09/02/05
DRILLER:	B. Bartron
GEOLOGIST:	J. Doerr
REVIEWED BY:	C. Wasteneys

DATE	TIME	LEVEL	TYPE	TYPE	CAS.	SAMPLER	CORE	TUBE
				DIA.		2"		
				WT.				
				LENGTH				
				* POCKET PENETROMETER READING				

DEPTH FEET	STRATA	SAMPLE NO.	SAMPLE BLOW COUNT	REC% / RQD%	COLOR	SOIL CONSISTENCY / ROCK HARDNESS	MATERIAL DESCRIPTION	USCS	PID	REMARKS
0		1	14/26/17/10	60%	Gray	Dense	Fine to coarse slag sand and fine to coarse slag gravel	FILL	0.0	Moist
					Rd/Brn					
		2	3/3/5/7	50%	Black	Stiff	Silty clay, trace coarse angular gravel.		0.0	Moist
-5		3	3/5/11/17	50%			Silty clay, trace fine angular gravel, mottled black/gray staining, slight petroleum odor.		0.0	Moist
		4	10/12/17/24	30%		Very Stiff			0.0	Wet
		5	7/11/16/28	95%			SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel.	CL	0.0	Dry
-10		6	6/11/17/30	95%	Red Brn				0.0	Dry
		7	23/26/30/43	80%		Hard			0.0	Dry
		8	5/9/14/26	90%		Very Stiff			0.0	Dry
-15		9	22/23/27/34	100%		Hard	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel, swelling in split spoon.		0.0	Slightly Moist
		10	8/10/15/24	100%		Very Stiff			0.0	Slightly Moist
-20		11	3/4/10/16	80%		Stiff	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel.		0.0	Dry
		12	17/16/20/29	100%		Very Stiff			0.0	Dry
		13	5/6/7/13	100%		Stiff	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel, slight plasticity.		0.0	Dry
-25		14	11/10/12/16	100%	Red Brn	Very Stiff	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel, plastic.	CL	0.0	Dry
		15	3/5/7/11	100%					0.0	Slighty Moist
-30							End of boring at 30' BGS			

COMMENTS:
Boring advanced with a truck mounted Diedrich D-50 rig utilizing 4-1/4" ID HSA with 2" split spoon sampler.

DRILLING SUMMARY

Geologist:
J. Doerr

Drilling Company:

Earth Dimensions

Driller:
B. Bartron

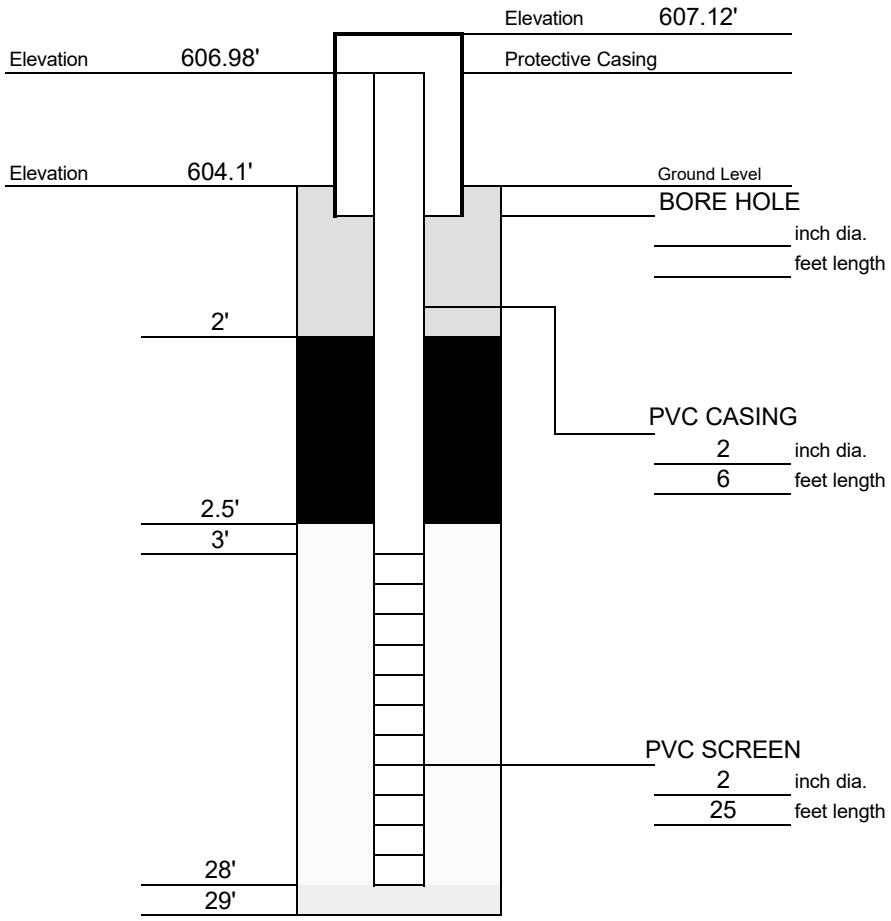
Rig Make/Model:
Diedrich D-50

Date:
9/2/2005

GEOLOGIC LOG

Depth(ft.)	Description
0.0-1.8	FILL: Fine to coarse slag sand and fine to coarse slag gravel, some silt
1.8-8.0	FILL: Silty clay some coarse angular gravel stained with slight petroleum odor
1.8-29.0	SILTY CLAY, some fine subangular to subrounded gravel

DEPTH



WELL DESIGN

CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface: Steel Protective Casing	Type: 2" PVC	Type: #00 sand Setting:2.5'-29.0
		SEAL MATERIAL
Monitor: 2" PVC	Slot Size: 0.010	Type: Bentonite Setting :2.0'-2.5'

COMMENTS:

LEGEND

- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

Client:Ashland Oil	**Location: Tank 75**	**Project No.: 37679411.05100**
URS Corporation	**MONITORING WELL CONSTRUCTION DETAILS**	**Well Number: MW05-03**

URS Corporation

TEST BORING LOG

BORING NO. : MW05-04

PROJECT/PROJECT LOCATION: Tank 75

SHEET: 1 **OF** 1

CLIENT: Ashland

JOB NO. : 37679571.06400

BORING CONTRACTOR: Earth Dimensions

NORTHING: 1090694.7 **EASTING:** 409314.7

GROUNDWATER:

DATE	TIME	LEVEL	TYPE	TYPE	CAS.	SAMPLER	CORE	TUBE
				DIA.		2"		
				WT.				
				LENGTH				
				* POCKET PENETROMETER READING				

GROUND ELEVATION: 596.5

DATE STARTED: 09/06/05

DATE FINISHED: 09/06/05

DRILLER: A. Morris

GEOLOGIST: J. Doerr

REVIEWED BY: C. Wasteneys

DEPTH FEET	STRATA	SAMPLE NO.	SAMPLE BLOW COUNT	REC% / RQD%	COLOR	SOIL CONSISTENCY / ROCK HARDNESS	MATERIAL DESCRIPTION	USCS	PID	REMARKS
0		1	5/5/6/5	60%	Gray	Stiff	Silt and fine to coarse angular gravel, some clay.	FILL	0.0	Moist
		2	2/7/2/4	70%			Silty clay, some fine angular gravel, slight staining and odor.		0.0	Moist
-5		3	3/6/10/17	90%	Red Brn	Very Stiff	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel. Prominent white/light gray filled dessication cracks.	CL	0.0	Dry
		4	19/21/27/33	100%		Hard			0.0	Dry
		5	6/9/16/24	85%		Very Stiff			0.0	Dry
-10		6	8/11/15/21	90%			SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel.		0.0	Dry
		7	8/9/13/20	75%					0.0	Dry
		8	7/9/14/22	60%					0.0	Slightly Moist
-15		9	9/13/14/22	100%					0.0	Slightly Moist
		10	3/7/10/15	85%			CLAY and SILT, trace fine SAND.	ML/CL	0.0	Slightly Moist
-20		11	4/5/8/11	100%		Stiff	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel.	CL	0.0	Slightly Moist
		12	9/13/16/21	100%		Very Stiff	SILTY CLAY, well to poorly laminated, trace fine sub angular to sub rounded gravel, slight plasticity.		0.0	Slightly Moist
-25							End of boring at 24' BGS			

COMMENTS:
Boring advanced with a truck mounted Diedrich D-50 rig utilizing 4-1/4" ID HSA with 2" split spoon sampler.

BORING NO. : MW05-04

DRILLING SUMMARY

Geologist:
J. Doerr

Drilling Company:

Earth Dimensions

Driller:
B. Bartron

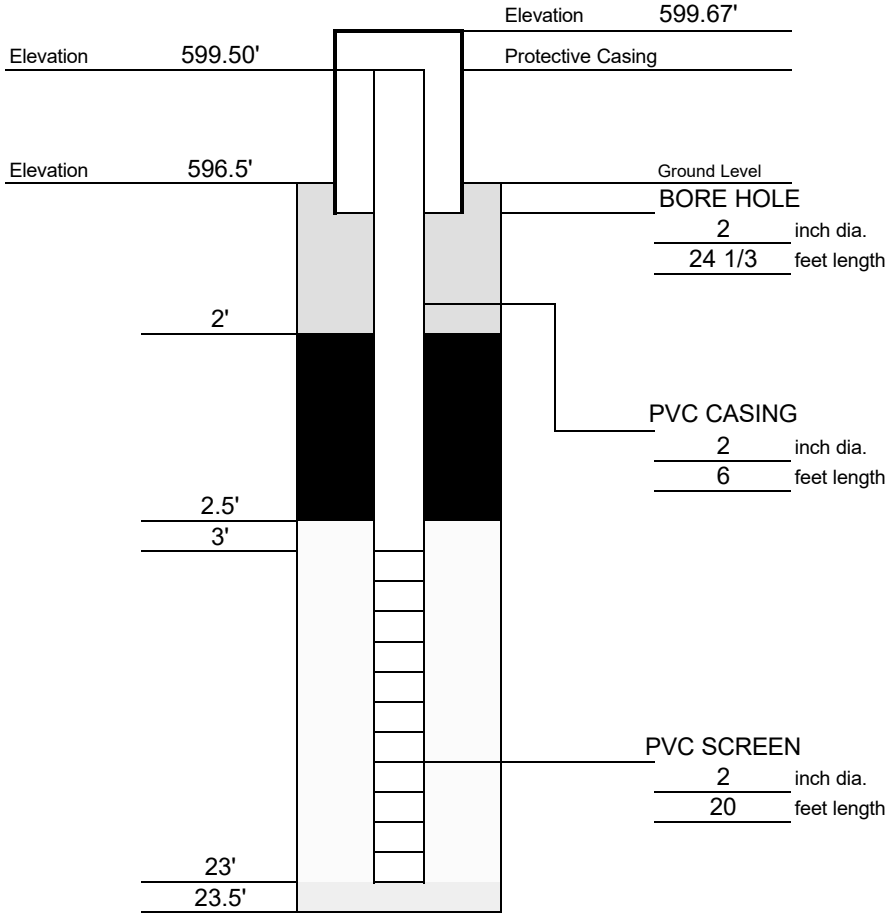
Rig Make/Model:
Diedrich D-50

Date:
9/6/2005

GEOLOGIC LOG

Depth(ft.)	Description
0.0-0.4	FILL: Silt and fine to coarse angular gravel
0.4-3.6	FILL: Silty clay, some fine to coarse angular gravel
3.6-19.1	SILTY CLAY, trace fine subangular to subrounded gravel
19.1-19.3	SILTY CLAY, some SILT trace fine SAND
19.3-23.5	SILTY CLAY, trace fine subangular to subrounded gravel

DEPTH



WELL DESIGN

CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface: Steel Protective Casing	Type: 2" PVC	Type: #00 sand Setting: 2.5'-24.3'
Monitor: 2" PVC	Slot Size: 0.010	*SEAL MATERIAL* Type: Bentonite Setting: 2.0'-2.5'

COMMENTS:

LEGEND

- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

Client:Ashland Oil	**Location: Tank 75**	**Project No.: 37679411.05100**
URS Corporation	**MONITORING WELL CONSTRUCTION DETAILS**	**Well Number: MW05-04**

TABLE 2
GROUNDWATER ANALYTICAL RESULTS
1997 AND 1998
Ashland Tank 75 - Tonawanda, NY

Analyte	Screening Criteria[1]	MW-2D		MW-3		MW-2S		MW-4D		MW-4S		MW-5	
		08/19/97	07/17/98	08/19/97	07/17/98	08/19/97	07/17/98	08/19/97	07/17/98	08/19/97	07/17/98	08/19/97	07/17/98
Metals, USEPA Method 6020, mg/L													
Arsenic	0.025	0.011	<0.002	0.002	<0.002	<0.002	<0.002	0.008	0.007	<0.002	<0.002	<0.002	<0.002
Barium	1.000	0.05	0.217	0.04	0.023	0.067	0.069	0.18	0.158	0.040	0.059	0.047	0.048
Beryllium	NV	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cadmium	0.005	**0.017**	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	**0.006**	<0.003
Chromium	0.050	0.036	<0.002	0.005	<0.002	<0.002	0.002	0.005	0.003	<0.003	<0.002	<0.002	0.003
Cobalt	NV	0.014	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Copper	0.200	0.032	<0.002	0.006	0.002	0.003	<0.002	0.127	0.006	0.005	0.018	0.005	<0.002
Lead	0.025	**0.030**	<0.003	0.003	<0.003	<0.003	<0.003	0.006	0.005	<0.003	0.005	<0.003	<0.003
Manganese	0.300	**0.88**	0.005	0.063	0.054	0.0056	0.059	0.064	0.044	0.025	0.056	0.016	0.017
Mercury	0.0007	NA	<0.001	NA	<0.001	NA	<0.001	NA	<0.001	NA	<0.001	NA	<0.001
Nickel	0.100	0.065	0.006	0.009	0.006	0.005	0.004	<0.003	0.008	0.007	0.007	0.007	0.004
Selenium	0.010	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Silver	0.050	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Thallium	NV	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	NV	0.053	<0.002	0.005	0.002	<0.002	<0.002	0.005	0.002	<0.002	<0.002	<0.002	<0.002
Zinc	NV	0.012	0.005	<0.06	0.108	<0.06	0.006	<0.06	0.029	<0.06	0.042	<0.06	0.011
VOCs, USEPA Method 8260, ug/L													
Methylene Chloride	5	**5.3**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs, USEPA Method 8270, ug/L													
Sulfolane	NV	ND	ND	ND	ND	ND	ND	ND	ND	13.6/ND*	21.4	ND	ND

[1] - NYSDEC Groundwater Quality Standards for Class GA Groundwater, 6 NYCRR Part 703 amended August 1999
* - Sulfolane was detected in the original sample but not in the resample collected on 10/24/97.
Bold - Concentration exceeds screening criteria
ug/L - Microgram per Liter
mg/L - Milligram per Liter
NA - Not Analyzed
<0.002 - analyte not detected above reporting limit shown
NV - No Value
SVOC - Semi-volatile Organic Compound
VOC - Volatile Organic Compound
USEPA - United States Environmental Protection Agency

TABLE 3
GROUNDWATER ANALYTICAL RESULTS
SEPTEMBER 2005
Ashland Tank 75 - Tonawanda, NY

Analyte	Screening Criteria[1]	MW-2S	MW-2D	MW-3	MW-4S	MW-4D	MW05-01	MW05-02	MW05-04
		09/13/05	09/13/05	09/13/05	09/13/05	09/13/05	09/13/05	09/13/05	09/13/05
TAL Metals, USEPA Method 6010B/7470A, mg/L									
Aluminum	NV	ND	2.500	12.000	ND	3.800	6.700	0.740	0.230
Antimony	0.003	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	0.025	ND	ND	ND	ND	ND	ND	ND	ND
Barium	1.000	0.047	0.190	0.086	0.052	0.120	0.076	0.029	0.019
Beryllium	NV	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.005	ND	**0.065**	ND	**0.0095**	**0.015**	ND	ND	ND
Calcium	NV	68.0	80.0	97.0	69.0	79.0	91.0	140.0	97.0
Chromium	0.050	ND	0.028	0.015	ND	ND	ND	ND	ND
Cobalt	NV	ND	ND	ND	ND	ND	ND	ND	ND
Copper	0.200	ND	0.025	ND	ND	0.034	ND	ND	ND
Iron	0.300	**0.380**	**2.300**	**15.000**	**2.300**	**5.300**	**8.200**	**0.940**	**0.420**
Lead	0.025	ND	ND	0.015	ND	0.016	ND	ND	ND
Magnesium	NV	140.0	2.9	170.0	150.0	61.0	140.0	170.0	210.0
Manganese	0.300	0.088	0.056	**0.450**	0.170	0.120	**0.500**	**0.690**	**0.330**
Nickel	0.100	ND	**0.120**	ND	ND	ND	ND	ND	ND
Potassium	NV	6.5	11.0	9.5	5.2	12.0	9.2	13.0	10.0
Selenium	0.010	ND	ND	ND	ND	ND	ND	ND	ND
Silver	0.050	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20.0	**48.0**	**49.0**	**80.0**	**53.0**	**120.0**	**50.0**	**62.0**	**86.0**
Thallium	NV	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	NV	ND	ND	0.020	ND	ND	0.012	ND	ND
Zinc	NV	ND	0.034	0.045	ND	0.070	0.032	ND	ND
VOCs, USEPA Method 8260B, ug/L									
Carbon disulfide	50	ND	ND	ND	ND	ND	2.2	2.9	2.7
cis-1,2-Dichloroethene	5	ND	ND	ND	ND	ND	ND	4.1	ND
SVOCs, USEPA Method 8270C, ug/L									
Pentachlorophenol	1	ND	ND	ND	ND	**130**	ND	ND	ND
Phenol	1	ND	**39**	ND	ND	ND	ND	ND	ND

[1] - NYSDEC Groundwater Quality Standards for Class GA Groundwater, 6 NYCRR Part 703 amended August 1999
Bold - Concentration exceeds screening criteria

ug/L - Microgram per Liter
mg/L - Milligram per Liter
ND - Not Detected
NV - No Value
SVOC - Semi-volatile Organic Compound
TAL - Target Analyte List
VOC - Volatile Organic Compound
USEPA - United States Environmental Protection Agency

TABLE 5
GROUNDWATER ANALYTICAL RESULTS
JANUARY-FEBRUARY 2018
Ashland Tank 75 - Tonawanda, NY

Analyte	Screening Criteria[1]	MW-2S	MW-2D	MW-3	MW-4S	MW-4D	MW05-01	MW05-02	MW05-03	MW05-04	Duplicate
		1/31/2018	2/2/2018	1/31/2018	1/31/2018	2/1/2018	1/29/2018	1/31/2018	1/29/2018	2/1/2018	1/29/2018
TAL Metals (dissolved), USEPA Method 6010B/7470A, mg/L											
Aluminum	NV	0.0911 U	0.106 J	0.0911 U	0.0911 U	0.0911 U	0.0911 U	0.0911 U	0.0911 U	0.0911 U	0.0911 U
Antimony	0.003	0.0074 U	0.0074 U	0.0074 U	0.0074 U	0.0074 U	0.0074 U	0.0074 U	0.0074 U	0.0074 U	0.0074 U
Arsenic	0.025	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0062 J	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U
Barium	1	0.0633 J	0.11 J	0.0204 J	0.062 J	0.0178 J	0.104 J	0.0379 J	0.027 J	0.17 J	0.0997 J
Beryllium	NV	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U
Cadmium	0.005	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U
Calcium	NV	77.4	50.8	72.2	80.1	20.3	90.7	85.2	405	170	86.9
Chromium	0.05	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U	0.0033 U
Cobalt	NV	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0031 U	0.0035 J	0.0031 U
Copper	0.2	0.0081 U	0.0081 U	0.0081 U	0.0081 U	0.0081 U	0.0081 U	0.0081 U	0.0084 J	0.0081 U	0.0081 U
Iron	0.3	0.0921 U	0.0921 U	0.0921 U	**1.37**	0.0921 U	0.0921 U	0.0921 U	0.0921 U	**0.761**	0.0921 U
Lead	0.025	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U
Magnesium	35	**156**	7.49	**175**	**172**	**61.2**	**130**	**162**	**42.7**	**52.5**	**124**
Manganese	0.3	0.0031 U	0.0031 U	0.0253	0.0978	0.0031 U	0.0957	0.0898	0.0324	**1.5**	0.0911
Nickel	0.1	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.0146 J	0.009 U
Potassium	NV	3.97 J	4.86 J	4.56 J	4.91 J	6.16	3.94 J	4.47 J	4.93 J	2.64 J	3.84 J
Selenium	0.01	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U	0.0044 U
Silver	0.05	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U	0.0018 U
Sodium	20	**48.1**	**68.2**	**91.8**	**55.8**	**85.7**	**44.5**	**58.4**	**42.8**	**25.9**	**42.9**
Thallium	NV	0.0071 U	0.0071 U	0.0071 U	0.0071 U	0.0071 U	0.0071 U	0.0071 U	0.0071 U	0.0071 U	0.0071 U
Vanadium	NV	0.0025 U	0.0045 J	0.0025 U	0.0025 U	0.0025 U	0.0053 J	0.0046 J	0.0177 J	0.0025 U	0.0053 J
Zinc	NV	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U
VOCs, USEPA Method 8260B, ug/L											
Acetone	50	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	7	1.1 U
Benzene	0.7	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U	0.15 J	0.09 U
1,1-Dichloroethane	5	0.24 U	0.24 U	0.24 U	0.33 J	0.24 U	0.24 U	0.36 J	0.24 U	0.24 U	0.24 U
cis-1,2-Dichloroethene	5	0.26 U	0.26 U	0.26 U	0.48 J	0.26 U	0.26 U	1.7	0.26 U	0.26 U	0.26 U
Vinyl chloride	2	0.06 U	0.06 U	0.06 U	0.26 J	0.06 U	0.06 U	**3.2**	0.06 U	0.06 U	0.06 U
SVOCs, USEPA Method 8270C, ug/L											
Di-n-butyl phthalate	50	0.82 U	0.82 U	0.82 U	0.82 U	1.0 J	0.87 UH	0.82 U	0.82 UH	0.82 U	0.89 UH

[1] - NYSDEC Groundwater Quality Standards for Class GA Groundwater, 6 NYCRR Part 703 amended August 1999

Bold - Concentration exceeds screening criteria

ug/L - Microgram per Liter

mg/L - Milligram per Liter

NV - No Value

SVOC - Semi-volatile Organic Compound

TAL - Target Analyte List

VOC - Volatile Organic Compound

USEPA - United States Environmental Protection Agency

J - Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

U - analyte not detected above reporting limit shown

H - Sample was prepped or analyzed beyond the specified holding time

Table 2-7
COMPARISON OF SLUDGE DATA TO K049, K050, AND K051 TREATMENT STANDARDS
Ashland Tank 75 - Buffalo, NY

	CAS No.	Tank 75-Solid Sampled 9/6/2005 mg/kg	Centrifuged Sludge Solid (Solid-001) Sampled 9/6/2005 (mg/kg, unless otherwise noted)	Sludge Samples (SG-1 - SG-4) (Sampled 5/26/2005) (mg/L) Max TCLP level	Sludge Sample (Composite) Sampled 9/1999 mg/kg	Sludge Sample (Jar 1) Sampled 6/18/98 mg/kg	Sludge Sample (Jar 2) Sampled 6/18/98 mg/kg	K049 Treatment Standard Non-Wastewater Concentration (mg/kg, unless otherwise noted)	K050 Treatment Standard Non-Wastewater Concentration (mg/kg, unless otherwise noted)	K052 Treatment Standard Non-Wastewater Concentration (mg/kg, unless otherwise noted)
Anthracene	120-12-7	**30.2**	ND (99)	Not reported	Not reported	Not reported	Not reported	3.4	--NA / NC--	--NA / NC--
Benzene	71-43-2	0.829	ND (10)	0.12	**25**	Not reported	Not reported	10	--NA / NC--	10
Benzo(a)pyrene	50-32-8	**40.3**	ND (99)	Not reported	Not reported	Not reported	Not reported	3.4	3.4	3.4
bis(2-Ethylhexyl) phthalate	117-81-7	4.96	ND (99)	Not reported	Not reported	Not reported	Not reported	28	--NA / NC--	--NA / NC--
Carbon disulfide	75-15-0			Not reported	ND (2.0)	Not reported	Not reported	NA	--NA / NC--	--NA / NC--
Chrysene	2218-01-9	**107**	ND (99)	Not reported	Not reported	Not reported	Not reported	3.4	--NA / NC--	--NA / NC--
o-Cresol	95-48-7	ND (0.999)	ND (99)	Not reported	Not reported	Not reported	Not reported	--NA / NC--	--NA / NC--	5.6
m-Cresol (difficult to distinguish from p-Cresol)	108-39-4		ND (99)	Not reported	Not reported	Not reported	Not reported	--NA / NC--	--NA / NC--	5.6
p-Cresol (difficult to distinguish from m.-Cresol)	106-44-5	1.26	ND (99)	Not reported	Not reported	Not reported	Not reported	--NA / NC--	--NA / NC--	5.6
2,4-Dimethylphenol (as listed under K049 treatment standards)	105-67-9	ND (0.999)		Not reported	Not reported	Not reported	Not reported	NA	--NA / NC--	NA
Ethylbenzene	100-41-4	ND (0.999)	ND (10)	Not reported	9.0	Not reported	Not reported	10	--NA / NC--	10
Naphthalene	91-20-3	1.42	ND (99)	Not reported	Not reported	Not reported	Not reported	5.6	--NA / NC--	5.6
Phenanthrene	85-01-8	**153**	ND (99)	Not reported	Not reported	Not reported	Not reported	5.6	--NA / NC--	5.6
Phenol	108-95-2	ND (0.999)	ND (99)	Not reported	Not reported	Not reported	Not reported	6.2	6.2	6.2
Pyrene	129-00-0	**138**	ND (99)	Not reported	Not reported	Not reported	Not reported	8.2	--NA / NC--	--NA / NC--
Toluene	108-88-3	0.907	ND (10)	Not reported	ND (0.98)	Not reported	Not reported	10	--NA / NC--	10
Xylenes-mixed isomers	1330-20-7	ND (2.0)	ND (20)	Not reported	9.8	Not reported	Not reported	30	--NA / NC--	30
Cyanide (Total)	57-12-5		ND (0.025)	Not reported	Not reported	Not reported	Not reported	590	590	590
Chromium (Total)	7440-47-3		ND (0.2 mg/L)	ND (0.2 mg/L)	2,800	94	20.5	0.60 mg/L TCLP	0.60 mg/L TCLP	0.60 mg/L TCLP
Lead	7439-92-1		ND (0.2 mg/L)	0.84 mg/L	4,000	1746	218	NA	NA	NA
Nickel	7440-02-0		13	Not reported	Not reported	Not reported	Not reported	11 mg/L TCLP	11 mg/L TCLP	11 mg/L TCLP

NOTES:
1) NA / NC = Not Applicable, no concentration standard specified for constituent
2) ND = below practical quantitation limit (PQL value in parentheses)

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Ashland Tank 75
Sludge TCLP Analytical Results

Sample ID		Solid-001	SG-1	SG-2	SG-3	SG-4
Compound	TCLP Regulatory Level	Centrifuged Solid	Sludge	Sludge	Sludge	Sludge
Sampling Date		9/6/2005	05/26/05	05/26/05	05/26/05	05/26/05
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
D004 Arsenic	5	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
D005 Barium	100	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
D006 Cadmium	1	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
D007 Chromium	5	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)	ND (0.2)
D008 Lead	5	ND (0.2)	0.84	0.52	0.25	0.42
D009 Mercury	0.2					
D010 Selenium	1	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)
D011 Silver	5	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
D012 Endrin	0.02		ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)
D013 Lindane	0.4		ND (0.0025)	ND (0.0025)	ND (0.0025)	ND (0.0025)
D014 Methoxychlor	10		ND (0.025)	ND (0.025)	ND (0.025)	ND (0.025)
D015 Toxaphene	0.5		ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)
D016 2,4-D	10		ND (0.025)	ND (0.025)	0.16	ND (0.025)
D017 2,4,5-TP (Silvex)	1		ND (0.025)	ND (0.025)	ND (0.025)	ND (0.025)
D018 Benzene	0.5	ND (0.02)	0.12	0.021	0.02	0.042
D019 Carbon tetrachloride	0.5	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
D020 Chlordane	0.03		ND (0.025)	ND (0.025)	ND (0.025)	ND (0.025)
D021 Chlorobenzene	100	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
D022 Chloroform	6	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
D027 1,4-Dichlorobenzene	7.5	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
D028 1,2-Dichloroethane	0.5	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
D029 1,1-Dichloroethylene	0.7	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
D030 2,4-Dinitrotoluene	0.13	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
D031 Heptachlor (and its epoxide).	0.008		ND (0.0025)	ND (0.0025)	ND (0.0025)	ND (0.0025)
D032 Hexachlorobenzene	0.13	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
D033 Hexachlorobutadiene	0.5	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
D034 Hexachloroethane	3	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
D035 Methyl ethyl ketone	200	ND (0.2)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
D036 Nitrobenzene	2	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
D037 Pentrachlorophenol	100	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)
D038 Pyridine	5	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)	ND (0.25)
D039 Tetrachloroethylene	0.7	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
D040 Trichloroethylene	0.5	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
D041 2,4,5-Trichlorophenol	400	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
D042 2,4,6-Trichlorophenol	2	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
D043 Vinyl chloride	0.2	ND (0.02)	ND (0.04)	ND (0.04)	ND (0.04)	ND (0.04)
General Chemistry - 1010						
Flashpoint (Degrees F)		>140	>140	>140	>140	>140
Sulfide, Reactive (mg/kg)		98	170	180	ND (50)	ND (50)
Cyanide, Reactive (mg/kg)		ND (100)	ND (100)	ND (100)	ND (100)	ND (100)
pH (SU)		7.42	7.11	6.75	6.93	6.87

QUALIFIERS

GC Semi VOA

*: LCS, LCSD, MS, MSD, MD, or Surrogate exceeds the control limits

GC/MS Semi VOA

*: LCS, LCSD, MS, MSD, MD, or Surrogate exceeds the control limits

GC/MS VOA

*: LCS, LCSD, MS, MSD, MD, or Surrogate exceeds the control limits

ATTACHMENT II

Physical Inventory Determination of Tank 75

ASHLAND OIL
Buffalo Refinery Tank 75
Site Sampling Results/Cost Estimate

REPORT

1.0 SUMMARY

In November 1989 Perland presented a tank closure proposal to Ashland Oil for Tank 75 at Ashland Oil's Buffalo Refinery. The estimate was based upon information generated over five years ago. Current data was needed before actual closure procedures could be selected.

Perland initiated work in mid February 1990 to obtain representative samples and to measure the thickness of the various layers of materials stored in Tank 75. In March, Perland commenced field efforts to determine the amount and volume of the materials in Tank 75 and to prepare a methodology and cost estimate for closure. Tank 75 is a 300 ft. by 200 ft. below ground open top tank. The tank has five layers of materials. The results of the effort are summarized below:

1. Top Oil Layer: 550,000 gallons (20 inches) of a very viscous asphaltic type oil with waxy naphtha lumps. This material should be acceptable for processing at Ashland's Canton Refinery or for disposal to a fuel blender or cement kiln.

2. Water Layer: 4,289,000 gallons (15 feet) of clear water. This material will be disposed of by Ashland directly to the site oil separator and to the oily sewer for discharge to the Tonawanda POTW.

3. Pumpable Sludge: 500,000+ gallons (2 feet to 5 feet) of a pumpable sludge consisting of water, oil and solids. Investigation indicates that the best separation method is to break the oil from the solids using a cutter stock with three-phase centrifugal separation. Disposal of the separated oil and water will be as per 1 and 2 above. Disposal of the solids will be to a landfill permitted to accept the waste.

4. Non-Pumpable Sludge: 2,000 to 4,200 yd^3 of thick oil/solids matrix located primarily on the north side of the tank as a result of intermittent dumping in the northeast corner. Some waste minimization may be possible by processing part of this material with the pumpable sludges. The balance of the material must be landfilled.

5. Gunite and Soil Layers: No samples were obtained. No remediation effort is contemplated for this material.

6. The estimated cost for the closure, not including the non-pumpable sludge, is $2,048,495. The non-pumpable sludge profile varies throughout the tank. The quantity is estimated between 2,000 - 4,200 yd^3, and some of that sludge may be converted to pumpable sludge and centrifuged. The cost for disposing of the non-pumpable sludge will decrease accordingly. Assuming 4,200 yd^3 of non-pumpable sludge, the non-pumpable sludge disposal cost was estimated at $3,244,455 yielding a total closure cost of $5,292,950.

7. There are several disposal options which, if considered, will impact the closure cost. Of major significance if the non-pumpable sludge can be left on site, the total closure cost would be reduced by approximately $3,000,000.

Following hereafter please find a description of the Field Program - Section 2.0, and a discussion of the Estimate in Section 3.0.

2.0 FIELD PROGRAM

On February 26, 1990 four technicians were sent to perform the sampling work. Three technicians were required to collect samples and record data from a platform supported from a crane, with the other technician working as safety watch and general support on the shore. All samples and profiles were collected by March 1, 1990. On March 2, the job site was cleaned up and the equipment decontaminated. The samples were packaged and sent to Buffalo Testing Labs for analysis and shipped to phase separation vendors for bench scale tests.

2.1 SAMPLING LOCATION AND ACCESS

Seven locations were selected to generate data on layer thickness. Four of these locations were selected to provide samples for laboratory analysis to generate the information required to determine methods of material processing and/or disposal. Figure 2-1 shows the actual sampling locations.

For safe access to each sampling location, an 8 foot x 8 foot floating platform was designed and fabricated. The platform had a 2 foot x 2 foot opening in the bottom to allow easy access to the lagoon surface for sampling. The platform was hoisted to each sampling location using a 65 ton truck crane set up at the edge of the tank directly opposite each location. To allow set up of the crane closer to the tank, the existing safety berms along the south side of the tank were removed. Poor ground and minimum road clearances on the north side of the tank required the use of a 40 ton rough terrain crane.

2.2 SAMPLING EFFORT

Two pieces of specialized equipment were used: a "Sludge Grabber" and "Discrete Water Sampler." The Sludge Grabber was used with a penetration bit to sample pumpable sludges, and an auger bit to sample the hard bottom sludges. The Discrete Water Sampler was utilized to check water clarity and determine the sludge/water interface.

The Sludge Grabber is best described as a modified soil core sampler. The penetration bit has been modified with a butterfly valve that automatically closes on extraction of the sampler, retaining the flowable materials in the sampling barrel. Perland used a 24" x 6" diameter sample barrel enabling the retrieval of 2/3 gallons of sample.

Figure 2-1 Ashland Oil Tank 75 Sampling Locations

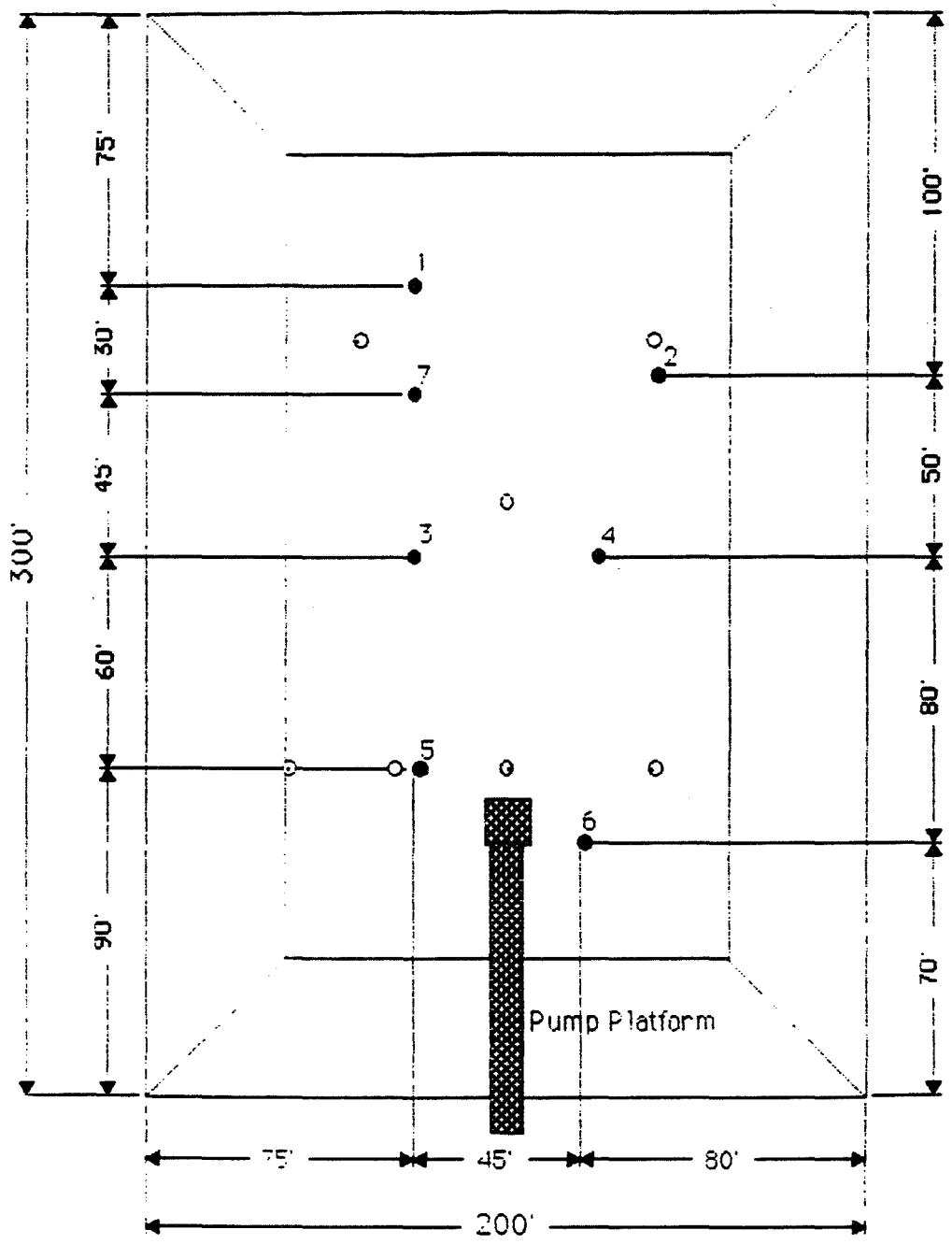


Figure 2-1 Plan View of Tank 75

● Perland Sample Locations 3/1/90

○ Ashland Sample Locations 1984

The Discrete Water Sampler is a modified well bailer. The water inlet valve is spring loaded in the closed position and opened at the desired water depth with a manual wire line system.

The technicians wore Level C respiratory protective equipment and rain gear. Air monitoring was conducted using an organic vapor analyzer.

2.2.1 Top Oil Layer

At each sampling location, an open ended box was inserted through the platform access opening to isolate the sampling location. The top oil was then shoveled out leaving a clean water surface to enable sampling to continue unobstructed. While shoveling out the top oil, random shovel loads were placed into a six gallon pail to produce the required sample volume. Depth of top oil was measured at each location.

Five gallons of top oil were collected from four sampling locations designated 1, 3, 4 and 6. Four gallons were sent to Buffalo Testing Labs for analysis of oil quality. One gallon was sent to Ashland's lab in Kentucky for internal quality control checks. The following tests were performed on the top oil:

BS&W
% Water by Distillation
% Solids by Solvent Extraction
Viscosity
API Gravity
Flash Point
Ash
Sulfur
Heating Value (BTU)
Chlorides

2.2.2 Pumpable Sludge Layer

The pumpable sludges were sampled using a Sludge Grabber with a penetration head. The sampler was lowered until the sampler was supported by the hard-bottom sludges. The sludge thickness was determined by measuring the total depth of penetration of the sampler into the sludge layer. The top of sludge elevation was determined by lowering the Discrete Water

Sampler until the tip hit a solid layer. At this point, a water sample was taken to verify that this was a clean sludge/water interface. All measurements were referenced to the surface of the tank/top of oil.

Five gallons of pumpable sludge were collected and shipped to potential three phase separation technology vendors. Three technologies were considered for the processing of the pumpable sludges. The methods are as follows:

1. Three-phase separation using centrifuges.

2. Three-phase separation using centrifuges and emulsion breakers, with solids further processed using a thermal dryer to reduce solids tonnage. Vapors from this process are captured, recondensed and reprocessed through the centrifuge. The advantage of this system is the reduction of solid waste volumes and the production of a cleaner solid that will be easier to prepare for landfilling.

3. Three-phase separation using filter presses for solids separation followed by a two-phase centrifuge and emulsion breakers for oil water separation. The advantage of this system is the capability to handle a higher solid content.

2.2.3 Hard-Bottom Sludge

The hard bottom sludges were sampled using the Sludge Grabber with the auger head installed. Depth measurements to surface of the tank were taken after the auger had been advanced as far as possible into the hard sludges.

One gallon of hard-bottom sludge was sent to Buffalo Testing Lab for waste characterization to enable profiling and shipment of materials to landfills. The following analysis was performed:

Ignitability
Corrosivity
Reactivity
EP Tox
PCB

An additional sample was sent to Ashland's lab in Kentucky.

2.3 SAMPLING RESULTS

Five layers of materials were encountered and measured during the sampling program. The layer profiles are summarized in Figure 2-2 and discussed below:

1. Top Oil Layer - A very viscous asphaltic oil 10 inches to 30 inches thick with 8-inch to 12-inch lumps of waxy oil. The deeper accumulation of oil is at the northwest end by the pump platform.

2. Water - Water layer varied from 9 feet to 18 feet. Water samples were very clean, with no problem distinguishing the pumpable sludge/water interface.

3. Pumpable Sludge - Consistency varied from a high water/oil-solid matrix to a fairly viscous oil/solids/water matrix. Bottom of pumpable sludge was assumed when no further penetration was achieved with the Sludge Grabber. Layer thickness varied from 1 foot to 5 feet. At the thicker areas, the sludge was generally more viscous.

4. Non-Pumpable Sludge - A solids/oil matrix with a clay-type consistency. Material had to be sampled with auger sampler. Layer thicknesses appeared to be about 2 feet to 3 feet in the southern third of the tank.

5. Asphaltic Layer - No samples of this material were obtained. It is known to exist in the southeast corner of the Tank. The amount of this material is unknown. In the location where the asphalt is suspected, penetration of the auger sampler was not possible, this elevation was assumed to be the top of asphalt.

Figure 2-2 Layer Thickness Recorded per Sampling Location

SAMPLE Pt#	Top Oil	Water	Sludge	Hard Sludge	Asphalt	Notes	
1	12"	9.0	1.0	3.0+	5.5	Auger Penetration refusal	19.5
2	24"	15.0	1.5	2.0+	0.0		20.5
3	20"	16.6	2.25	0.0	0.0		20.5
4	10"	17.7	1.5	0.0	0.0		20.0
5	20"	16.8	1.0	0.0	0.0		19.5
6	30"	13.25	5.0	0.0	0.0		20.75
7	12"	15.75	2.0	2.0+	0.0	Auger Penetration refusal	20.75

2.3.1 Field Observation

During the sampling effort, the following field observations were made at the seven sample locations:

Sample Point # 1 — Top oil layer was found to be thinner and relatively less viscous compared to the other locations. The pumpable sludge was fairly thick with a higher oil content. Hard bottom sludges were an oil/grit/water matrix, clayey texture. Auger sampler unable to penetrate further than three feet into hard-bottom sludges, possible interface for suspected asphaltic materials.

Sample Point # 2 — Relatively thick topsoil layer, very lumpy. Sample location was in the shade so top oil was probably more frozen than the other locations. Pumpable sludge was fairly thick with a higher oil content. Hard bottom sludges were an oil/grit/water matrix with clay-like texture. A distinct gunite bottom was encountered.

Sample Point # 3 — Fairly viscous topsoil layer, stringy and fairly lumpy. Pumpable sludge was thick. No hard-bottom sludges were found. A distinct gunite bottom was encountered.

Sample Point # 4 — Very thin top oil layer, viscous. Pumpable sludge was fairly thick. No hard-bottom sludges were found. A distinct gunite bottom was encountered.

Sample Point # 5 — Relatively thick top oil layer, very lumpy and stringy. The pumpable sludge was free flowing, having a high water content with no resistance to the "Sludge Grabber." No hard-bottom sludges were found. A distinct gunite bottom was encountered.

Sample Point # 6 — The top oil layer was the deepest and most viscous at this location; large "waxy" lumps were also found. Deepest location of pumpable sludge was encountered with a depth of five feet. The pumpable sludge was free flowing, having a higher water content than any other location with almost no resistance to the "Sludge Grabber." No hard-bottom sludges were encountered. A distinct gunite bottom was encountered.

Sample Point # 7 — Due to the high spot found at #1, this location was added in order to better interpolate the quantity data between locations 1 and 3. The pumpable sludge was fairly thick. Hard-bottom sludge was an oil/grit/water matrix with a clay-like texture. A gunite layer was not detected.

Figures 2-3 through 2-7 illustrate the contours and sections of the various materials.

Figure 2-3 Ashland Oil Tank 75 - Top of Surface Oil Layer Contours

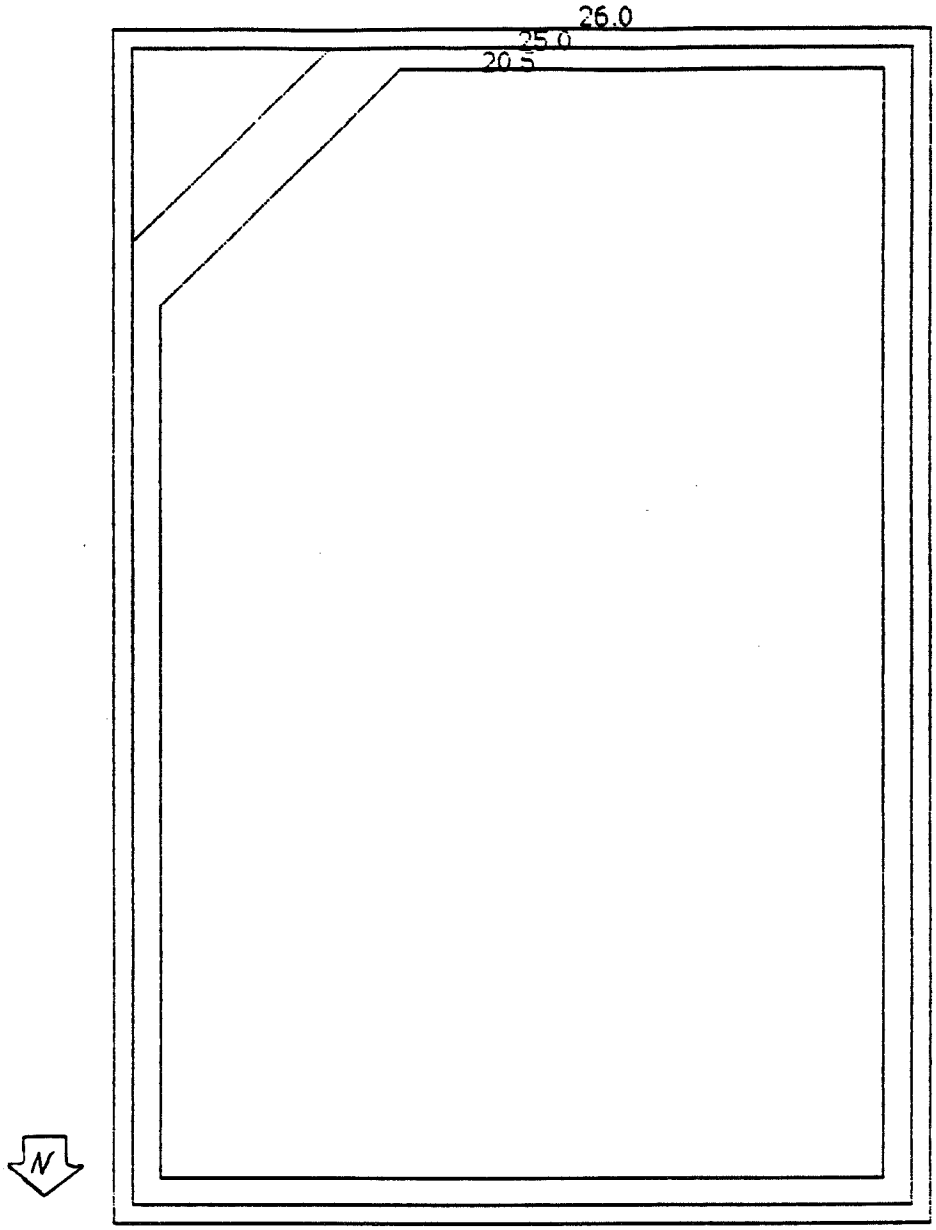


Figure 2-4 Ashland Oil Tank 75 - Top of Pumpable Sludge Contours

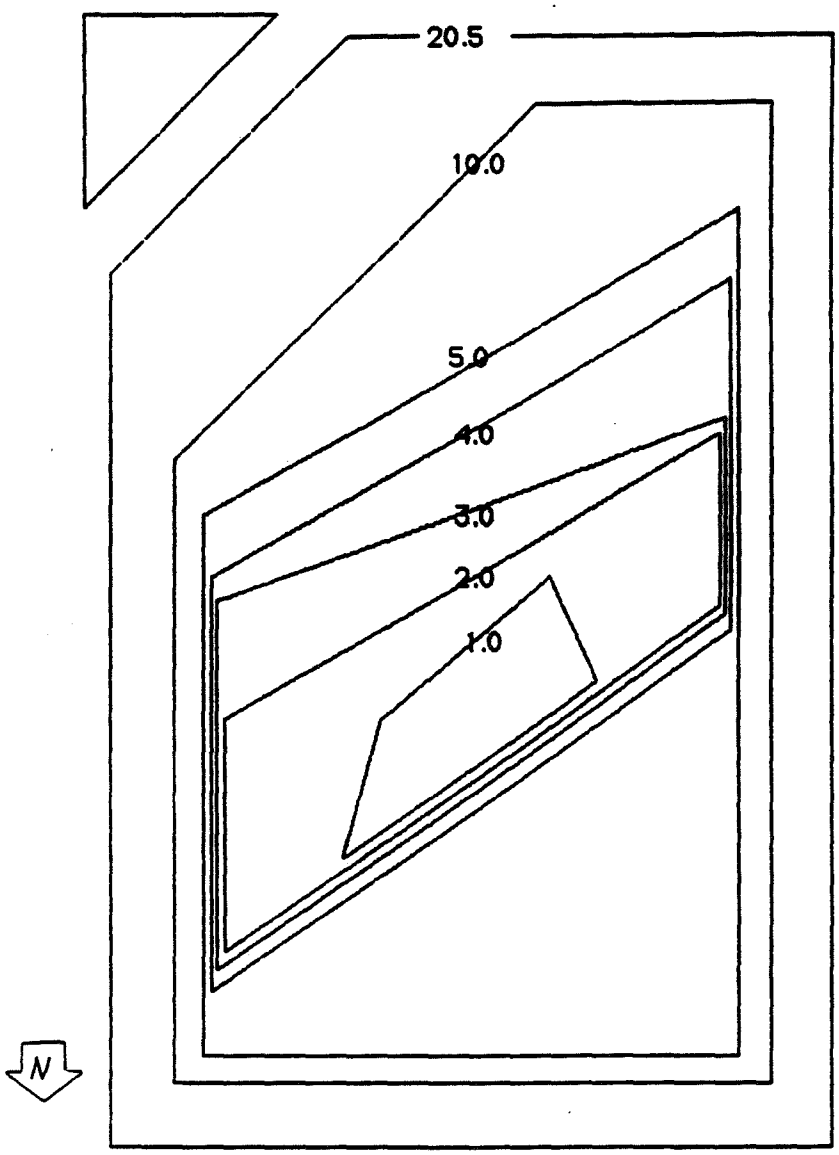
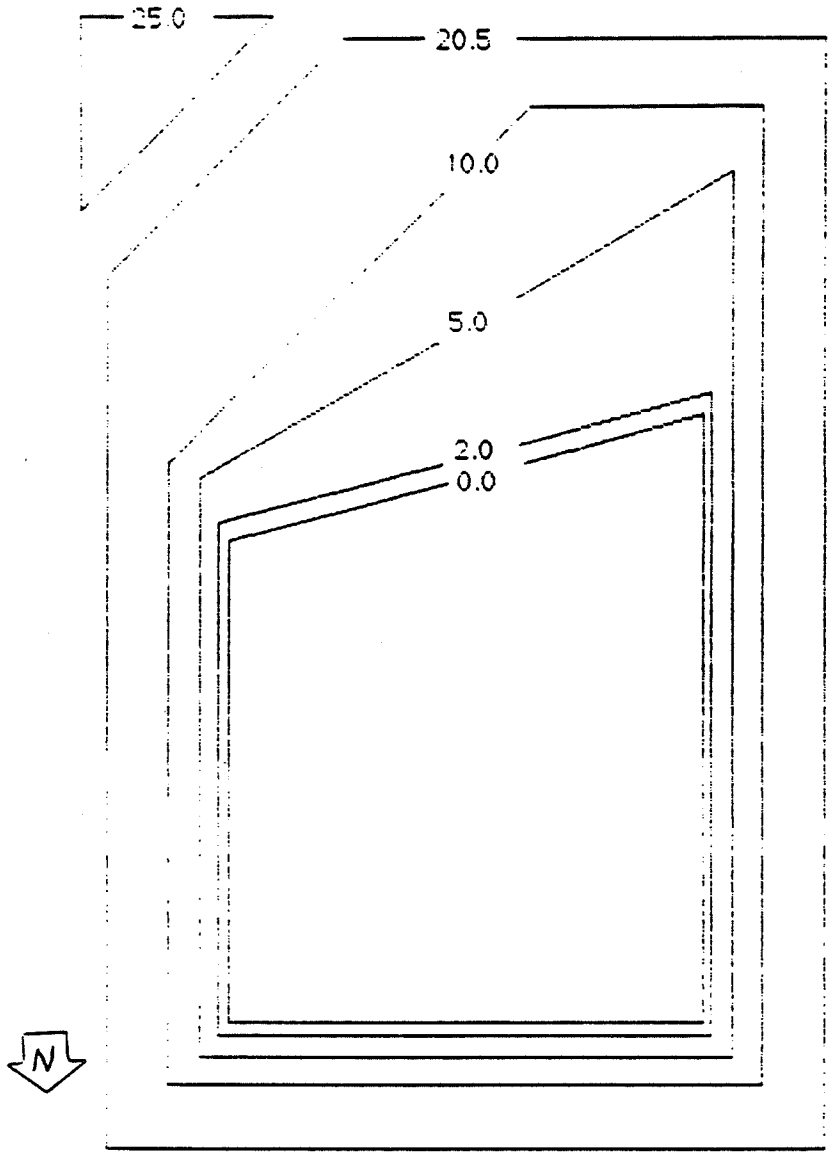
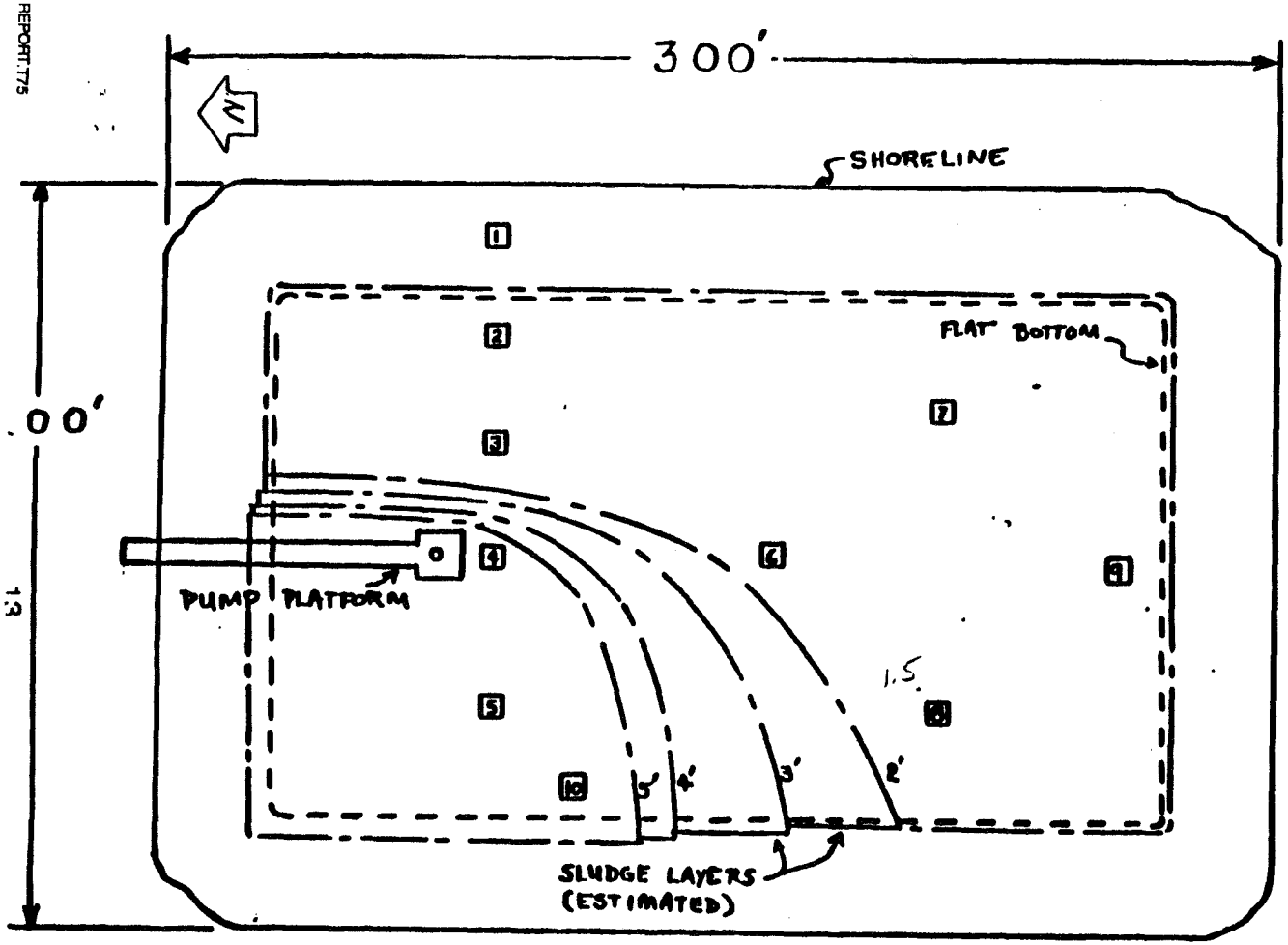


Figure 2-5 Ashland Oil Tank 75 - Top of Hard Bottom Sludge Contours

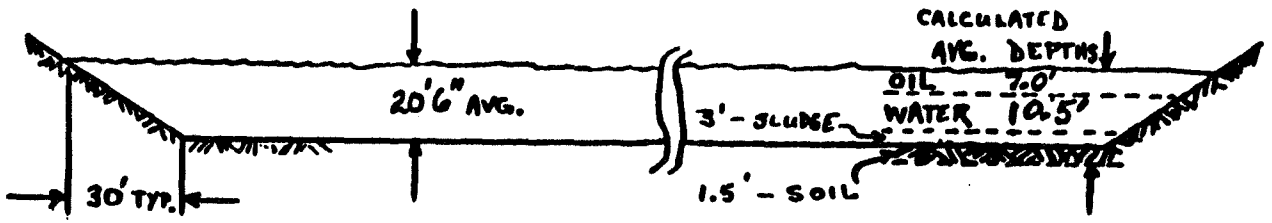




SAMPLE STATION LOCATION	SLUDGE DEPTH	BOTTOM DEPTH
1	0'	12'-6"
A 2	2'	21'-0"
3	2'	20'-8"
P 4	5'	20'-8"
E 5	5'	20'-6"
6	2'	20'-3"
C 7	2'	20'-3"
D 8	2'	20'-6"
S 9	Surface Sample	
S 10	Surface Sample	

OCTOBER SAMPLES
A, B, C, & D

NOVEMBER SAMPLES
P = PROFILE
S = SURFACE



OIL = 68000 BBL
WATER = 87,000 BBL
SLUDGE = 3700 YD³
SOIL = 3700 YD³

ASHLAND PETROLEUM COMPANY
ENGINEERING DEPARTMENT

SUBJECT: 75 TANK CLEANUP
BUFFALO REFINERY

BY: J.H. GRAY
CHECKED BY:
APPROVED BY:
DATE: 12-11-84
DRAWING: SK-001
SCALE:
SHEET:

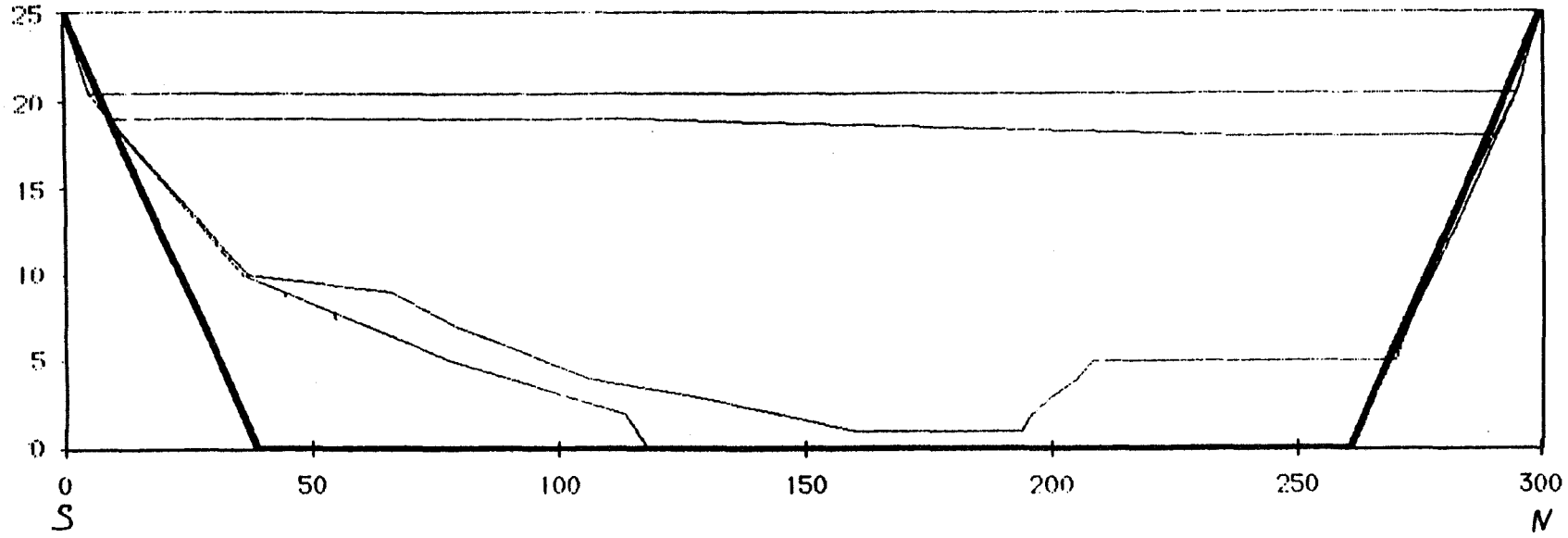
0427-2

REPORT.T75

1-3

Figure 2-6 Ashland Oil Tank 75 - Sampling Profile

Figure 2-7 Ashland Oil Tank 75 - Cross Section

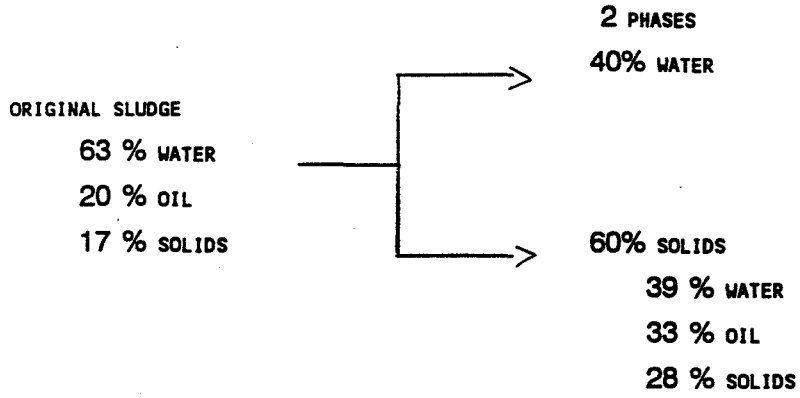


2.3.2 Pumpable Sludges

The samples of pumpable sludge were forwarded to three vendors: Bird Environmental, YWC, and SRS. YWC quickly determined that the use of filter presses on this sludge was not applicable, and combined its efforts with Bird. The vendors investigated the material and reached the following conclusion:

2.3.2.1 Bird/YWC

Bird/YWC concluded that contrifuging with their equipment would provide two-phase separation. They determined that the process results would be as follows:



The water phase could be disposed using the existing sewer system. There is no market for the solids portion, and this material would be landfilled after solidification. The benefit of the Bird/YWC would be to reduce the volume of pumpable sludge by 40%.

2.3.2.2 SRS

SRS concluded that addition of cutter oil in a 1.5:1 ratio was essential to separation. Using three-phase separation and thermal drying, the pumpable sludge is separated into three phases:

The benefit in the use of this system is twofold: reduction in volume, and the ability to reuse the oil. The following represents the expected volumes of material:

ORIGINAL SLUDGE	3 PHASES
500,000 GALLONS	235,000 GALLONS WATER
	110,000 GALLONS OIL
	155,000 GALLONS SOLIDS

BUFFALO TESTING LABORATORIES INC.

CHEMISTS - METALLURGISTS
902 Kenmore Avenue
Phone (716) 873-2302

BIOLOGISTS - ENGINEERS
Buffalo, NY 14216-1452
FAX (716) 873-9914

Report No.: 93394
Client: Perland Environmental Technologies, Inc.
Page: 2

Sample No. 2: Hard Bottom Sludge

Parameters		Result
Ignitability		>212 F
Corrosivity		<0.5 mmpy (passes test)
Reactivity	Cyanide	<10 ppm
	Sulfide	108 ppm
PCB		<10 ppm as AROCLOR 1260

EP Tox:

Parameters	Result	Max. Allowable Concentration
Arsenic	<.005 ppm	5.0 ppm
Barium	<1.0 ppm	100.0 ppm
Cadmium	<.04 ppm	1.0 ppm
Chromium	<.50 ppm	5.0 ppm
Lead	1.15 ppm	5.0 ppm
Mercury	<.001 ppm	0.2 ppm
Selenium	<.005 ppm	1.0 ppm
Silver	<.10 ppm	5.0 ppm

NOTE: Samples will be shipped under separate cover.

Very truly yours,
BUFFALO TESTING LABORATORIES, INC.

Grant W. Vincent
GRANT W. VINCENT

BUFFALO TESTING LABORATORIES INC.

CHEMISTS - METALLURGISTS
902 Kenmore Avenue
Phone (716) 873-2302

BIOLOGISTS - ENGINEERS
Buffalo, NY 14216-1452
FAX (716) 873-9914

March 29, 1990 Report No.: 93394

Attn: Roger Brady
Perland Environmental Technologies, Inc.
8 New England Executive Park
Burlington, MA 01803

Gentlemen:

Following are the results of tests performed on the samples which we picked up from the Ashland Oil Company on March 2, 1990 per Roger Brady.

Samples Submitted: Two (2) samples identified as:
1) Top Oil
2) Hard Bottom Sludge

Object: Chemical Analysis.

Method: ASTM methods.

Results:

Sample No. 1: Top Oil

Parameters	Result
Flash Point	294 F
Viscosity	101.5 SFS @ 122 F
	27.0 SFS @ 140 F
Ash	0.73%
Heating Value	15,038 BTU/lb.
Sulfur	0.98%
Chlorides	<10 ppm
API Gravity (60 F)	14.2
% Water Distillation	18.8%
BS&W	21%

APPENDIX B

DER-10 Fish and Wildlife Resources Impact Analysis Decision Key

Appendix 3C Fish and Wildlife Resources Impact Analysis Decision Key	If YES Go to:	If NO Go to:
1. Is the site or area of concern a discharge or spill event?	13	2
2. Is the site or area of concern a point source of contamination to the groundwater which will be prevented from discharging to surface water? Soil contamination is not widespread, or if widespread, is confined under buildings and paved areas.	13	3
3. Is the site and all adjacent property a developed area with buildings, paved surfaces and little or no vegetation?	4	9
4. Does the site contain habitat of an endangered, threatened or special concern species?	Section 3.10.1	5
5. Has the contamination gone off-site?	6	14
6. Is there any discharge or erosion of contamination to surface water or the potential for discharge or erosion of contamination?	7	14
7. Are the site contaminants PCBs, pesticides or other persistent, bioaccumulable substances?	Section 3.10.1	8
8. Does contamination exist at concentrations that could exceed ecological impact SCGs or be toxic to aquatic life if discharged to surface water?	Section 3.10.1	14
9. Does the site or any adjacent or downgradient property contain any of the following resources? i. Any endangered, threatened or special concern species or rare plants or their habitat ii. Any DEC designated significant habitats or rare NYS Ecological Communities iii. Tidal or freshwater wetlands iv. Stream, creek or river v. Pond, lake, lagoon vi. Drainage ditch or channel vii. Other surface water feature viii. Other marine or freshwater habitat ix. Forest x. Grassland or grassy field xi. Parkland or woodland xii. Shrubby area xiii. Urban wildlife habitat xiv. Other terrestrial habitat	11	10
10. Is the lack of resources due to the contamination?	3.10.1	14
11. Is the contamination a localized source which has not migrated and will not migrate from the source to impact any on-site or off-site resources?	14	12
12. Does the site have widespread surface soil contamination that is not confined under and around buildings or paved areas?	Section 3.10.1	12
13. Does the contamination at the site or area of concern have the potential to migrate to, erode into or otherwise impact any on-site or off-site habitat of endangered, threatened or special concern species or other fish and wildlife resource? (See #9 for list of potential resources. Contact DEC for information regarding endangered species.)	Section 3.10.1	14
14. No Fish and Wildlife Resources Impact Analysis needed.		

Appendix 3C: Fish and Wildlife Resources Impact Analysis Decision Key – Additional Information

Question 1:

"Is the site or area of concern a discharge or spill event?"

Yes, the Tank 75 Site (the Project) is a location known to have residual petroleum refining sludge contained within a 200' x 300' x 26' deep gunite-lined in-ground petroleum storage tank known as Tank 75. Further information on the site background/history can be found in the Section 2 of the RIWP.

Question 13:

"Does the contamination at the site or area of concern have the potential to migrate to, erode into or otherwise impact any on-site or off-site habitat of endangered, threatened, or special concern species or other fish and wildlife resource?"

The New York Natural Heritage Program (NHP) Environmental Resource Mapper was analyzed for the Project site. No rare, threatened, endangered, or species of special concern or their habitats, significant natural communities, or state regulated wetlands were identified onsite or within 0.25 miles of the Project site. The United States Fish & Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool was also analyzed, which identified the potential presence of the threatened Northern Long-eared Bat (*Myotis septentrionalis*) (NLEB) at the Project site. Due to there being no trees onsite and therefore no tree clearing required, there will be no anticipated impacts to the NLEB or its habitat. The Site is located within an active Major Oil Storage Facility. The Site is a 1.25-acre site that consists of a man-made gunite-lined in-ground surface impoundment (Tank 75) formerly used for storage of petroleum product. Tank 75 does not contain an outfall or drainage on-site or off-site. Monitoring wells surrounding Tank 75 on all sides show that there are no impacts to groundwater from materials that are contained within Tank 75. Therefore, Tank 75 is not anticipated to impact habitat of endangered, threatened, or special concern species or other fish and wildlife resources. The remaining resources listed within Question 9 have been assessed and are not located on site.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Environmental Resource Mapper

Base Map: Topographical | Using this map

Search

Tools

Layers and Legend

- Unique Geological Features
- Waterbody Classifications for Rivers/Streams
- Waterbody Classifications for Lakes
- State Regulated Freshwater Wetlands (Outside of the Adirondack Park)
  - State Regulated Wetland Checkzone
- Imperiled Mussels
  - Mussel Screening Ponded Waters
  - Mussel Screening Streams
- Significant Natural Communities
  - Natural Communities Near This Location
- Rare Plants or Animals

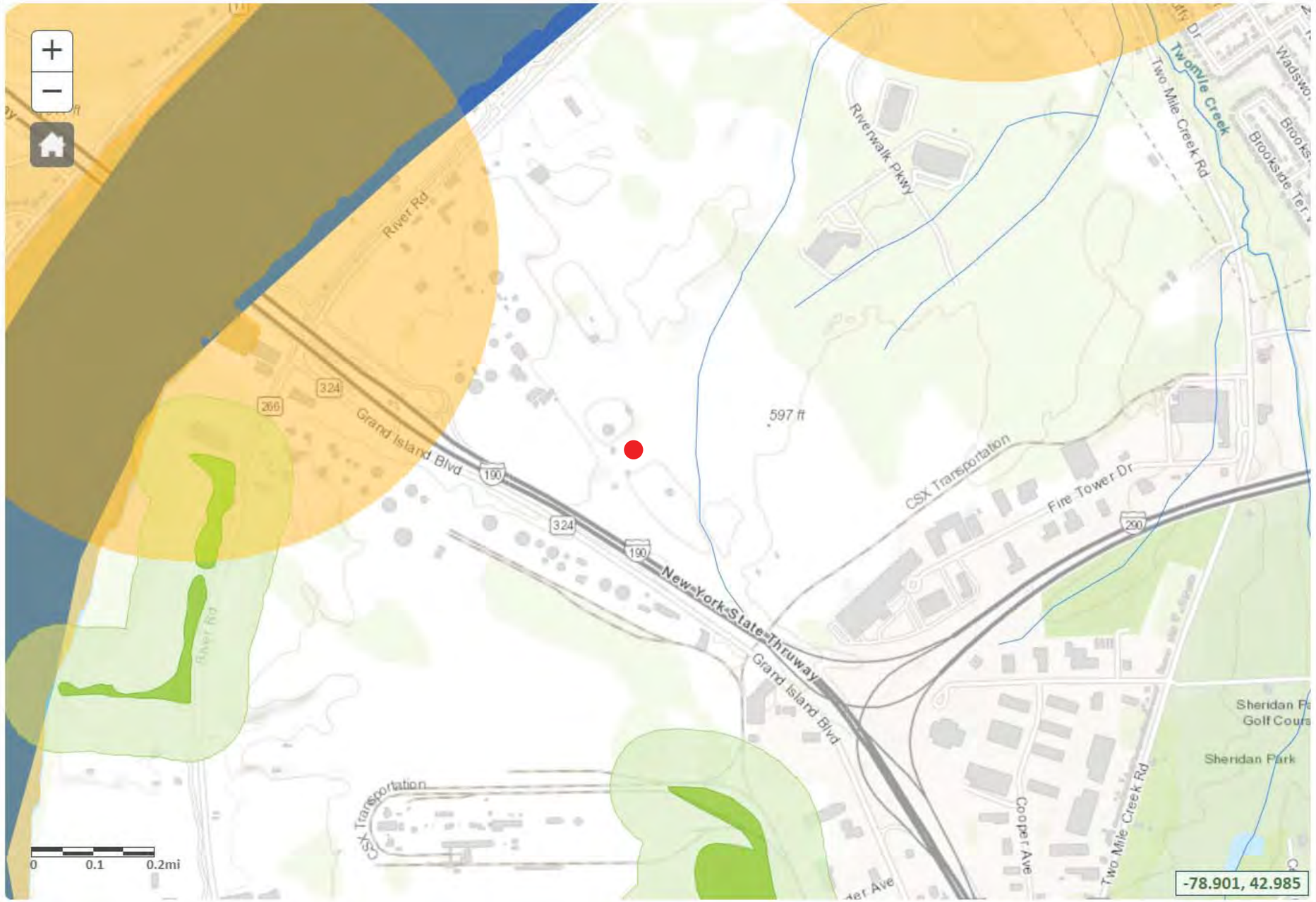
Other Wetland Layers

Reference Layers

Tell Me More...

Need A Permit?

Contacts



United States Department of the Interior

FISH AND WILDLIFE SERVICE
New York Ecological Services Field Office
3817 Luker Road
Cortland, NY 13045-9385
Phone: (607) 753-9334 Fax: (607) 753-9699
Email Address: fw5es_nyfo@fws.gov

In Reply Refer To:
Project Code: 2022-0081387
Project Name: Tank 75 RI

September 01, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)

(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. **Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.**

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New York Ecological Services Field Office
3817 Luker Road
Cortland, NY 13045-9385
(607) 753-9334

Project Summary

Project Code: 2022-0081387
Project Name: Tank 75 RI
Project Type: Non-NPL Site Remediation
Project Description: Perform remedial investigation of Tank 75 and surrounding area involving sampling of soil, groundwater, and materials.
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.9931811,-78.92162475178499,14z

Counties: Erie County, New York

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis*	Threatened

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9045

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

APPENDIX C

Emerging Contaminant Sampling Supporting Documents

NEW YORK STATE OF OPPORTUNITY.

Department of Environmental Conservation

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Under NYSDEC's Part 375 Remedial Programs

April 2023

Table of Contents

ERRATA SHEET for

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) Under NYSDEC's Part 375 Remedial Programs Issued January 17, 2020

Citation and Page Number	Current Text	Corrected Text	Date
Title of Appendix I, page 32	Appendix H	Appendix I	2/25/2020
Document Cover, page 1	Guidelines for Sampling and Analysis of PFAS	Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs	9/15/2020
Data Assessment and Application to Site Cleanup Page 3	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	3/28/2023
Water Sample Results Page 3	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt) and is determined to be attributable to the site, either by a comparison of upgradient and downgradient levels, or the presence of soil source areas, as defined below.	NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These guidance values also include criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt).Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.	3/28/2023
Soil Sample Results Page 3	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values:	NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:	3/28/2023
Protection of Groundwater Page 3	PFOA (ppb) 1.1 PFOS (ppb) 3.7	PFOA (ppb) 0.8 PFOS (ppb) 1.0	3/28/2023

Citation and Page Number	Current Text	Corrected Text	Date
Footnote 2 Page 3	The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	3/28/2023
Testing for Imported Soil Page 4	If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable.	If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.	3/28/2023
Routine Analysis, page 9	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1 or ISO 25101."	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533."	9/15/2020
Additional Analysis, page 9, new paragraph regarding soil parameters	None	"In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (EPA Method 9060), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils."	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Data Assessment and Application to Site Cleanup Page 10	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Target levels for cleanup of PFAS in other media, including biota and sediment, have not yet been established by the DEC.	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.	9/15/2020
Water Sample Results Page 10	PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water (…) If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water (…) If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Soil Sample Results, page 10	"The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase."	"Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values. " [Interim SCO Table] "PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP. As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf. "	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Testing for Imported Soil Page 11	Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the PFAS Analyte List (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs. If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable. PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Footnotes	None	[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances. [2] The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the soil cleanup objective for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	9/15/2020
Additional Analysis, page 9	In cases… soil parameters, such as Total Organic Carbon (EPA Method 9060), soil…	In cases… soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil…	1/8/2021
Appendix A, General Guidelines, fourth bullet	List the ELAP-approved lab(s) to be used for analysis of samples	List the ELAP- certified lab(s) to be used for analysis of samples	1/8/2021
Appendix E, Laboratory Analysis and Containers	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101.	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101	1/8/2021
Water Sample Results Page 9	"In addition, further assessment of water may be warranted if either of the following screening levels are met: a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L"	Deleted	6/15/2021

Citation and Page Number	Current Text	Corrected Text	Date
Routine Analysis, Page XX	Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP)… criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids).	Deleted	5/31/2022
Analysis and Reporting, Page XX	As of October 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS.	Deleted	5/31/2022
Routine Analysis, Page XX	LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media.	EPA Method 1633 is the procedure to use for environmental samples.	
Soil Sample Results, Page XX	Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6	
Appendix A	"Include in the text… LC-MS/MS for PFAS using methodologies based on EPA Method 537.1"	"Include in the text ….EPA Method 1633"	
Appendix A	"Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101"	Deleted	
Appendix B	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	

Citation and Page Number	Current Text	Corrected Text	Date
Appendix C	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	
Appendix D	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	
Appendix G		Updated to include all forty PFAS analytes in EPA Method 533	
Appendix H		Deleted	
Appendix I	Appendix I	Appendix H	
Appendix H	"These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report."	"These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER)."	
Appendix H	"The holding time is 14 days…"	"The holding time is 28 days…"	
Appendix H, Initial Calibration	"The initial calibration should contain a minimum of five standards for linear fit…"	"The initial calibration should contain a minimum of six standards for linear fit…"	
Appendix H, Initial Calibration	Linear fit calibration curves should have an R^2 value greater than 0.990.	Deleted	
Appendix H, Initial Calibration Verification	Initial Calibration Verification Section	Deleted	
Appendix H	secondary Ion Monitoring Section	Deleted	
Appendix H	Branched and Linear Isomers Section	Deleted	

Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis, reporting, and assessment of PFAS, DER has developed this document which summarizes currently accepted procedures and updates previous DER technical guidance pertaining to PFAS.

Applicability

All work plans submitted to DEC pursuant to one of the remedial programs under Part 375 shall include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments, or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day per site or one per twenty samples, whichever is more frequent.

Analysis and Reporting

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third-party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix G) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

EPA Method 1633 is the procedure to use for environmental samples. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist. Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay).

In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.[1]

[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

Water Sample Results

NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These human health criteria should also be applied to surface water that is used as a water supply. This guidance also includes criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:

Guidance Values for Anticipated Site Use	PFOA (ppb)	PFOS (ppb)
Unrestricted	0.66	0.88
Residential	6.6	8.8
Restricted Residential	33	44
Commercial	500	440
Industrial	600	440
Protection of Groundwater[2]	0.8	1.0

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These

[2] The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).

additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.

As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf.

Testing for Imported Soil

Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.

PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
    - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP certified lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an "Analytical Methods/Quality Assurance Summary Table" specifying:
    - Matrix type
    - Number or frequency of samples to be collected per matrix
    - Number of field and trip blanks per matrix
    - Analytical parameters to be measured per matrix
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by EPA Method 1633
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
-
- Include detailed sampling procedures
    - Precautions to be taken
    - Pump and equipment types
    - Decontamination procedures
    - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per site for each matrix

Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix C - Sampling Protocols for PFAS in Monitoring Wells

General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix D - Sampling Protocols for PFAS in Surface Water

General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel cup

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Where conditions permit, (e.g. creek or pond) sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

If site conditions permit, samples can be collected directly into the laboratory container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., washroom sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank per day per site and a minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers.
- A field reagent blank (FRB) should be collected at a rate of one per 20 samples. The lab will provide a FRB bottle containing PFAS free water and one empty FRB bottle. In the field, pour the water from the one bottle into the empty FRB bottle and label appropriately.
- Request appropriate data deliverable (Category B) and an electronic data deliverable
- For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.

Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the current SOP developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8). This SOP should be followed when collecting fish for contaminant analysis. Note, however, that the Bureau of Ecosystem Health will not be supplying bags or tags. All supplies are the responsibility of the collector

Procedure Name: General Fish Handling Procedures for Contaminant Analysis

Number: FW-005

Purpose: This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

Organization: Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

Version: 8

Previous Version Date: 21 March 2018

Summary of Changes to this Version: Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

Originator or Revised by: Wayne Richter, Jesse Becker

Date: 26 April 2019

Quality Assurance Officer and Approval Date: Jesse Becker, 26 April 2019

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:

   1. The top box is to be filled out **and signed** by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).

   2. The second section is to be filled out **and signed** by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.

   3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified, signed, and dated**, until laboratory personnel take possession of the fish.

B. The following data are required on each **Fish Collection Record** form:

   1. Project and Site Name.

   2. DEC Region.

   3. All personnel (and affiliation) involved in the collection.

   4. Method of collection (gill net, hook and line, etc.)

   5. Preservation Method.

C. The following data are to be taken on each fish collected and recorded on the **Fish Collection Record** form:

   1. Tag number - Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.

   2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.

   3. Date collected.

   4. Sample location (waterway and nearest prominent identifiable landmark).

   5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.

6. Sex - fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.

2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.

3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.

4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate “Age” column.

5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.

6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.

7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.

E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish’s tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.

G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.

H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.
No Post-it notes.
No ice packs; only water ice or dry ice.
Any gloves worn must be powder free nitrile.
No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
Wash hands after handling any food containers or packages as these may contain PFCs.
Keep pre-wrapped food containers and wrappers isolated from fish handling.
Wear clothing washed at least six times since purchase.
Wear clothing washed without fabric softener.
Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with “fluor” in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.

J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.

K. A recommended equipment list is at the end of this document.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE
FISH COLLECTION RECORD

Project and Site Name _____ DEC Region _____

Collections made by (include all crew) _____

Sampling Method: □Electrofishing □Gill netting □Trap netting □Trawling □Seining □Angling □Other _____

Preservation Method: □Freezing □Other _____ Notes (SWFDB survey number): _____

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ( )	WEIGHT ( )	REMARKS

richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CHAIN OF CUSTODY

I, _____, of _____ collected the
(Print Name) (Print Business Address)

following on _____, 20____ from _____
(Date) (Water Body)

in the vicinity of _____
(Landmark, Village, Road, etc.)

Town of _____, in _____ County.

Item(s) _____

_____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on _____, 20_____.

_____ _____
Signature Date

I, _____, received the above mentioned sample(s) on the date specified and assigned identification number(s) _____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

_____ _____
Signature Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

richter: revised 21 April 2014; becker: 23 March 2017, 26 April, 2019

NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

Scale or balance of appropriate capacity for the fish to be collected.

Fish measuring board.

Plastic bags of an appropriate size for the fish to be collected and for site bags.

Individually numbered metal tags for fish.

Manila tags to label bags.

Small envelops, approximately 2” x 3.5”, if fish scales are to be collected.

Knife for removing scales.

Chain of custody and fish collection forms.

Clipboard.

Pens or markers.

Paper towels.

Dish soap and brush.

Bucket.

Cooler.

Ice.

Duct tape.

Appendix G – PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonic acids	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorononanesulfonic acid	PFNS	68259-12-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
	Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Perfluoroalkyl carboxylic acids	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUnA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTeDA	376-06-7
Per- and Polyfluoroether carboxylic acids	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
Fluorotelomer sulfonic acids	4:2 Fluorotelomer sulfonic acid	4:2-FTS	757124-72-4
	6:2 Fluorotelomer sulfonic acid	6:2-FTS	27619-97-2
	8:2 Fluorotelomer sulfonic acid	8:2-FTS	39108-34-4
Fluorotelomer carboxylic acids	3:3 Fluorotelomer carboxylic acid	3:3 FTCA	356-02-5
	5:3 Fluorotelomer carboxylic acid	5:3 FTCA	914637-49-3
	7:3 Fluorotelomer carboxylic acid	7:3 FTCA	812-70-4
Perfluorooctane sulfonamides	Perfluorooctane sulfonamide	PFOSA	754-91-6
	N-methylperfluorooctane sulfonamide	NMeFOSA	31506-32-8
	N-ethylperfluorooctane sulfonamide	NEtFOSA	4151-50-2
Perfluorooctane sulfonamidoacetic acids	N-methylperfluorooctane sulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethylperfluorooctane sulfonamidoacetic acid	N-EtFOSAA	2991-50-6
Perfluorooctane sulfonamide ethanols	N-methylperfluorooctane sulfonamidoethanol	MeFOSE	24448-09-7
	N-ethylperfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2

Group	Chemical Name	Abbreviation	CAS Number
Ether sulfonic acids	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)	9Cl-PF3ONS	756426-58-1
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	11Cl-PF3OUdS	763051-92-9
	Perfluoro(2-ethoxyethane) sulfonic acid	PFEESA	113507-82-7

Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER). Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov.

Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 28 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

Temperature greatly exceeds 6ºC upon arrival at the lab*	Use professional judgement to qualify detects and non-detects as estimated or rejected
Holding time exceeding 28 days to extraction	Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded

*Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

Initial Calibration

The initial calibration should contain a minimum of six standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

%RSD >20%	J flag detects and UJ non detects

Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

CCV recovery <70 or >130%	J flag results

Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

Blank Result	Sample Result	Qualification
Any detection	<Reporting limit	Qualify as ND at reporting limit
Any detection	>Reporting Limit and >10x the blank result	No qualification
>Reporting limit	>Reporting limit and <10x blank result	J+ biased high

Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

RPD >30%	Apply J qualifier to parent sample

Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects

Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only
RPD >30%	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only

Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

Recovery <50% or >150%	Apply J qualifier
Recovery <25% or >150% for poor responding analytes	Apply J qualifier
Isotope Dilution Analyte (IDA) Recovery <10%	Reject results

Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

Peak Integrations

Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

2023 ADDENDUM TO JUNE 1998 DIVISON OF WATER TECHNICAL AND OPERATIONAL GUIDANCE SERIES (TOGS) NO. 1.1.1 (Originator – Alexander Smith)

TABLE 1
NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES
February 2023

SUBSTANCE (CAS No.)	WATER CLASSES	STANDARD (µg/L)	GUIDANCE VALUE (µg/L)	TYPE	BASIS CODE
1,4-Dioxane (123-91-1)	A, A-S, AA, AA-S		0.35	H(WS)	A
	GA		0.35	H(WS)	A
	GSA		0.35	H(WS)	A
	A, A-S, AA, AA-S, B, C		18,000	A(C)	
	A, A-S, AA, AA-S, B, C, D		160,000	A(A)	
	SA, SB, SC, I		7,000	A(C)	
	SA, SB, SC, I, SD		63,000	A(A)	
Perfluorooctane Sulfonic Acid (PFOS) (1763-23-1)	A, A-S, AA, AA-S		0.0027	H(WS)	A
	GA		0.0027	H(WS)	A
	GSA		0.0027	H(WS)	A
	A, A-S, AA, AA-S, B, C		160	A(C)	
	A, A-S, AA, AA-S, B, C, D		710	A(A)	
	SA, SB, SC, I		41	A(C)	
	SA, SB, SC, I, SD		190	A(A)	
Perfluorooctanoic acid (PFOA) (335-67-1)	A, A-S, AA, AA-S		0.0067	H(WS)	A
	GA		0.0067	H(WS)	A
	GSA		0.0067	H(WS)	A

TABLE 5
NEW YORK STATE GROUNDWATER EFFLUENT LIMITATIONS (CLASS GA)
February 2023

SUBSTANCE (CAS No.)	MAXIMUM ALLOWABLE CONCENTRATION (µg/L)	CATEGORY
1,4-Dioxane (123-91-1)	0.35	B
Perfluorooctane Sulfonic Acid (PFOS) (1763-23-1)	0.0027	B
Perfluorooctanoic acid (PFOA) (335-67-1)	0.0067	B

Carol Lamb-Lafay, P.E., Director
Division of Water

APPENDIX D

Standard Forms and Operating Procedures

AECOM **Radiological Service Technical Practice Group Standard Operating Procedure**	PROCEDURE NO. RS-TPG SOP 001, R2 DATE: June 10, 2022 APPROVED: Radiological Service TPG Leader
Portable Detection Equipment	

Standard Operating Procedure

PORTABLE DETECTION EQUIPMENT

AECOM's Radiological Service Technical Practice Group (RS-TPG) is responsible for the issuance, revision, and maintenance of this procedure. This procedure has also been provided to the United States Nuclear Regulatory License Division of Nuclear Materials Safety (NRC LDNMS) as part of AECOM's "decommissioning license" application. Therefore, any deviations from the procedures set forth in this document require approval of the RS-TPG Leader and the NRC LDNMS license Radiation Safety Officer (RSO).

RS-TPG License RSO Approval: _____ June 10, 2022

1 PURPOSE

The purpose of this procedure is to provide instruction for operating portable radiation detection instrumentation. For aspects of instrumentation operation not covered in this procedure, refer to the instrument technical manual.

2 SCOPE

This procedure provides guidance for the response and source checks of portable instrumentation, portable sample counters, and area radiation monitors. Response and source checks are the periodic checks to verify that the instrument is properly functioning within the manufacturer's specifications. Guidance is also provided for removing from service, shipping and receipt of instruments returned from repair and calibration.

3 ALARA POLICY

It is AECOM's policy to plan and conduct its radiological activities safely and in such a fashion as to protect the health and safety of its employees, subcontractors, members of the public, and the environment. To achieve this, AECOM shall confirm that efforts are taken to reduce radiological exposures and releases to the environment as low as is reasonably achievable (ALARA), taking into account social, technical, economic, practical and public policy considerations. AECOM's RS-TPG is committed to implementing this procedure and maintaining radiation detection equipment in a manner to reflect this policy.

4 PRECAUTIONS

4.1 Use only instruments possessing a current calibration.

4.2 When operating a battery powered instrument, the batteries shall be checked each time the instrument is used. Batteries shall be changed when required.

4.3 Handle instruments and cables with care. Do not drop or allow them to bang against hard surfaces. More information on addressing issues with cables is provided in Attachment 6.

4.4 Care should be taken when using thin window detectors (pancake and scintillation detectors) near sharp objects so that the window and detector shall not be damaged. More information on addressing light leaks in mylar film is provided in Attachment 6.

4.5 Slowly enter areas of unknown radiation with instruments on the highest scale to avoid off-scale readings and subsequent prolonged recovery time.

4.6 Minimize contact with the surface being surveyed. If loose/removable contamination is present, **avoid** contact with the surface and check instruments for contamination if contact occurs.

4.7 Occasionally verify instrument is responding properly if background appears outside the expected range.

4.8 When checking instruments, place the source in its holder or center it on the probe as required.

4.9 Carefully pack for shipment any instrument being sent to a facility to be calibrated or repaired to avoid damage in transit.

4.10 Radiation survey instruments and count rate instruments shall be calibrated at least every twelve months, after the instrument is repaired and at the start of each project.

5 PROCEDURE

5.1 Steps Prior to Using Instruments

5.1.1 Calibration Verification

5.1.1.1 All portable radiological instruments shall have a current calibration label.

5.1.1.2 The calibration date will be checked daily, prior to use of the instrument.

5.1.2 Physical Check

5.1.2.1 Inspect the general physical condition of the instrument and detector prior to each use.

5.1.2.2 Inspect for loose/damaged knobs, buttons, cables, connectors, broken/damaged meter movements/ displays, dented or corroded instrument cases, punctured/deformed probe/probe window(s), cables, etc., and any other physical impairments that may affect the proper operation of the instrument or detector.

5.1.2.3 Any instrument or detector having a questionable physical condition shall not be used until corrected.

5.1.3 Battery Check

5.1.3.1 Check that there is sufficient power being supplied to the detector and instrument circuitry for proper operation.

5.1.3.2 Document the battery check in the daily log or on the Radiological Instrument Daily Source Check Record, Attachment 1 (or similar).

5.1.3.3 Perform this check in accordance with the instrument's technical manual; although, it is generally performed as follows:

5.1.3.3.1 Position the appropriate selector switch to the "Batt" position or depress the "Batt Check" button with the instrument on.

5.1.3.3.2 Observe the indication for the current battery condition. Typically, the current battery condition will be indicated by a meter deflection into the "Batt OK" region or "Batt OK" on the display, etc.

5.1.3.3.3 If unsatisfactory results are obtained, refer to the technical manual for replacement of the batteries and repeat the check. The instrument shall display a satisfactory battery check prior to use.

5.1.4 High Voltage (HV) Check

5.1.4.1 HV is adjusted appropriately during instrument calibration and does not require adjustment for normal operation.

5.1.4.2 A HV check is required for instruments with an “HV” check button prior to each use as applicable in accordance with the instrument technical manual.

5.1.4.3 Record the HV setting on the Radiological Instrument Daily Source Check Record, Attachment 1 (or similar).

5.1.4.4 An instrument with suspected HV problems shall be reported to the Project Manager, Site/RS License RSO, and, for AECOM-owned equipment, the responsible Equipment Manager.

5.1.5 Instrument Source Check (Scaler Instruments and Sample Counters)

This check is performed periodically to verify that the instrument will respond accurately to a known source of radiation. Locate the source for the instrument/detector being used and perform the response source check as described in the following.

5.1.5.1 Check the battery condition. If batteries are not in the allowed range, replace the batteries or clean contacts as necessary. If battery check is not satisfactory after corrective actions, then place instrument out of service and send to an authorized calibration facility for repair and calibration. (Not applicable to sample counters.)

5.1.5.2 Determine the background radiation level. It must be low enough to allow a measurable response to the check source being used. Careful monitoring of changing background levels is necessary to obtain accurate instrument readings.

5.1.5.3 Perform source checks with appropriate sources. For on-contact readings, verify that the source to probe geometry is reproducible, in direct contact, and facing the probe.

5.1.5.4 Record the source check results on the Radiological Instrument Daily Source Check Record, Attachment 1 (or similar).

5.1.5.5 Compare the source check counts against the response range calculated in accordance with Section 5.3.7. Instruments with source check responses that responded outside the acceptable range two out of three times will be removed from service and the Project Lead notified.

5.1.6 Daily Response Checks (Dose Rate/Exposure Rate Detectors)

This instrument check is performed to see if the instrument responds to a known source of radiation. This is a qualitative check only.

5.1.6.1 Daily response checks of dose/exposure rate survey instruments shall be performed every day when in use. Documentation of these response checks is required.

5.1.6.2 Begin with the instrument on the highest range/scale and enable the audible device, if applicable.

5.1.6.3 Slowly move the detector towards the check source and observe for an increase in audible and/or visual response.

5.1.6.4 Change the range/scale of the instrument as appropriate to obtain a readable indication and to check each of the meter ranges/scales possible. If an appreciable response has not been obtained, even in the lowest range, evaluate instrument performance by comparison to previous source check data for the instrument.

5.1.7 Should the battery, source or response check be unsatisfactory, the instrument shall be removed from service. Record this on the instrument check form, Attachment 1 (or similar). Send the instrument to an authorized calibration facility for repair and calibration.

5.1.8 When an instrument has reached its calibration due date, the instrument shall be sent to an authorized calibration facility.

5.2 Background Measurement for Scaler Instruments and Sample Counters (Initial Setup)

5.2.1 Verify that the background area is free of radioactive sources. The detector geometry should be set up in the same configuration as that to be used when counting samples to produce the most accurate results.

5.2.2 Perform the background measurement for one minute and record the total counts measured (C_b) on the Background Setup Sheet, Attachment 2.

5.2.3 Repeat the background measurement 9 times, for a total of ten measurements. Record the total counts observed (C_b) for each measurement on the Background Setup Sheet, Attachment 2 (or similar).

5.2.4 Calculate the average background counts ($\overline{C}_b$), the standard deviation (SD_b) and average background count rate ($\dot{C}$):

$$\overline{C}_b = \frac{\Sigma_i^n C_i}{N}$$

$$SD_b = \sqrt{\frac{\Sigma_i^n (C_i - \overline{C}_b)^2}{N-1}}$$

$$\dot{C}_b = \frac{\overline{C}_b}{t_b}$$

where:

$\overline{C}_b$ = average background count

SD_b = standard deviation of the average background

N = number of measurements

Σ = summation

C_i = C_1 through C_n (C_{10} if 10 measurements are made)

$\dot{C}_b$ = average net background count rate

t_b = time in minutes of a background count

5.2.5 Record the average background counts ($\overline{C}_b$), the standard deviation (SD_b), and the average background count rate ($\dot{C}_b$) on the Background Setup Sheet, Attachment 2.

5.2.6 Calculate the limits for background and record on Attachment 3, Instrumentation Efficiency Sheet.

High limit $\dot{C}_b + 2SD_b$

Low limit $\dot{C}_b - 2\ SD_b$ (if less than 0, record 0)

5.3 Instrument Efficiency for Scaler Instruments and Sample Counters (E)

Efficiency is a quantitative measure of detector performance for a particular radioisotope. It provides the necessary relationship between counts per minute (cpm) as seen by the detector and disintegrations per minute (dpm) from source decay. Determine detector efficiency with a source of known activity of the nuclide (or of a nuclide with similar energy decay products) being monitored for as follows:

5.3.1 Correct source activity for decay as follows: (if necessary)

$$A = A_o e^{-\lambda T}$$

$$\textit{Where: } \lambda = \frac{0.693}{t_{1/2}}$$

where: A = present source activity.

A_o = source activity at initial assay.

λ = decay constant for the source isotope.

T = time elapsed since initial source assay*

$t_{1/2}$ = source isotope half-life

*Time units must be consistent (days, hrs., or min., etc.)

5.3.2 Correct source activity for backscatter: (if necessary)

$$A_c = A(1+B_s)$$

where: A_c = corrected activity (dpm)

A = present source activity.

B_s = percent backscatter (expressed as a decimal, i.e., 50% = 0.50 taken from source calibration sheet); $(1+B_s)$ can be found on page 127 of the Radiological Health Handbook.

5.3.3 Determine expiration date of source check limits by adding to the current date the value derived from dividing the $t_{1/2}$ of the source by 15. The limits will need to be recalculated in accordance with this section (5.4) after the expiration date.

Current date + $(t_{1/2})/15$ (of source) = Expiration date

If this date is later than the calibration due date, record the calibration due date as the expiration date.

5.3.4 Count the source ten times (one minute each) and calculate the standard deviation (SD_n). Record the total counts measured (C_i) on the Instrument Efficiency Determination form, Attachment 3 (or similar):

$$SD_g = \frac{\sqrt{\Sigma_i^{10}\left(C_i - \overline{C}_g\right)^2}}{N-1} = \sqrt{\frac{SS}{N-1}}$$

where: SS = sum of squares

$$SD_n = \sqrt{(SD_g)^2 + (SD_b)^2}$$

C_i = gross counts (source counts including background for a single count)

Σ = summation

N = number of measurements

SD_n = standard deviation of the average net counts.

SD_g = standard deviation of the average gross counts

SD_b = standard deviation of the average background counts (obtained from section 5.2)

Record the ten gross counts (C_g) and the standard deviations (SD_n and SD_g) on the Instrumentation Efficiency Sheet, Attachment 3.

5.3.5 Calculate the net count rate ($\dot{C}_n$):

$$\dot{C}_g = \frac{\overline{C}}{t_g}$$

$$\dot{C}_n = \dot{C}_g - \dot{C}_b$$

where: $\dot{C}_g$ = average gross count rate
$\overline{C}_g$ = average gross counts
t_g = time in minutes of a source count
C_b = average background count rate (obtain from Section 5.2)

Record on Attachment 3.

5.3.6 Calculate the detector efficiency (E) for the radioactive standard which equals or best approximates the potential contamination source as follows:

$$E = \frac{\dot{C}_n}{A_c} = \frac{cpm}{dpm}$$

where: $\dot{C}_n$ = average net cpm
A_c = corrected activity (dpm).

Record on Attachment 3.

5.3.7 Calculate the limits for source checks and record on Attachment 3.

High limit $\dot{C}_n + 2\ SD_n$

Low limit $\dot{C}_n - 2\ SD_n$

5.4 Estimated Minimum Detectable Concentration (MDC) for Scaler Instruments and Sample Counters

5.4.1 The estimated minimum detectable activity is determined to verify that the detector being used will detect the presence of activity at or above the allowable limit under a given set of counting conditions. MDC is based on the estimated detection limit in counts (L_D) and detector efficiency. Determine the estimated L_D and MDC as follows:

$$L_D = k^2 + 2k\sqrt{B}$$

$$L_D = 3 + 4.65\sqrt{B}$$

Where:
k = Poisson probability sum for α and β (assuming a and b are equal)
= 1.645 for α and β both equal to 0.05 (95% confidence level)

B = number of background counts expect while performing the measurement (background rate x sample count time)

5.4.2 Record the calculated L_D on the Minimum Detectable Concentration Calculation form, Attachment 4.

5.4.3 Calculate the estimated MDC (in dpm/100 cm^2). For instances when the background and sample count time are the same:

$$MDC = \frac{L_D}{E \times A/100 \times t_b}$$

For instances when the background count time and the sample count time are different:

$$MDC = \frac{3 + 3.29\sqrt{C_b t_s \left(1 + \frac{t_s}{t_b}\right)}}{E \times t_s x \frac{A}{100}}$$

Where:

E = total detector 2-pi efficiency (in cpm/dpm) (from Section 5.3.6)

A = detector probe area (in cm^2)

t_s = sample count time

t_b = background count time

5.4.4 Record the calculated MDC in on Attachment 4 (or similar).

5.5 Control Charts

5.5.1 Control charts should be used by the health physics technician to monitor for shifts, trends, or increases in variability. They are used as guides to indicate the need for investigative action, rather than for evaluating precise values.

5.5.1.1 The cpm for each background check should be plotted on a control chart with high and low limits.

5.5.1.2 The net cpm for each source check should be plotted on a control chart with high and low limits.

5.6 Calibration

Instruments and sample counters used for radiation monitoring and contamination control shall be:

- Periodically maintained and calibrated on an established frequency of at least once per year;
- Appropriate for the type(s), levels, and energies of the radiation(s) encountered;
- Appropriate for existing environmental conditions; and
- Routinely tested for operability.

5.6.1 Radiological instruments shall be used only to measure the radiation for which their calibrations are valid.

5.6.2 The ANSI N323 method for radiological instrumentation calibration will be adhered to.

5.6.3 Calibrations shall use National Institute of Standards and Technology (NIST) traceable sources.

5.6.4 Calibration records shall be maintained on-site and in an electronic project file.

5.6.5 Pocket and electronic dosimeters and area radiation monitors should be calibrated at least annually.

5.6.6 The effects of environmental conditions, including interfering radiation, on an instrument shall be known prior to use.

5.6.7 Functional tests should be used to assess instrumentation designs that include alarms or that involve a process control.

5.6.8 A functional test should be developed to test all components involved in an alarm or trip function and performed at least annually.

5.6.9 Special calibrations should be performed for use of instrumentation outside manufacturer's specifications.

5.6.10 The instrument should be adjusted, calibrated and labeled to identify the special conditions and used only under the special conditions for which it was calibrated.

5.6.11 Instruments should bear a label or tag with the date of calibration and date calibration expires.

5.6.12 For AECOM-owned instruments, the calibration will be performed by a vendor appropriately licensed by the NRC or an Agreement State. Calibrations will be performed at least once annually while the instrument is in service. Rented instruments will also have a valid calibration from a vendor appropriately licensed by the NRC or an Agreement State.

5.7 Receipt of Repaired/Calibrated Instrument

5.7.1 This section applies to instruments sent from a project site, out for calibration and returned to the project site. It does not apply to rented equipment received on the project site for the first time.

5.7.2 Verify instrument has the correct calibration due date on the calibration sticker

5.7.3 Place the date the instrument was returned to service in the Out of Service Tracking Log, Attachment 5.

5.7.4 Perform a reference source check of the instrument using the appropriate source.

5.7.4.1 Repeat the procedure provided in Section 5.2 through 5.4 if the instrument's response is outside the original response range.

5.7.4.2 The new background, efficiency, and MDA obtained shall be used as the base line value for that instrument.

5.8 Instruments requiring calibration or repair at an off-site facility, as determined in Section 5.1, are treated as follows.

5.8.1 Remove the instrument or counter from service and record information on instrument check form. In addition, fill out the appropriate information in the Out of Service Tracking Log, Attachment 5.

5.8.2 Instruments with delicate probe windows should have a probe cover secured to prevent damage. Any special instructions should be included with the instrument.

5.8.3 Carefully package the instrument or counter and ship to the calibration facility.

The following procedures (5.9 – 5.13) are for general guidance only. Project-specific work plans will fully describe survey requirements.

5.9 Using Exposure and Dose Rate Instruments

5.9.1 General Area Surveys

Hold the detector at waist level with the most sensitive areas of the detector facing the item or areas being surveyed. Unless the radiation level on the item being surveyed is known, start on the highest scale and work down scale until the instrument reading is between 1/4 and 3/4 (mid-scale) scale, if possible.

5.9.2 Direct Measurements

Hold the detector at about one inch from the surface of the item being surveyed.

5.9.3 Recording a Measurement

Allow the detector to stabilize 15-30 seconds before recording the measurement. If the analog or digital display is sporadic and it is difficult to obtain an average response, record 10 instantaneous readings and calculate the average.

5.10 Using Gamma Scintillation Detectors

5.10.1 Direct Measurements

With the detector as close to the surface as possible, or some other pre-determined position, collect a measurement for a length of time sufficient to provide an acceptable minimum detectable count rate (MDC). Record the measurement on the appropriate field survey form.

5.10.2 Walk-Over Surveys

With the detector as close to the ground as possible, move the detector in a serpentine pattern while advancing along a predetermined survey area transect at a rate of not more than 1 meter per second. For instruments mounted on carts, ensure that the detector height allows sufficient field of view considering the coverage requirements and the spacing of the survey area transect. Record the average and maximum count rates observed for a predetermined survey area, or log the data using appropriate survey and position logging instruments.

5.11 Using Beta-Gamma Survey Meters

5.11.1 Counting Smears, Air Sample Filters, and Direct Measurements

Hold the detector no further than 1/2 inch from the smear, filter, or surface. Count smears/filters for a length of time such that the MDA is less than the removable contamination release criterion. Count surfaces for a length of time such that the MDA is less than the total contamination release criterion.

5.11.2 Frisking/scanning

Hold the detector within 1/2 inch of the surface being frisked/scanned. Move the detector no faster than two inches per second. Stop when positive indication is noted from audio response, allow meter indication to stabilize and record that value.

5.12 Using Alpha/Beta Survey Meters

5.12.1 Direct Measurements

Hold the detector no further than 1/4 inch from the surface. Count surfaces for a length of time such that the MDA is less than the total contamination release criterion.

5.12.2 Personnel Frisking/scanning

Hold the detector within 1/4 inch of the surface being surveyed. Move the detector no faster than two inches per second. Stop when positive indication is noted and allow meter indication to stabilize and record that value. Any positive personnel frisk reading shall be reported to the Site/RS Licensed RSO.

5.13 Using Alpha/Beta Sample Counters

5.13.1 Swipe Samples

Using tweezers, peal the filter from the paper. Place the swipe sample on a planchette with the adhesive side down. Place the planchette in the sample counter. Count the sample for a length of time such that the alpha and/or beta MDA is less than the removable contamination release criterion specified in RS-TPG-SOP 020, License/Site Radiation Protection Program.

5.13.2 Air Samples

Place the air filter sample on a planchette with the outside surface facing up. Place the planchette in the sample counter. Count the sample for a length of time such that the alpha and/or beta MDA supports detection at the appropriate air concentration action level and Derived Air Concentration (DAC) Guidelines in 10 CFR 20, Appendix B, Tables 1 and 2.

6 RECORDS

The following records are available for use in hardcopy, and any equivalent electronic copies generated and used shall be approved by the RS License RSO or CHP.

6.1 Radiological Instrument Daily Source Check Record, Attachment 1

6.2 Background Setup Record, Attachment 2

6.3 Instrument Efficiency Determination, Attachment 3

6.4 Minimum Detectable Concentration Calculation, Attachment 4

6.5 Out of Service Tracking Log, Attachment 5

ATTACHMENT 1

RADIOLOGICAL INSTRUMENT DAILY SOURCE CHECK RECORD

INSTRUMENT:_____ **SERIAL NO.:**_____
CALIBRATION DUE DATE:_____

DETECTOR:_____ **SERIAL NO.:**_____

SOURCE CHECK MATERIAL:_____ **SERIAL NO.:**_____
ACTIVITY:_____ **COUNT TIME:**_____

DATE	TIME	BATTERY CHECK	HV SETTING	SOURCE CPM	IN RANGE (Y/N)	TECHNICIAN INITIALS

Reviewed By:_____

ATTACHMENT 2

BACKGROUND SETUP RECORD

Technician:		**Date:**	
Location:		**Project:**	
Meter Model	**Meter S/N**	**Detector Model**	**Detector S/N**

Count Time (t_b):	minutes
Measurement #	**Counts (C_i)**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Average: $\overline{C}_b = \frac{\Sigma_1^{10} C_i}{N}$	
Standard Deviation: $SD_b = \sqrt{\frac{\Sigma_i^n (C_i - \overline{C}_b)^2}{N-1}}$	
$\dot{C}_b = \frac{\overline{C}_b}{t_b}$	cpm
High Limit : $\dot{C}_b + 2SD_b$	cpm
Low limit: $\dot{C}_b - 2\ SD_b$ (if less than 0, record 0)	cpm

Reviewed By:_____

$\overline{C}_b$ = average background count

SD_b = standard deviation of the average background

N = number of measurements (10)

Σ = summation

C_i = C_1 through C_n (C_{10} if 10 measurements are made)

$\dot{C}_b$ = average net background count rate

t_b = time in minutes of a background count

ATTACHMENT 3

INSTRUMENT EFFICIENCY DETERMINATION

Technician:		**Date:**	
Location:		**Project:**	
Source/Activity:		**Source S/N:**	
Meter Model	**Meter S/N**	**Detector Model**	**Detector S/N**

Count Time (t):	minutes	**Corrected Source 2-pi Activity (A_c):**	dpm
Measurement #	**Counts Gross**	**Counts Net**	**Equations**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Average			$\overline{C} = \frac{\Sigma_1^{10} C_i}{N}$
Average Count Rate ($\dot{C}_n$)			$\dot{C}_n = \frac{\overline{C}}{t}$
2-pi Efficiency (E)			$E = \frac{\dot{C}_n}{A_c} = \frac{cpm}{dpm}$
SD_g (gross)			See Attachment 2
SD_b (background)			See Attachment 2
SD_n (net)			$SD_n = \sqrt{(SD_g)^2 + (SD_b)^2}$
Upper Source Check Limit			$\dot{C}_n$ + 2SD_b
Lower Source Check Limit			$\dot{C}_n$ - 2SD_b

Reviewed By:_____

ATTACHMENT 4

MINIMUM DETECTABLE CONCENTRATION CALCULATION

Technician:		**Date:**	
Location:		**Project:**	
Meter Model	**Meter S/N**	**Detector Model**	**Detector S/N**

C_b = Background count rate (from Attachment 2)	cpm
t_b = background measurement count time	minutes
t_s = Sample/direct measurement count time	minutes
B = background counts expected during sample count (C_b x t_s)	counts
Minimum Detectable Count Rate (L_D)	cpm
E = 2-pi Efficiency (see Instrument Efficiency Determination, Attachment 3)	cpm/dpm
Detector Probe Area (A)	cm^2
Minimum Detectable Concentration (MDC)	dpm/100 cm^2

$$L_D = 3^* + 4.65^* \sqrt{B}$$

$$MDC = \frac{L_D}{E \times A/100 \times t_b}$$

* - derived constant based on the 95% confidence (α and β = 0.05)

$$MDC = \frac{3 + 3.29\sqrt{C_b t_s \left(1 + \frac{t_s}{t_b}\right)}}{E \times t_s x \frac{A}{100}}$$

Reviewed By:_____

ATTACHMENT 5

OUT OF SERVICE TRACKING LOG

Instrument [1]	Serial # [2]	Calibration Due Date [3]	Out of Service Date [4]	Remarks [5]	Returned to Service Date [6]

1. Instrument type
2. Instrument serial number
3. Calibration due date
4. Date removed from service
5. Reason instrument removed from service
6. Date instrument returned from service

Reviewed By:_____

www.ERGoffice.com (505) 298-4224

Light Leak? Bad Cable? What is going on???

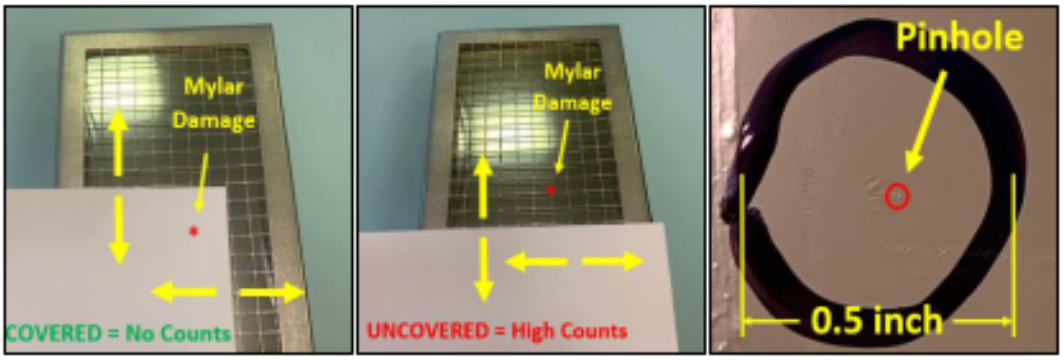
Sometimes a detector may exhibit unexpected high counts (or even no counts). This may represent the true radiological conditions, OR it could be indicative of a problem with your equipment. Below are some examples of problems that may cause high counts.

LIGHT LEAK

Do your counts change significantly when you rotate the detector face towards the sun or a bright light? If using a detector with a mylar window it is very possible the mylar has been damaged and you may be experiencing a light leak.

What is happening? If using a scintillator detector, keep in mind these detectors work by converting ionizing radiation into light photons, which are then converted into electrical signal(s) measured by the meter. When you have a light leak, the radiation to light photon step is bypassed and the detector is flooded with light. This makes the detector unusable until the light leak issue is resolved.

How to confirm? Confirm the light leak by locating where it is on the mylar. Sometimes the damage may be obvious, and other times the damage is difficult to locate. If you cannot visibly see the damage, then attempt to locate it by moving your hand (or piece of paper) up down and side-to-side over the mylar until you have located the pinhole. When you block the light leak using this manner you then you have confirmed it is a light leak.



How to fix? Replace the mylar. Mylar window replacement is not considered major repair and if replacing using a mylar of the same thickness then no recalibration is necessary. If no mylar window replacement is available, then a small drop of Wite•Out or nail polish may be used to block the light leak.

NOTE: While mentioned here, the use of Wite•Out or nail polish is discouraged, as it may bleed through the mylar and permanently damage the zinc-sulfide detector underneath.

IMPORTANT: If a light leak is bad enough (obvious and significant damage to the mylar window) it is possible the detector has gone into overload and no counts are registered. Replace the mylar.

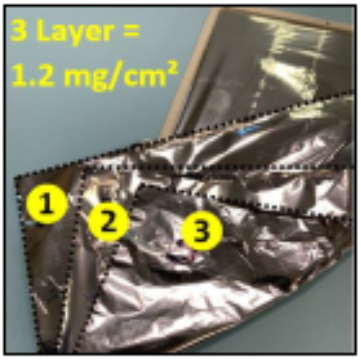
THIN MYLAR

Very similar to a light leak is the issue of thin mylar. Do you have a possible light leak outdoors (in bright sunlight) but not when using indoors? Mylar windows typically come in two- or three-layer windows; ERG most often uses three-layer mylar windows (1.2 mg/cm^3) but in some cases four-layer (1.6 mg/cm^3) windows may be warranted.

What is happening? Alpha particles will not make it through a piece of paper, so how do they make it through a mylar window? The mylar used in windows is incredibly thin. So thin that light can sometimes permeate through. Because of this, a balance between maximizing the alpha particles passing through and minimizing any unwanted light passing through the mylar must be found. If the mylar window is too thick, the detector alpha efficiency is reduced, too thin and your alpha background counts may be too high.

How to confirm? Thin mylar issues are not common unless using outdoors or in very bright light. Look for a light leak. If you cannot locate a light leak it is possible the mylar window is too thin. As previously stated, ERG most often uses three-layer mylar windows (1.2 mg/cm^3) but in some cases four-layer (1.6 mg/cm^3) windows may be warranted.

How to fix? Replace the mylar. Consider using a thicker layer mylar window.



CABLE ISSUES

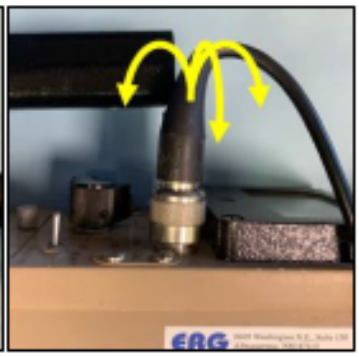
Do you have an unexpected spike or drop in readings when the detector is moved around? If an unexpected spike in counts or a drop to zero in counts, and this is not related to a light leak then it is possible the meter to detector cable is not properly connected or it has been damaged.

> IMPORTANT: Do not support a detector by the cable alone. Added stress of supporting a detector may damage the cable. Take care of your cable and your cable will take care of you.

What is happening? It is possible the cable connection is not secure, the connector has moisture or dirt in it, or the cable is damaged. Any of these possibilities may result in no electrical signal causing a complete drop in counts or an electrical short causing either an instantaneous spike in counts.

How to confirm?

a. Cable is secure? – The cable will feel loose and come off the connector when pulled.
b. Moisture or Dirt? – Visibly inspect meter connector for moisture or excessive dirt buildup.
   NOTE: If working in high-humidity environments or if instrument is left in the open environment it is possible rain/moisture has made it into the connector.
c. Damaged Cable? – Visually inspect the cable looking for cuts in the housing or a damaged connector. While connected to the meter put pressure/gently bend the cable connector at both the meter and detector connections to attempt to recreate the issue. Continue bending the cable every few inches throughout the length of the cable until damage has been identified or ruled out.



How to fix? Replace the cable.

NOTE: Replace with the similar length cable. A significant change in cable length may warrant a separate calibration with different operating high voltage.

a. To lock the cable in place, press the cable female connector onto the male meter connector and rotate counterclockwise.

b. Use compressed air to blow the moisture out of the connector or use a paper towel/Q-tip to dry the connector.
c. Replace with a new cable.

AECOM **Radiological Service Technical Practice Group Standard Operating Procedure**	PROCEDURE NO. RS-TPG SOP 011, R1 DATE: June 10, 2022 APPROVED:
Radiological Surveys	Radiological Service TPG Leader

Standard Operating Procedure

RADIOLOGICAL SURVEYS

AECOM's Radiological Service Technical Practice Group (RS-TPG) is responsible for the issuance, revision, and maintenance of this procedure. This procedure has also been provided to the United States Nuclear Regulatory License Division of Nuclear Materials Safety (NRC DNMS) as part of AECOM's "decommissioning license" application. Therefore, any deviations from the procedures set forth in this document require approval of the RS-TPG Leader and the NRC DNMS license Radiation Safety Officer (RSO).

RS-TPG License RSO Approval: _____ June 10, 2022

1 PURPOSE

This document establishes the guidelines to be used for measuring radiation and total and removable contamination. It also provides guidelines for maintaining control of radioactive materials and areas that need to be surveyed.

2 SCOPE

This procedure provides guidance on properly performing radiological surveys conducted on temporary project sites where AECOM has either implemented its NRC DNMS license, or its use in a state under reciprocity to the states regulatory body where RS-TPG leadership is involved with project planning, implementation, and execution.

3 ALARA POLICY

It is AECOM's policy to plan and conduct its radiological activities safely and in such a fashion as to protect the health and safety of its employees, subcontractors, members of the public, and the environment. To achieve this, AECOM shall confirm that efforts are taken to reduce radiological exposures and releases to the environment as low as is reasonably achievable (ALARA), accounting for social, technical, economic, practical, and public policy considerations. AECOM's RS-TPG is committed to implementing this radiological survey procedure to reflect this policy.

4 EQUIPMENT

The following are examples of instrumentation that might be used to perform surveys.

- Beta-gamma contamination surveys are performed using a Ludlum model 2224 with a thin window Geiger-Mueller (GM) probe, a Ludlum Model 44-9, or equivalent.

- Alpha/Beta surveys are performed with a thin window 43-93, 100 cm^2 area probe, or equivalent zinc scintillation detector, a Ludlum model 2224 scaler/ratemeter with dual power supply for differentiating between alpha and beta particle radiation, or equivalent.

- Gamma count rate and gamma exposure rate correlation scan and screening surveys of building areas may be performed with a Ludlum model 2221 ratemeter scaler, Ludlum Model 44-10 NaI (2”x2”) detector or equivalent.

- Disk swipes/smear samples from equipment or building surfaces may be counted in the Ludlum Model 2929 attached to a zinc sulfide “phoswich” thin-window scintillator, or equivalent.

- The Ludlum Model 2224 Scaler with/239-1F gas flow proportional detector or equivalent will be utilized to characterize flooring, during the characterization and final status survey phases. The Model 2224 is battery-capable and will be mounted on a cart with a P-10 gas supply for easy handling and overall equipment protection.

- The Ludlum Model 19 or equivalent micro-R meter will be used to document gamma exposure rate levels. The Model 19 is portable, battery powered and durable.

- The Bicron micro-Rem Survey Meter or equivalent dose rate meter will be used to document tissue-equivalent gamma dose rates.

- RS-232 data logging and GPS systems maybe coupled to some of the instrument systems above to collect and record gross data position and count rate levels for instrumentation equipped with the necessary hardware.

5 INSTRUMENT OPERATIONAL CHECKS

5.1 A pre-operational check will be performed on all instruments prior to use to verify the following requirements in accordance with RS TPG SOP-001, *Portable Detection Equipment*. In general:

5.1.1 The instrument must be source checked every day before use;

5.1.2 The instrument has been calibrated within the last year;

5.1.3 The battery check is satisfactory, and spare batteries are available (for portable instrumentation);

5.1.4 Overall physical condition of the instrument is satisfactory; and

5.1.5 A consistent low-background counting area must be selected for daily checks of the instruments.

6 PROCEDURES

The following procedures are for general guidance only. Project-specific work plans will fully describe survey requirements.

6.1 Exposure/Dose Rate Surveys

6.1.1 General Requirements

- Exposure rate surveys are performed, using any of the exposure rate instruments approved for use, to provide an indication of the amount and type (e.g., beta or gamma) of external radiation exposure the workers will receive while performing routine work operations;
- A reasonable amount of care should be taken when performing exposure rate surveys to identify items that are contributing to the general area exposure rates (i.e., barrels, equipment, etc.);
- Exposure rate measurements should be observed continually while approaching a radiation source from a background area;
- All exposure rates shall be recorded on a Radiological Survey Report Form, Attachment SOP011-1, or equivalent;
- Exposure rates that are taken "on contact" shall be noted as such on the Radiological Survey Report Form, Attachment SOP011-1, or equivalent; and
- Items identified with exposure rates greater than five times the general work area shall be recorded with an asterisk indicating "hot spot". As these items are identified, the surveyor should shield the item, or remove it from the area, if possible.

6.1.2 Gamma Surveys

- Gamma dose rates:
  - Allow instruments to stabilize for 15 to 30 seconds.
  - Record measurements as mrem/hr (µSv/hr) or µrem/h.
  - If the analog or digital display is sporadic and difficult to obtain an average response, record 10 instantaneous readings and calculate the average.
- Gamma exposure/dose rates:
  - Allow instruments to stabilize for 15 to 30 seconds.
  - Use the detector slow response/integrating mode.
  - Record exposure rate measurements as mR/hr (µSv/hr) or µR/hr.
  - Record dose rate measurements as mrem/hr or µrem/hr.
  - If the analog or digital display is sporadic and difficult to obtain an average response, record 10 instantaneous readings and calculate the average.
- Gamma count rates:
  - Allow instruments to stabilize for 15 to 30 seconds.
  - Use the detector slow response/integrating mode.
  - Record count rates in counts per minute (cpm).
  - If the analog or digital display is sporadic and difficult to obtain an average response, record 10 instantaneous readings or perform 10 one-minute counts in digital mode and calculate the average.

6.1.3 Beta Dose Rate Surveys

- Beta dose rates are recorded as mRad/hr (µGy/hr) or µRad/h;
- Beta dose rates are derived by the following formula:

  mRad/hr = (OW - CW) x CF

  OW = Open window exposure rate
  CW = Closed window exposure rate
  CF = dose correction factor*
- (*) - The beta dose correction factor used for each instrument shall be determined by the calibration facility and can be found on the calibration papers.
- If the analog or digital display is sporadic and difficult to obtain an average response, record 10 instantaneous readings and calculate the average.

6.2 Contamination Surveys

6.2.1 Contamination surveys are used as a tool to maintain control of work areas, verify clean areas, and establish protective clothing requirements;

6.2.2 Direct measurements may be performed with any approved count rate instrument. Background measurements and performance checks shall be conducted in accordance with RS-TPG SOP-001, *Portable Detection Equipment*. Direct measurement count time shall be determined to ensure that the required minimum detectable concentration (MDC) is met as described in RS-TPG SOP-001, *Portable Detection Equipment*.

Disintegrations per minute per 100 square centimeters (dpm/100cm^2) shall be calculated from gross counts per minute (cpm) by the following formula. For smears, the area of the surface smeared (e.g., 100 cm^2) is substituted for the probe area.

$$dpm/100cm^2 = \frac{gross\ cpm - background\ cpm}{detector\ efficiency \times {}^{probe\ area}/_{100}}$$

Example:

$$dpm/100cm^2 = \frac{1200\ cpm - 100\ cpm}{20\% \times {}^{15cm^2}/_{100cm^2}}$$

6.2.3 Scan surveys may be performed with any approved count rate instrument. Background measurements and performance checks shall be conducted in accordance with RS-TPG SOP-001, *Portable Detection Equipment*. Consideration should be given to using the audible setting on the instrument, if so equipped, since audible response is quicker to respond to than the visual response provided by the meter.

- When using the beta-gamma instrument, the detector should be held within 1/2 inch of the surface being frisked and moved no faster than 2 inches per second.

- When using the alpha instrument, the detector should be held within 1/4 inch of the surface being monitored and the probe moved no faster than 2 inches per second. Increased counts are an indication of alpha activity. When counts increase either by audible or visual response, stop all detector motion until a stable count rate is determined.

6.2.4 Personnel contamination surveys ("frisking") shall be performed on all individuals and materials and equipment (M&E) exiting or being removed from a radiologically controlled area by a qualified radiation professional or technician. Surveys are performed in accordance with Section 6.2.3. When surveying personnel, at a minimum, the bottoms of the shoes and hands should be scanned. During more detailed scans, detector movement should be paused at locations of potential contamination such as knees, elbows, and mouth.

6.3 Removable Contamination Sample Collection and Counting

6.3.1 Latex or nitrile gloves shall be worn when taking swipes where radiological contamination is present or suspected. Cotton gloves may be worn under the latex or nitrile gloves. Change gloves when contamination is suspected, or gloves become torn. Check hands periodically for contamination.

6.3.2 Initial Actions

- Follow the appropriate provisions of the Work Plan for initial actions and determining where swipes are to be collected.

- For each new box of 500 swipes opened, randomly choose one unused swipe, and submit for field gross alpha/beta counting. Perform a 60-minute background count on the swipe and use this value to establish the background cpm rate for swipes (perform this operation away from investigation site or an area known to be unimpacted.)

6.3.3 Collection of Swipe Samples for Surfaces

- Measure all surfaces or items that have the potential for fixed contamination. Fixed contamination may become removable during these operations and must be identified so that proper precautions may be taken.

- Use caution when surveying rough surfaces to avoid personal injury or tearing of the swipe paper.

- Hold the swipe paper with the back of the swipe firmly against the fingers. Ensure the face of the swipe paper contacts the surface to be swiped.

- Apply moderate pressure across the swipe paper to ensure that most of the swipe face contacts the surface.

- Swipe an area of approximately 100 square centimeters (16 square inches) per swipe. A template may be used to standardize swipe collection.

- Place individual swipes in a separate envelope (or similar container) to prevent cross contamination.

- Label each container with a sample location number cross-referenced to a sample location, preferably a location map.

- Screen the swipe samples for the presence of radiological materials. Do this outside the survey area. Swipes shall be screened individually by performing a 1-minute or longer count (sufficient to reach the necessary MDC as described in RS-TPG SOP-001, *Portable Detection Equipment*). Place the swipe on the same surface used to perform the background measurement or in a sample planchette. Center the swipe with the contaminated side facing upward under the alpha/beta probe or place the planchette in the sample counter. Count the sample and report gross cpm values.

- Record the following information on the Radiological Survey Record Form, Attachment 1 (or similar):

    - Sample location (or other specific identification)
    - Background count rate
    - Swipe screening results (gross cpm)
    - Date of survey
    - Signature(s) of individual(s) performing the survey

6.3.4 **NOTE**: Large-area swipes may be used to obtain a general indication of the amount of removable contamination present on a surface. However, they are not to be used to compare against release criteria. Large-area swipes are not to exceed 1 square meter.

6.4 Gamma Count Rate Surveys

6.4.1 With the detector as close to the surface as possible or some other pre-determined position, collect a measurement for a length of time sufficient to provide an acceptable minimum detectable count rate (MDCR). Record the measurement on the appropriate field survey form.

6.4.2 With the detector as close to the ground as possible, move the detector in a serpentine pattern while advancing along a predetermined survey area transect at a rate of no more than 1 meter per second. For instruments mounted on carts, ensure that the detector height allows sufficient field of view considering the coverage requirements and the spacing of the survey area transect. Record the average and maximum count rates observed for a predetermined survey area or log the data using appropriate survey and position logging instruments. When using data-logging instruments which

also log position using GPS, follow additional instructions/procedures and download data at a frequency no less than once per day.

6.5 Survey Frequency

The frequency of routine surveys shall be determined at the start of the project by the Project Health Physicist based on the likelihood for contamination in the area. Survey coverage is generally described in a Survey Plan prepared according to the guidance in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).

6.6 Survey Documentation

Field surveys shall be documented on a Radiological Survey Report Form, Attachment 1 (or similar). Final survey records documentation should include:

- Survey type
- The meter and probe model numbers and serial numbers
- Detector calibration dates
- Detector efficiencies
- Net measurement results (reported in dpm/100cm^2 or exposure/dose rate units)
- Minimum detectable concentrations (MDC)
- Date of the survey
- Name of individual performing the survey
- Maps, diagrams, or pictures.

6.7 Surveying Materials and Equipment (M&E)

- The surveying M&E (e.g., pipe, valves, tools, heavy equipment, vehicles, etc.) shall be performed and documented as in Sections 6.2 and 6.5.

- M&E surveys shall include a drawing, photograph, or description on the survey form and in the final survey record, to the extent it could be relocated and resurveyed. Measurement locations shall be identified.

- For projects involving a significant amount of surveys for the release of M&E, the Project Health Physicist should develop a separate Survey Plan in accordance with the protocols described in the Multi-Agency Radiation Survey and Assessment of Materials and Equipment (MARSAME) Manual.

6.8 Posting Radiation and Contamination Areas

- Posting of Radiation and Contamination Areas identified during radiological surveys will be done in accordance with RS-TPG SOP 20, *License/Site Radiation Protection Program*.

7 THE SURVEYING M&E (E.G., PIPE, VALVES, TOOLS, HEAVY EQUIPMENT, VEHICLES, RECORDS

7.1 Calibration Records and Daily Instrument Check Records (according to RS-TPG SOP-001, *Portable Detection Equipment.)*

7.2 Radiological Survey Record, Attachment 1 (example) or equivalent.

7.3 An electronic version of Attachment 1 can be obtained from the RS-TPG Leader.

ATTACHMENT 1
RADIOLOGICAL SURVEY RECORD

AECOM

Project Name
Project No.

Survey No.: _____

Surveyor: _____ _____

Reviewer: _____ _____
Date

Survey Meters

Total (Direct) β γ	Removable β γ	Removable α	Dose γ
Instrument #	Instrument #	Instrument #	Instrument #
Meter Model #	Meter Model #	Meter Model #	Meter Model #
Meter Serial #	Meter Serial #	Meter Serial #	Meter Serial #
Detector Model #	Detector Model #	Detector Model #	Detector Model #
Detector Serial #	Detector Serial #	Detector Serial #	Detector Serial #
Cal Due	Cal Due	Cal Due	Cal Due
Detector Efficiency (ε_i)	Detector Efficiency (ε_i)	Detector Efficiency (ε_i)	Detector Efficiency (ε_i)
Surface Efficiency (ε_s)	Surface Efficiency (ε_s)	Surface Efficiency (ε_s)	(Approximate)
Sample Time (T_s) (min)	Sample Time (T_s) (min)	Sample Time (T_s) (min)	Sample Time (T_s) (min)
Background Time (T_b) (min)	Background Time (T_b) (min)	Background Time (T_b) (min)	Background Time (T_b) (min)
BKG (R_b) (cpm)	BKG (R_b) (cpm)	BKG (R_b) (cpm)	BKG (R_b) (cpm)
Probe Area (A) (cm)	Swipe Area (A) (cm)	Swipe Area (A) (cm)	Probe Area (A) (cm)
MDC (dpm/100cm2)	MDC (dpm/100cm2)	MDC (dpm/100cm2)	MDC (dpm/100cm2)

LOCATION:	Location	dpm/100cm^2 α/β/γ - Total	dpm/100cm^2 β/γ - Remov.	dpm/100cm^2 α - Remov.	uR/hr γ - Dose
PURPOSE:	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				
	15				

AECOM **Radiological Service Technical Practice Group Standard Operating Procedure**	PROCEDURE NO: RS-TPG SOP 012, R1 DATE: May 3, 2023 APPROVED:  Radiological Service TPG Leader
Soil Sampling	

Standard Operating Procedure

SOIL SAMPLING

AECOM's Radiological Service Technical Practice Group (RS-TPG) is responsible for the issuance, revision, and maintenance of this procedure. AECOM's RS-TPG is responsible for the issuance and execution of this procedure. Any deviations from the instructions set forth in this document require approval of the project Radiological Services Manager (RSM).

1. PURPOSE

The purpose of this procedure is to provide instruction for collecting samples of soil from the surface and subsurface for routine or special radiochemical/radiological analysis.

2. SCOPE

This procedure provides guidance for ALARA applications, work responsibility, general safety, required equipment, sample management, sampling procedures, and record keeping. Guidance for this SOP focuses on manual collection of surface and subsurface samples with limited focus for mechanized drilling rigs or boring technologies and methods.

3. ALARA POLICY

It is AECOM's policy to plan and conduct its radiological activities safely and in such a fashion as to protect the health and safety of its employees, subcontractors, members of the public, and the environment. To achieve this, AECOM shall confirm that efforts are taken to reduce radiological exposures and releases to the environment as low as reasonably achievable (ALARA), accounting for social, technical, economic, practical, and public policy considerations. AECOM's RS-TPG is committed to implementing this procedure and maintaining radiation detection equipment in a manner to reflect this policy.

4. RESPONSIBILITES

4.1. The Radiological Services Manager (RSM) or designee is responsible for the preparation and maintenance of this procedure.

4.2. Implementation of this procedure is the responsibility of the Project Health Physicist (HP) or Health Physics Technician (HPT) under direction of the Project Manager (PM).

5. GENERAL SAFETY

5.1. Appropriate safety requirements as established by the Project HP shall be followed.

5.2. Proper safety precautions must be observed when collecting soil samples. The sampler should refer to pertinent site-specific Health and Safety Plans and Job Hazard Assessments for guidelines on safety precautions. Potential chemicals and radionuclides posing specific safety concerns should be addressed prior to sampling.

5.3. Proper personal protective equipment (PPE) should consist of safety glasses, work gloves, nitrile gloves (when handling samples), hearing protection, hard-hats, work-boots, and high visibility vests. Proper PPE should be inspected prior to sampling.

5.4. Samples or sample batches should be surveyed at sample receiving for the dose rate at contact with the sample or package. Packages with 2 milliroentgen per hour (mR/h) or higher on contact must be labeled and stored in a controlled shielded area.

5.5. The worksite should be clean, organized, and well-marked. Slip, trips and fall hazards must be minimized to any extent possible. Any unused sample material should be placed back to the auger, drill or push hole from which the sample was collected. Additional fill material may be needed to close a hole.

6. EQUIPMENT

- Digging tools including, garden trowel, shovel, plastic or stainless-steel spoons, etc.;
- Stainless steel, glass, or disposal plastic mixing/homogenization bowls;
- Table or flat surface;
- Plastic sheeting;
- Laboratory bottles/containers;
- Coolers (may require ice);
- Air sampling and radiation detection equipment;
- Drilling equipment, as determined needed by the PM/Project HP: drilling rig, portable motorized auger, manual auger;
- Specialized sampling apparatus (split-spoon sampler, Shelby tube sampler, downhole sampler, cup cutter, etc.) as required;
- Plastic bags (zip-lock);
- Trash bags;

- Cardboard "ice cream" containers (1-quart size), or geology sample bags;
- Twist-ties;
- Masking tape;
- Record forms and/or logbook and chain-of custody forms;
- Labels and security seals;
- Indelible pen (e.g., Sharpie);
- Equipment cleaning/decontamination supplies, as appropriate; and
- Appropriate PPE.

7. SAMPLE MANAGEMENT

7.1. Sample Handling Overview

7.1.1. A clean pair of new, non-powdered, disposable gloves will be worn each time a different sample is collected, and the gloves should be donned immediately prior to sampling. The gloves should not come in contact with the media being sampled and should be changed between samples.

7.1.2. Sample containers with samples suspected of containing high concentrations of contaminants should be handled and stored separately.

7.1.3. All background samples shall be segregated from obvious high-concentration or waste samples. Sample collection activities should proceed progressively from the least suspected contaminated area to the most suspected contaminated area. Samples of waste or highly-contaminated media must not be placed in the same cooler as environmental (i.e., containing low contaminant levels) or background samples.

7.1.4. If possible, one member of the field sampling team should take all the notes and photographs, fill out tags, etc., while the other members collect the samples.

7.1.5. Samplers must use new, verified/certified-clean disposable or non-disposable equipment that has been cleaned or decontaminated (decontamination procedures should be defined in a separate procedure, work instruction, or sampling plan).

7.2. Sample Mixing Overview

7.2.1. If sub-sampling the primary sample in the field or compositing multiple primary samples in the field, place the sample into a glass or stainless-steel bowl and mix

thoroughly. Each aliquot of a composite sample should be of the same approximate volume.

7.2.2. All soil samples must be thoroughly mixed to ensure that the sample is as representative as possible of the sample media.

7.2.3. Place the sample into an appropriate, labeled container and secure the cap tightly. Threads on the container and lid should be cleaned to ensure a tight seal when closed.

7.3. Sample Security

7.3.1. Special care must be taken not to contaminate samples. This includes storing samples in a secure location to preclude conditions which could alter the properties of the sample. Samples shall be custody sealed during long-term storage or shipment.

7.3.2. Collected samples are in the custody of the sampler or sample custodian until the samples are relinquished to another party. If samples are transported by the sampler, they will remain under his/her custody or be secured until they are relinquished.

7.3.3. Chain-of-custody documents shall be filled out and remain with the samples until custody is relinquished.

7.3.4. Shipped samples shall conform to all U.S. Department of Transportation (DOT) rules of shipment found in Title 49 of the Code of Federal Regulations and/or International Air Transportation Association (IATA) hazardous materials shipping requirements.

7.3.5. All shipping documents, such as air bills, bills of lading, etc., and chain-of-custody documents shall be retained by the project leader in the project files.

8. PROCEDURES

8.1. Surface Sample Collection

Surface soils are generally classified as soils between the ground surface and 6 to 12 inches below ground surface (bgs). The most common interval is 0 to 6 inches bgs, however the data quality objectives of the investigation may dictate another interval, such as 0 to 3 inches bgs for risk assessment purposes.

Because standard surface soil contamination criteria for radionuclides are usually applicable to the average concentration in the upper 6 inches of soil, the usual sampling protocol in Section 8.1 is based on obtaining a sample of this upper 6 inches. Special situations, such as to evaluate trends or airborne deposition, determining near surface

contamination profiles, and measuring non-radiological contaminants, necessitate special sampling procedures. These special situations are evaluated on a case-by-case basis, as directed by the PM/Project HP.

8.1.1. Direct surface and gamma radiation measurements may be performed at each location before initiating sampling. Contact the PM/ Project HP if the exposure rate measurement exceeds the capability of the instrumentation available on site before proceeding with sample collection.

8.1.2. If required, cut vegetation to approximately soil surface level, and remove any "litter" on the ground surface (e.g. stones, or dead/dry sticks and leaves that are not part of the soil humus layer. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials.

8.1.3. Loosen the soil at the selected sampling location to a depth of 6 inches, using a trowel or other digging implement.

8.1.4. Remove large rocks, vegetation, and foreign objects while digging the sample. (These items may also be collected as separate samples, if appropriate.)

NOTE: Only reusable stainless steel or dedicated plastic tools are to be used for the collection of samples. Sticks and rocks less than approximately one quarter (¼) inch in size may remain in the sample. They will typically be removed at the laboratory during the sample preparation stage. Their weight will be accounted for at that time.

8.1.5. Place approximately 500 to 1000 grams of this soil, depending on laboratory needs, in a suitable container for limiting moisture leakage and/or cross-contamination. If it is not possible to reach a depth of 6 inches using a hand tool, such as a trowel or shovel, the soil should be collected from the accessible depth. The actual depth should be recorded on the sample container and the data form.

8.1.6. Seal the sample container, wipe off visible soil on the exterior of the container, and collect a removal contamination sample (swipe) on the exterior of the sample container. Count the swipe sample in accordance with counting procedures and record the results. If there is detectable removable contamination on the container, wipe down the container again using a moist disposable towel and collect another swipe sample. Repeat until there is no detectable radioactivity on the swipe sample.

8.1.7. Label and secure the sample container in accordance with the chain-of-custody procedures. Record the pertinent information on the Chain-of-Custody Form.

8.1.8. Record sample identification, location, and other pertinent data on appropriate record forms, maps, drawings, and/or site logbook.

8.1.9. If the location has been identified as having elevated activity, a measurement should be obtained after the sample is collected to determine the possibility of contamination at a depth greater than 6 inches. Based on project data quality objectives, subsurface sampling may be deemed necessary with direction from the PM and/or Project HP.

8.1.10. Clean/decontaminate sampling tools, as necessary, before proceeding to the next sampling location.

8.2. Systematic Subsurface Sampling (Option 1)

Section 8.2 is applicable to shallow boreholes, generally no greater than 2 to 3 meters (6.5 to 10 feet) maximum depth.

8.2.1. Assemble a suitable auger or sampler. Ensure depth demarcation on the auger and extension handles or other method defined for determining sample depth.

8.2.2. Advance auger/sampler to each desired depth. Extract auger/sampler as needed to achieve required sample depth. Direct monitoring should be performed and if contamination is suspected, decontaminate the auger between each sampling interval, as needed to prevent cross-contamination.

8.2.3. At the desired depth, remove the sample from the auger and transfer the sample to a container (plastic bag, plastic jar, etc.) and seal the container in a manner sufficient to ensure moisture leakage and/or cross-contamination does not occur.

8.2.4. Seal the sample container, wipe off visible soil on the exterior of the container, and collect a removal contamination sample (swipe) on the exterior of the sample container. Count the swipe sample in accordance with counting procedures and recorded the results. If there is detectable removable contamination on the container, wipe the down the container again using a moist disposable towel and collect another swipe sample. Repeat until there is no detectable radioactivity on the swipe sample.

8.2.5. Label and secure the sample container in accordance with the chain-of-custody procedures. Record the pertinent information on the Chain-of-Custody Form.

8.2.6. Record sample identification, location, and other pertinent data on appropriate record forms, maps, drawings, and/or site logbook.

8.2.7. Clean/decontaminate sampling tools, as necessary, before proceeding with further sample collection.

8.3. Systematic Subsurface Sampling (Option 2)

Section 8.3 is applicable to depths of approximately 3 meters (10 feet) when boreholes or trenches have been dug and remain un-collapsed or do not contain water.

NOTE: If borehole logging is to be done it should be completed before sampling begins. If multiple samples are collected from a borehole, sampling is to be initiated at the deepest location and proceeds at subsequent depths toward the surface. Prior to collecting samples, dress the borehole wall at each sampling location in order to remove any soil that was potentially transferred from other depths.

8.3.1. Assemble suitable auger or sampler. Ensure depth demarcation on the auger and extension handles or other method defined for determining sample depth.

8.3.2. Place a plastic bag liner into the downhole sampler and secure.

8.3.3. Lower the sampling tool to the desired depth in the borehole or trench.

8.3.4. Scrape the inside borehole or trench wall with the toothed edge of the tool until approximately 1 kg of sample is collected.

8.3.5. Transfer the sample and liner material (if necessary) into a container sufficient to ensure moisture leakage and/or cross-contamination does not occur.

8.3.6. Seal the sample container, wipe off visible soil on the exterior of the container, and collect a removal contamination sample (swipe) on the exterior of the sample container. Count the swipe sample in accordance with counting procedures and record the results. If there is detectable removable contamination on the container, wipe down the container again using a moist disposable towel and collect another swipe sample. Repeat until there is no detectable radioactivity on the swipe sample.

8.3.7. Label and secure the sample container in accordance with the chain-of-custody procedures. Record the pertinent information on the Chain-of-Custody Form.

8.3.8. Record sample identification, location, and other pertinent data on appropriate record forms, maps, drawings, and/or site logbook.

8.3.9. Clean/decontaminate sampling tools, as necessary, before proceeding with further sample collection.

8.4. Systematic Subsurface Sampling (Option 3)

Section 8.4 is applicable to depths exceeding 3 meters (10 feet) and in boreholes where walls do not remain intact or that fill with water.

8.4.1. Drill the borehole to the desired sampling depth using an auger.

8.4.2. Drive a split-spoon, Shelby tube, or similar sampler beyond the auger depth. The driving distance should be 1 to 2 feet.

8.4.3. Withdraw the collecting device and remove the collected core. Remove and appropriately discard the top 1 to 2 inches of the core as this material may represent soil that had collapsed into the borehole from other depths.

8.4.4. Place the core, or a portion of the core, into a container sufficient to ensure moisture leakage and/or cross-contamination does not occur. The core may be split into multiple segments, representing different sampling depths.

8.4.5. Seal the sample container, wipe off visible soil on the exterior of the container, and collect a removal contamination sample (swipe) on the exterior of the sample container. Count the swipe sample in accordance with counting procedures and record the results. If there is detectable removable contamination on the container, wipe down the container again using a moist disposable towel and collect another swipe sample. Repeat until there is no detectable radioactivity on the swipe sample.

8.4.6. Label and secure the sample container in accordance with the chain-of-custody procedures. Record the pertinent information on the Chain-of-Custody Form.

8.4.7. Record sample identification, location, and other pertinent data on appropriate record forms, maps, drawings, and/or site logbook.

8.4.8. Clean/decontaminate sampling tools, as necessary, before proceeding with further sample collection.

8.5. Biased Subsurface Sampling

This section is applicable when a surface sample has been collected and radiation levels are still elevated sufficiently above background as to require further investigation at the location.

NOTE: Contact the site coordinator if the exposure and count rate measurements exceed the capacity of the instrumentation available on site.

8.5.1. Using a shovel, post hole diggers, manual auger, drill rig, etc. collect 1000 grams of the next 6 inches of soil and place into a container sufficient to ensure moisture leakage and/or cross-contamination does not occur. Care must be taken, and sampling methods selected to ensure that soil that may have collapsed into the hole from the surface is removed and not included in the subsurface sample.

8.5.2. Seal the sample container, wipe off visible soil on the exterior of the container, and collect a removal contamination sample (swipe) on the exterior of the sample container. Count the swipe sample in accordance with counting procedures and record the results. If there is detectable removable contamination on the container, wipe down the container again using a moist disposable towel and collect another swipe sample. Repeat until there is no detectable radioactivity on the swipe sample.

8.5.3. Label and secure the sample container in accordance with the chain-of-custody procedures. Record the pertinent information on the Chain-of-Custody Form.

8.5.4. Record sample identification, location, and other pertinent data on appropriate record forms, maps, drawings, and/or site logbook.

8.5.5. Clean/decontaminate sampling tools, as necessary, before proceeding with further sample collection.

8.5.6. Survey the sample location to determine gamma exposure level or gamma count rate. If the activity level is still elevated, repeat previous four steps. If the activity level has dropped to background, record the measurement and survey the area, including personnel and equipment, to determine the extent of decontamination that may be necessary.

8.6. Preparing Field Composite Samples

The application of composite sampling is determined on a site-specific basis as directed by the PM/Project HP. Data quality objectives for the project, analytical cost considerations, and special case site conditions are used to identify situations where sample compositing may be employed. Generally, five samples may be included in a composite with a maximum number of ten. The area represented by a composite sample will vary and should not exceed 100 m^2 unless directed by the site coordinator. Samples collected for analyses should be homogenized in a properly decontaminated reusable stainless steel or dedicated plastic bowl.

8.6.1. Collect equal aliquots of soil over 6-inch depth intervals, from each location that will be included in the composite and place in a bowl, on plastic sheeting or other type of containment.

8.6.2. Thoroughly mix sample and break up aggregates.

8.6.3. Divide soil into equal quadrants.

8.6.4. Place an equal aliquot (approximately 50 to 100 grams) from each quadrant into the sample container.

8.6.5. Repeat Steps 8.6.1 through 8.6.5 a total of three times. Total sample amount collected should approximate 1,000 grams.

8.6.6. Seal the sample container, wipe off visible soil on the exterior of the container, and collect a removal contamination sample (swipe) on the exterior of the sample container. Count the swipe sample in accordance with counting procedures and record the results. If there is detectable removable contamination on the container, wipe down the container again using a moist disposable towel and collect another swipe sample. Repeat until there is no detectable radioactivity on the swipe sample.

8.6.7. Label and secure the sample container in accordance with the chain-of-custody procedures. Record the pertinent information on the Chain-of-Custody Form.

8.6.8. Record sample identification, location, and other pertinent data on appropriate record forms, maps, drawings, and/or site logbook.

8.6.9. Clean/decontaminate sampling tools, as necessary, before proceeding with further sample collection.

9. RECORDS

9.1. Records generated from radiological surveys, sampling and chain-of-custody shall be maintained in accordance with Radiation Safety Plan.

9.2. Completed and reviewed survey documentation shall be retained as a legal record.

AECOM	*Client:* Ashland LLC	***BORING ID:***
	Project Number: 60669081	
	Boring Location:	
		Sheet: 1 of 1
	Drilling Method:	*Date/Time Started:*
	Weather:	
Logged By:		*Date/Time Finished:*
Drilled By:		

Depth (ft)	Sample Number	Sample Type	Recovery (ft)	PID reading*	MVA reading	U.S.C.S	**Lithologic Description**	Lab Sample ID
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

END OF BORING @

NOTES:

* units relative to isobutylene span gas in parts per million (ppm)
f - fine; m - medium; c - coarse
NA - not applicable
SAA - Same as above

Checked by:_____ Date:_____

WELL DEVELOPMENT LOG

AECOM

PROJECT TITLE: _____ WELL NO.: _____ PAGE: _____

PROJECT NO.: _____

STAFF: _____

DATE(S): _____

			WELL ID.	VOL. (GAL/FT)
1. TOTAL CASING AND SCREEN LENGTH (FT.)	=		1"	0.04
2. WATER LEVEL BELOW TOP OF CASING (FT.)	=		2"	0.17
3. NUMBER OF FEET STANDING WATER (#1 - #2)	=		3"	0.38
4. VOLUME OF WATER/FOOT OF CASING (GAL.)	=		4"	0.66
5. VOLUME OF WATER IN CASING (GAL.)(#3 x #4)	=		5"	1.04
6. VOLUME OF WATER TO REMOVE (GAL.)(#5 x 5)	=		6"	1.50
7. VOLUME OF WATER ACTUALLY REMOVED (GAL.)	=		8"	2.60

OR

$V=0.0408 \times (\text{CASING DIAMETER})^2$

	ACCUMULATED VOLUME PURGED (GALLONS)											
PARAMETERS	Init											
pH												
SPEC. COND. (mS)												
TURBIDITY												
TEMPERATURE (°C)												
APPEARANCE												
TIME												

COMMENTS:

LOW FLOW GROUNDWATER PURGING/SAMPLING LOG

Project: _____ Site: Tank 75 Well I.D.: _____

Date: _____ Sampling Personnel: _____ Company: AECOM

Purging/ Sampling Device: GeoPump Peristaltic Tubing Type: LDPE Pump/Tubing Inlet Location: Screen midpoint

Measuring Point: Below Top of Riser Initial Depth to Water (ft.): _____ Depth to Well Bottom (ft.): _____ Well Diameter: _____ Screen Length: _____

Casing Type: PVC Volume in 1 Well Casing (liters): _____ Estimated Purge Volume (liters): _____

Sample ID: _____ Sample Time: _____ QA/QC: _____

Sample Parameters: _____

PURGE PARAMETERS

TIME	pH	TEMP (°C)	COND. (mS/cm)	DISS. O_2 (mg/l)	TURB. (NTU)	Eh (mV)	FLOW RATE (ml/min.)	DEPTH TO WATER (btor)
Tolerance:	0.1	---	3%	10%	10%	+ or - 10	---	

Information: WATER VOLUMES--0.75 inch diameter well = 87 ml/ft.; 1 inch diameter well = 154 ml/ft.; 2 inch diameter well = 617 ml/ft.; 4 inch diameter well = 2470 ml/ft. ($vol_{cyl} = \pi r^2 h$)

Remarks:

DRILLING SUMMARY

Geologist:

Drilling Company:

Driller:

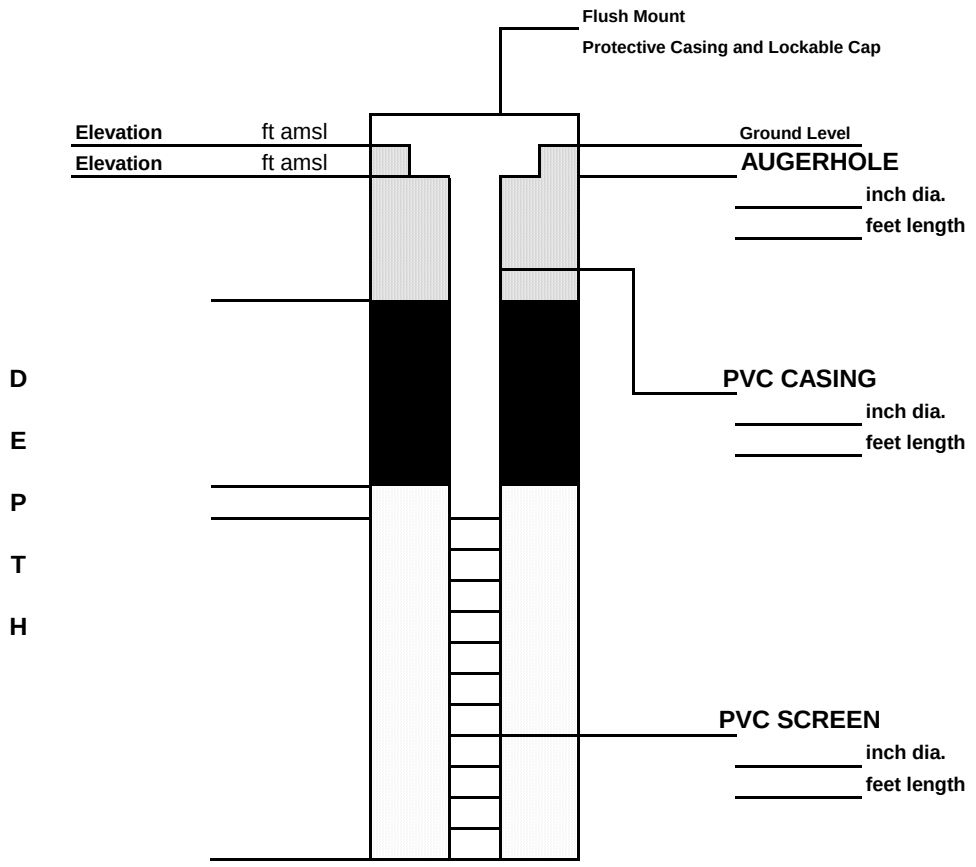
Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description
	See boring log for lithologic description.

WELL DESIGN



CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface:	**Type:**	**Type:** 00N Sand **Setting:** _ to _ ft
Monitor:	**Slot Size:**	***SEAL MATERIAL*** **Type:** Bentonite **Setting:** _ to _ ft

COMMENTS:

LEGEND

- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

Client: Ashland LLC	**Location: 4625 River Road, Tonawanda, NY**	**Project No.: 60669081**
AECOM	**MONITORING WELL CONSTRUCTION DETAILS**	**Well Number:**

SLUG TEST FIELD FORM

AECOM

Geologist: _____

Project Name: _____

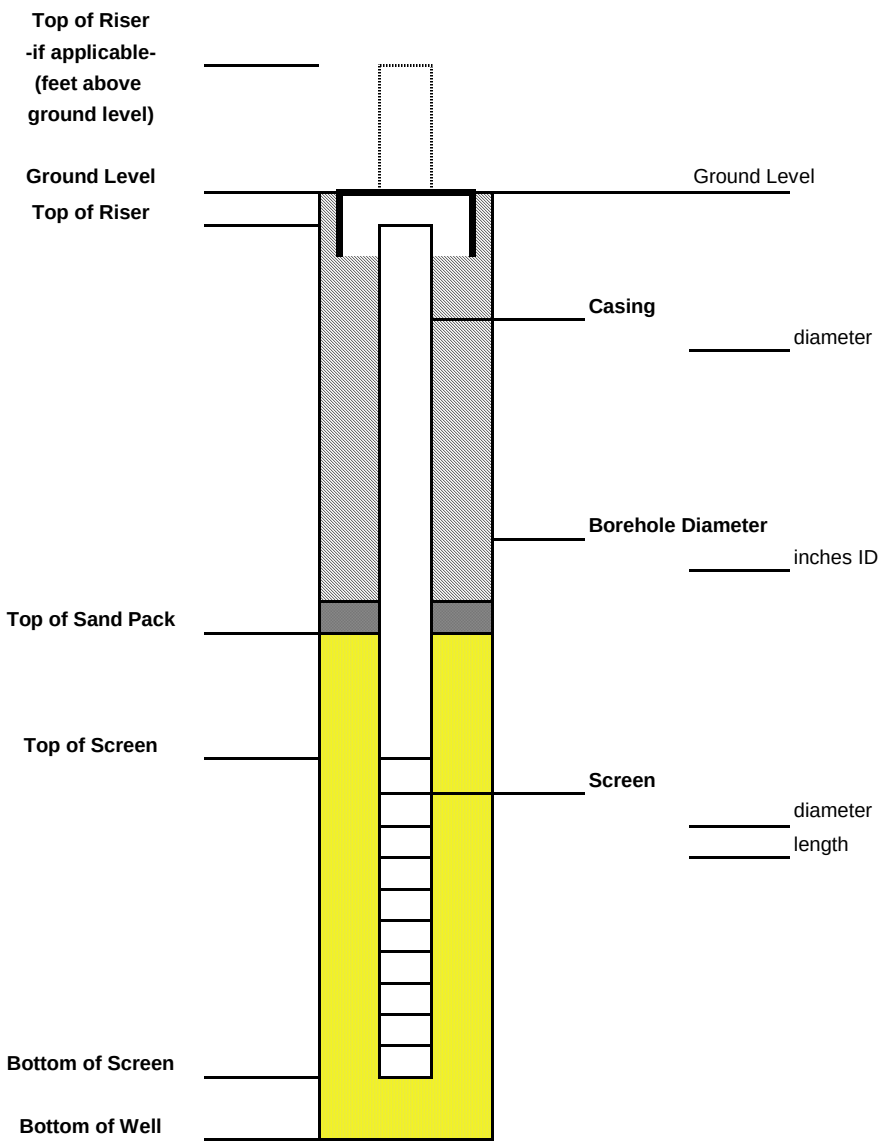
Project #: _____

Location: _____

Date & Time: _____

Weather:	
Well ID:	
DT Product:	
DT Water:	
Depth to Bottom:	
Troll ID #:	
Slug ID #:	
Slug Length:	
Slug Diameter:	

Volume of Slug: _____ in^3



SLUG IN (FALLING HEAD TEST)

Test Name: _____

Length of test: _____ min

Depth to static water level: _____

Initial Displacement: _____

SLUG OUT (RISING HEAD TEST)

Test Name: _____

Length of test: _____ min

Depth to static water level: _____

Initial Displacement: _____

Time	DTP	DTW	Comment	Time	DTP	DTW	Comment

Comments: _____

SURFACE WATER SAMPLING - SAMPLE COLLECTION DATA SHEET

Project Name: _____ Project Number: _____

Sampling Crew Members: _____ Client: _____

Date of Sample Collection: _____ Project Manager: _____

Sample ID Number	Time	Sample Location	Est. Stream/ Pond Width (ft)	Estimated Water Depth (ft)	Est. Stream Velocity (ft/sec)	Field pH	Field Temp °C	Field Turb.	DO (mg/L)	Sample Analyses	Sample Description

Additional Comments: _____

_____

_____

AECOM

SEDIMENT SAMPLING LOG

PROJECT:			**BORING ID:**
CLIENT:	**JOB NUMBER:**		
DATE STARTED:		**AECOM GEOLOGIST:**	
DATE COMPLETED:			
CONTRACTOR:			
EQUIPMENT:			
LOCATION:			
PURPOSE:			
DEPTH OF WATER:			

DEPTH (inches)	VERTICAL PROFILE DESCRIPTION
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Water depth approximately:

Sample ID:

Additonal Notes:

DRUM LOG

AECOM

SITE NAME: _____ PROJECT NUMBER: _____

SITE ADDRESS: _____

_____ CLIENT: _____

_____ _____

DRUM ID NUMBER	DATE STARTED/ CLOSED	BORING / WELL LOCATION	MATRIX	CONTENTS / COMMENTS	SOLID WASTE (Y/N)	RCRA WASTE (Y/N)

_____ _____

AECOM ONSITE REPRESENTATIVE (PRINT) (SIGN)

SITE NAME: _____ SITE ID.: _____

INSPECTOR: _____

MONITORING WELL FIELD INSPECTION LOG

DATE/TIME: _____

WELL ID.: _____

	YES	NO
WELL VISIBLE? (If not, provide directions below)		

WELL COORDINATES? NYTM X _____ NYTM Y _____ See Report

	YES	NO
WELL I.D. VISIBLE?		
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)		

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: .....

	YES	NO
SURFACE SEAL PRESENT?		
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)		
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)		

HEADSPACE READING (ppm) AND INSTRUMENT USED ..... _____

TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable) ..... _____

PROTECTIVE CASING MATERIAL TYPE: ..... _____

MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): .....

	YES	NO
LOCK PRESENT?		
LOCK FUNCTIONAL?		
DID YOU REPLACE THE LOCK?		
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		
WELL MEASURING POINT VISIBLE?		

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): ..... _____

MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): ..... _____

MEASURE WELL DIAMETER (Inches): ..... _____

WELL CASING MATERIAL: ..... _____

PHYSICAL CONDITION OF VISIBLE WELL CASING: ..... _____

ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE ..... _____

PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES ..... _____

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.).

DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

REMARKS:

APPENDIX E

NYSDOH Generic Community Air Monitoring Plan

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX F

Quality Assurance Project Plan

AECOM

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Site Characterization/ Remedial Investigation

Tank 75 Site
4625 River Road
Tonawanda, New York
NYSDEC State Superfund Program
Site No. 915008B

Prepared for:

Ashland LLC
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Prepared by:

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One John James Audubon Parkway, Suite 210
Amherst, NY 14228

March 2023, Rev.0

QUALITY ASSURANCE PROJECT PLAN (QAPP)

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Tank 75 Site
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March 2023, Rev.0

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1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The purpose of this Quality Assurance Project Plan (QAPP) is to document planned investigative activities and establish the criteria for performing these activities at a predetermined quality for the work conducted by AECOM, for the Tank 75 Site NYSDEC Superfund Program (Site No. 915008B) located at 400 47th Street in the City of Niagara Falls, New York. The location of the project site is shown on Site Characterization/ Remedial Investigation Work Plan (SC/RIWP) **Figure 1-1**. The QAPP is intended to be a companion document to the site-specific SC/RIWP.

Project work will be conducted in general accordance with the NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, May 2010), and United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988).

1.2 PROJECT MANAGEMENT AND ORGANIZATION

1.2.1 Personnel

The general responsibilities of key AECOM project personnel are listed below.

Project Manager – Colin Wasteneys, PG, will have responsibility for overall project management and coordination with the client and NYSDEC, and will coordinate the initiation and implementation of the Site activities as well as coordinate subcontractors

Field Team Leader – John Boyd, of AECOM's Buffalo, NY office, will be responsible for coordinating field activities including soil boring installations, vibracore sampling, monitoring well sampling, slug testing, soil sampling, and surface water and sediment sampling.

Quality Assurance Officer – Jim Kaczor, of AECOM's Buffalo, NY office, will serve as the Project Quality Assurance Officer (QAO) for this project. The QAO will be responsible for oversight of the data validation and laboratory subcontractors, as well as data usability reports. The QAO will work with the database manager to assure that electronic deliverables provided by the laboratory are accurate and are formatted consistent with AECOM and NYSDEC submittal requirements.

Health & Safety (H&S) Officer – Pete Wray, AECOM SH&E Manager, will be responsible for oversight of the preparation of the project Health and Safety plan (HASP), approving it, and tracking of its implementation.

Database Manager – Maxwell Reis, of AECOM's Buffalo, NY office, will serve as database manager. The database manager is responsible for verifying that laboratory deliverables meet AECOM and NYSDEC electronic deliverable specifications, and for preparing the final EQuIS deliverable for submission to NYSDEC.

Field surveying and mapping **-** Michael Rozeski, PLS of AECOM's Buffalo, NY office, will provide land surveying support. Mr. Rozeski is a NYS-licensed land surveyor.

Data Validation – Ann Marie Kropovitch of AECOM's Buffalo, NY office, a certified validator, will be assigned for data quality review and data usability summary report (DUSR).

1.2.2 Specific Tasks and Services

AECOM will obtain the following subcontractor specialists for services relating to laboratory analytical services:

Laboratory Analysis – Eurofins Laboratories, Inc. (Eurofins), Buffalo laboratory has been assigned for the project. Eurofins is certified for aqueous and non-aqueous matrices. Eurofins, Buffalo is also certified for air sample analysis.

1.3 SITE DESCRIPTION AND LOCATION

Detailed background data on the site, including the site description and location, site history, previous investigations, and current conditions, are summarized in the in the site-specific SC/RIWP.

The Ashland Tank 75 Site is located at 4625 River Road in the Town of Tonawanda, Erie County, New York (the "Site") and is listed on the New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class 3 site (Site ID #915008B). This Site is approximately 1.25 acres in size and consists of a former in-ground product storage tank owned by Ashland Inc. The tank is located on an industrial property where Ashland formerly operated an oil refinery and major oil storage facility; the property is currently operated by United Refining Company as an oil storage/distribution facility. The property is bounded by Interstate I-190 to the south, The Seaway/Niagara Landfill to the north, River Road to the west, and vacant commercial property to the east. The Site must be accessed by entering the front gate of the United Refining Company Terminal at 4545 River Road.

Tank 75 was constructed in the early 1940's during World War II (WWII) for the storage of No. 6 fuel oil. Because steel was scarce during WWII, the tank was constructed as an open-top, in-ground gunite-lined product storage tank. The tank dimensions are approximately 200 feet wide by 300 feet long with side slopes of 1.5H:1V to a flat bottom approximately 26 feet below surrounding grade. The gunite liner is approximately 3 to 4 inches thick and is reinforced with steel mesh. There are no construction or record drawings available for Tank 75. The tank is situated in a Glacial Lacustrine Clay typically logged as a clayey silt to silty clay soil deposit.

Ashland purchased the Tank 75 property in 1950. Tank 75 was taken out of service in 1980. The refinery itself discontinued production in July 1982. During the shutdown of the Ashland Refinery, hazardous wastes, including K-listed petroleum refinery industry wastes (K049 [slop oil emulsion solids], K050 [heat exchanger bundle cleaning sludge], and K052 [tank bottoms, leaded]), were placed in the tank. The sludge also meets the criteria for the RCRA ignitability characteristic (D001). Previous site investigations indicate that approximately 4,250,000 gallons of water, 500,000 gallons of a pumpable sludge, and 4,000 cubic yards of non-pumpable sludge are present in the tank. During the summers of 1992 and 1993, approximately 1,500,000 gallons of floating No. 6 fuel oil was removed and transferred to Ashland's Catlettsburg Kentucky refinery.

Six groundwater monitoring wells were installed at the site in 1986, and groundwater samples were collected annually from 1993 through 1998. Five of these wells (MW2S, MW2D, MW3, MW4S, and MW4D) are located in the immediate vicinity of Tank 75, and one well (MW5) is located in the southeast portion of the refinery property (Figure 2). In 2005, AECOM (as URS) installed four additional shallow monitoring wells (MW-05-01, MW-05-02, MW-05-03, and MW-05-04) in the immediate vicinity of Tank 75. AECOM conducted one round of groundwater sampling of the nine wells located in the immediate vicinity of Tank 75 in 2005. Historically (i.e., 1993 to 2005), the following parameters have been detected in groundwater at concentrations exceeding their respective New York State Department of Environmental Conservation (NYSDEC) groundwater standard; no other parameters have been detected at concentrations above their NYSDEC groundwater standard: methylene chloride, phenol, pentachlorophenol, cadmium, iron, lead, manganese, sodium. The results

from previous groundwater sampling in the vicinity of Tank 75 indicate that tank contents have not impacted surrounding groundwater quality, likely attributable to the clayey soil conditions in which the tank was built.

2.0 SITE INVESTIGATION

Site investigation procedures are provided below.

2.1 Field Sampling Procedures

Field activities are detailed in the SC/RIWP and are not repeated in this QAPP. However, activities will include soil borings, groundwater sampling of existing wells, collection of surface water and sediment; so that samples collected during this SC/RI will include surface soil, subsurface soil, sediment, groundwater, and surface water. The need for a Soil Vapor Investigation, and soil vapor/indoor air samples is not anticipated due to a lack of buildings near the Site; but upon evaluation of the RI data results will be considered.

2.2 Equipment Decontamination

To avoid cross-contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the procedures specified in the SC/RIWP.

Field equipment rinseate blanks (see Section 3.6.1) are generated and analyzed to monitor the effectiveness of field decontamination procedures.

Cross-contamination is minimized by the use of vendor-decontaminated, dedicated, disposable equipment to the extent practical.

2.2.1 Decontamination Procedures

A decontamination pad will be constructed on the site. The pad will be sized to be large enough to handle the equipment used on site (e.g., drill rig). The pad will also be used for small equipment decontamination as well as personnel decontamination.

2.2.2 Small Equipment Decontamination

Small equipment decontamination for non-disposable equipment such as groundwater samplers, transducer probes and cables, etc., will be accomplished using the following procedures:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse; and
- Distilled/deionized water rinse (certified PFAS free).

Solvents will not be used in the field decontamination procedure. Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g. Alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses. Tap water may be used from any treated municipal water system; the use of an untreated potable water supply is not an acceptable substitute. PFAS-free water will be utilized when PFAS sampling will occur.

Equipment should be allowed to dry prior to use. Steam cleaning or high pressure hot water cleaning may be used in the initial removal of gross, visible contamination.

Groundwater will be collected using peristaltic pumps. Dedicated sample tubing and silicone pump tubing will be used at each monitoring well.

2.2.3 Heavy Equipment Decontamination

Drilling equipment will be decontaminated before the first use during this project, between boreholes and prior to demobilization using high-pressure steam. Decontamination will be conducted at a dedicated decontamination pad constructed for the project. Decontamination fluids will be containerized (drummed) for subsequent characterization or disposal, unless other arrangements are made on a project-specific basis and as indicated in the SC/RIWP.

2.2.4 Personnel Decontamination

Wash buckets and potable water will be set up at the decontamination pad or alternate location as indicated in the SC/RIWP, or HASP. This includes washing hands and a boot wash. Details of the personnel decontamination procedures will be provided in the HASP.

3.0 SAMPLE HANDLING

3.1 SAMPLE IDENTIFICATION AND LABELING

Samples will be assigned a unique identification using the sample location or other sample-specific identifier.

The general sample identification format follows.

MW = Monitoring Well

SB = Soil Boring

SS = Surface Soil

SW = Surface Water

SD = Sediment

IA = Indoor Air

OA (or AA) = Outdoor (or ambient) Air

SSV = Sub-slab Soil Vapor

EB = Field Equipment (Rinseate) Blank

FD = Field Duplicate

TB = Trip Blank

XX = Numerical sample identifier (up to five characters). This will ordinarily be the number of the monitoring well or soil boring location from which the sample was obtained.

As part of the unique identifier, the sample date will be included following any location that may have more than one sample collected. The format will be MMDDYY. For example, MW-01S that is sampled on May 24, 2011 will be MW-01S -052411.

QC field duplicate samples will be submitted blind to the laboratory; a fictitious sample ID will be created using FD followed by the date followed by a numerical identifier in sequence for each duplicate sample collected for that day (e.g., FD-060319-1 would be the first field-duplicate taken on 06/03/2019). The sample identifications (of the original sample and its field duplicate) will be marked in the field book and on the copy of the chain-of-custody kept by the sampler and copied to the project manager. As the field duplicates are blind to the laboratory, the NYSDEC Valid Value for a field duplicate (FD) along with the identification of the parent sample will be done by AECOM after the EQuIS deliverable is received from the laboratory.

Affixed to each sampling container will be a non-removable label on which the following information will be recorded with permanent water-proof ink:

- Site name, location, and job number;
- Sample identifier;
- Company (AECOM)
- Date and time;
- Sampler's initials;

- Preservative;
- Type of sample (e.g., water, soil, sludge, sediment, air); and,
- Requested analyses.

3.2 SAMPLE BOTTLES, PRESERVATION, AND HOLDING TIME

Table 1 identifies the sample preparation and analytical method, matrix, holding time, containers, and preservatives for the typical analyses to be performed on this project. Sample bottle requirements, preservation, and holding times are discussed further below.

3.2.1 Sample Containers

The selection of sample containers used to collect samples is based on the criteria of sample matrix, analytical method, potential contaminants of concern, reactivity of container material with the sample, QA/QC requirements, and any regulatory protocol requirements.

Sample bottles will be provided by the analytical laboratory and will conform to the requirements of the USEPA Specifications and Guidance for Contaminant-Free Sample Containers. Aqueous samples for volatile organic compound (VOC) analysis will be collected in 40-mL vials with Teflon™ septa. Samples for PFAS will be collected using HDPE bottles and segregated from any bottle ware containing Teflon™.

3.2.2 Sample Preservation

Samples will be preserved as summarized on Table 1.

Chemical preservatives will be added to the sample bottles (prior to sample collection) by the analytical laboratory. The pH of samples will be spot-checked in the field and additional preservative will be added as needed. Sample preservation is checked upon sample receipt by the laboratory; this information is reported to the AECOM Quality Assurance Officer (QAO). If it appears that the level of chemical preservation added is not adequate, laboratory preservative preparation and addition will be modified or additional preservative will be added in the field by the sampling team.

3.2.3 Holding Times

Contractual holding times (see Table 1) are calculated from the validated time of sample receipt (VTSR) by the laboratory; samples will be shipped from the field to arrive at the lab no later than 48 hours from the time of sample collection. Holding time requirements will be those specified in the NYSDEC Analytical Services Protocol (ASP) 2005 with 2008 update for TO-15 analysis.

Although trip blanks are prepared in the analytical laboratory and shipped to the site prior to the collection of environmental samples, for the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered. Procurement of bottles and blanks will be scheduled to prevent trip blanks from being stored for excessive periods prior to their return to the laboratory; the goal is that trip blanks should be held for no longer than one week prior to use.

3.3 CHAIN OF CUSTODY AND SHIPPING

A chain-of-custody (COC) form will trace the path of sample containers from the project site to the laboratory. COC forms are typically provided by the analytical laboratory.

Sample bottle tracking sheets or the COC will be used to track the containers from the laboratory to the containers' destination. The Project Manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Insulated sample shipping

containers (typically coolers) will be provided by the laboratory for shipping samples. Sample bottles within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory. Project personnel receiving the sample containers from the laboratory will check each cooler for the condition and integrity of the bottles prior to field work.

Once the sample containers are filled, they will be immediately placed in the cooler with ice (in Ziploc plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at 4º C. The field sampler will indicate the sample designation/location number in the space provided on the chain-of-custody form for each sample. The chain of custody forms will be signed and placed in a sealed plastic Ziploc bag in the cooler. The completed shipping container will be closed for transport with nylon strapping, or a similar shipping tape, and two paper seals will be affixed to the lid. The seals must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. A label may be affixed identifying the cooler as containing “Environmental Samples” and the cooler will be shipped by an overnight delivery service to the laboratory. When the laboratory receives the coolers, the custody seals will be checked and lab personnel will sign the chain-of-custody form.

3.4 LABORATORY SAMPLE RECEIPT

Upon receipt at the laboratory, a laboratory representative inspects the samples for integrity and checks the shipment against the chain-of-custody/analytical task order form. Discrepancies are addressed at this point and documented on the chain-of-custody form and the cooler checklist. Discrepancies are reported to the Laboratory Project Manager who contacts the AECOM Project Manager or QAO for resolution.

When the shipment and the chain-of-custody are in agreement, the custodian enters the samples into the Laboratory Information Management System and assigns each sample a unique laboratory number. This number is affixed to each sample bottle. The custodian then enters the sample and analysis information into the laboratory computer system.

3.4.1 Laboratory Sample Custody

The laboratory must satisfy the sample chain-of-custody requirements by implementing the following procedures for laboratory/sample security:

- Samples are stored in a secure area;
- Access to the laboratory is through a monitored area;
- Visitors sign a visitor’s log and are escorted while in the laboratory;
- Only the designated sample custodians have keys to sample storage area(s); and
- Transfers of samples in and out of storage are documented.

3.4.2 Sample Storage, Security, and Disposal

While in the laboratory, the samples and aliquots that require storage at 4° C ± 2°C are maintained in a locked refrigerator unless they are being used for analysis. The laboratory is responsible for sample storage and security so that:

- Samples and extracts are stored for 60 days after the final analytical data report has been submitted to AECOM. The samples, extracts, and digestates are then disposed by the laboratory in accordance with laboratory SOPs and applicable regulations.
- Samples are not stored with standards or sample extracts.

4.0 DATA QUALITY REQUIREMENTS

4.1 ANALYTICAL METHODS

Soil and water sample analyses will utilize USEPA SW-846 methods as listed below.

Analytical and extraction/sample preparation methods typically used are shown on Table 1 and summarized below.

Investigation Analyses:

- Target Compound List (TCL) VOCs plus TICs – SW-846 Method 8260C
- TCL SVOCs plus TICs – SW-846 Method 8270D
- TCL Pesticides – SW-846 Method 8081B
- PCBs – SW 846 Method 8082A
- Target Analyte List metals – SW-846 Method 6010C/7470A/7471B
- 1,4-dioxane by EPA Method 8270 Selective Ion Monitoring (SIM)
- 40 PFAS compounds by EPA Draft Method 1633
- Total Organic Carbon - Method 9060A / Lloyd Kahn
- Cyanide – Method 9012B

Sediment Waste Characterization Analyses:

- Toxicity Characterization Leaching Procedure (TCLP) – Method SW-846 1311
    - VOCs – SW-846 Method 8260C
    - SVOCs – SW-846 Method 8270D
    - Pesticides – SW-846 Method 8081A/B
    - Herbicides – SW-846 Method 8151A
    - Metals – SW-846 Method 6010B/7470A
    - Corrosivity – SW 846
    - Ignitability - 40 CFR 261.21
    - Flashpoint - SW-846 1010A
    - Reactivity – SW 846 901A/9034
- BTU
- Total Extractable Petroleum Hydrocarbons
- Paint Filter Test
- Viscosity
- pH – SM-4500

- Ethylene glycol – 8015B

Analytical methods are presented in the NYSDEC Analytical Services Protocol (ASP), 2005. It is the laboratory's responsibility to be familiar with this document and procedures and deliverables within it pertaining to New York State work. Full Category B deliverables will be required.

AECOM has selected Eurofins to provide laboratory analytical services for this project. The proposed laboratory is certified by the NYSDOH Environmental Laboratory Approval Program. The laboratory is in good standing for the applicable parameter groups.

4.2 QUALITY ASSURANCE OBJECTIVES

Data quality objectives (DQO) for measurement data in terms of sensitivity and the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are established so that the data collected are sufficient and of adequate quality for their intended uses. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this site.

4.2.1 Sensitivity

The sensitivity or detection limit desired for each analysis or compound is based on the DQOs established for the project. The method detection limit is determined in accordance with the procedure in ASP Exhibit A, section 4.9.2.12, which is consistent with the procedure in 40 CFR Part 136 Appendix B.

The reporting limit (RL) for non-detected analytes will be the lowest calibration standard associated with the analysis. Reporting limits will be equal to or lower than those presented in Exhibit C of ASP 2005 for the applicable method. Analytes detected at concentrations below the RL but above the MDL will be flagged "J" (estimated) by the laboratory. Typical RLs are summarized on Table 2. PFAS compound specific RLs by EPA Draft Method 1633 are listed in Table 3.

The reporting limits and MDLs of the assigned laboratory will be reviewed by AECOM's QAO for each project to verify that the laboratory sensitivity is sufficient to meet the project objectives. These will typically include meeting the applicable standards, criteria, and guidance (SCGs) including soil cleanup objectives (6 NYCRR 375-6.8), supplemental soil cleanup objectives (NYSDEC, October 2010), groundwater and surface water criteria (compiled in TOGS 1.1.1), and indoor air screening levels (NYSDOH, 2006, 2007).

4.2.2 Precision

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Matrix spike duplicate analyses will be performed once for every 20 samples for VOCs.

Relative Percent Difference (RPD) criteria determined from laboratory performance data are used to evaluate precision between duplicates. A matrix spike duplicate will be performed once for every twenty samples for volatile organics.

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is usually stated in terms of standard deviation but other estimates such as the coefficient of variation, relative standard deviation, range (maximum value minus minimum value), and relative range are common, and may be used pending review of the data.

The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision; there are more historical data

related to individual method performance and the "universe" is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project.

Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision.

Precision will be determined from field duplicates, as well as laboratory matrix duplicate samples for metals analyses, and matrix spikes and matrix spike duplicates for organic analyses; it will be expressed as the relative percent difference (RPD):

$$RPD = 100 \times 2(|X_1 - X_2|) / (X_1 + X_2)$$

where:

X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is ≤ 50% RPD for all matrices for analytes detected at concentrations at least 2 times the reporting limit. Where one or both analytes are detected at less than 2 times the RL, the criterion is the absolute difference “D” ($X_1 - X_2$), and D should be less than the RL for the analyte.

4.2.3 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent method recovery criteria and those determined from laboratory performance data, are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike or laboratory control will be performed once for every analytical batch or as specified in the method or ASP. Other method-specific laboratory QC samples (such as continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

$$\% \text{ Recovery} = 100 \times (SSR-SR)/SA$$

Where:

SSR = Spiked sample Result;

SR = Sample Result; and

SA = Spike Added.

Accuracy measures the bias in a measurement system. It is difficult to measure accuracy for the entire data collection activity. Accuracy will be assessed through use of known QC samples. Accuracy values can be presented in a variety of ways. For projects under this contract, accuracy will be normally presented as percent recovery.

Routine organic analytical protocol requires a surrogate spike in each sample. Surrogate recovery will be defined as:

$$\% \text{ Recovery} = (R/S) \times 100$$

Where:

S = surrogate spike concentration; and

R = reported surrogate compound concentration.

Recovery criteria for laboratory spikes and other laboratory QC samples through which accuracy may be evaluated are established in the applicable analytical method.

4.2.4 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions. Representativeness will be determined by a comparison of the quality controls for these samples against data from similar samples analyzed at the same time.

4.2.5 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), the US Environmental Protection Agency (USEPA), or the New York State Departments of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

Comparability within any specific project is also assessed by comparison of the project data to data generated previously; and, if available, comparison of the data for multiple sampling events conducted for the project. Comparability (consistency) of sampling techniques is also assessed, to some extent, by analysis of field duplicates; although it should be noted that large differences between field duplicates may result from a wide variety of causes, not just inconsistent sampling.

4.2.6 Completeness

The goal of completeness is to generate the maximum amount possible of valid data for all planned samples. Completeness of 100 percent indicates that all planned samples were collected; and the resultant data were fully valid and acceptable. As completeness is a function of both field activities and laboratory activities, separate completeness goals are established for each.

The default goal for sampling completeness is 95 percent, as is calculated as:

$$\text{Sampling Completeness (\%)} = (Sc/Sp) \times 100$$

Where:

Sc = Samples collected (submitted) for analysis (documented from field records or COC); and

Sp = Samples planned (as documented in the SC/RIWP or QAPP).

The default goal for analytical completeness is also set at 95 percent. Analytical completeness may be less than 100 percent either due to systemic failures that result in the rejection or loss of data for an entire sample; or compound-specific rejection (e.g., 2-hexanone) within an otherwise valid analysis.

For typical work assignments, the default overall completeness goal is 90 percent useable data. The impact of rejected or unusable data will be made on a case-by-case basis. If the goals of the project can be achieved without the missing datum or data, or if data from a different sampling event can be used to fill the data gap, no further action would be necessary. However, loss of critical data may require resampling or reanalysis.

4.3 FIELD QUALITY ASSURANCE

Blank water generated for use during this project must be “demonstrated analyte-free.” The criteria for analyte-free water are based on the USEPA-assigned values for the Contract Required Quantitation Limits (CRQLs) for Contract Laboratory Program (CLP) analyses, or the RL for SW-846 or other methods.

However, specifically for the common laboratory contaminants (acetone and 2-butanone), the allowable limits are five times the CRQL (or RL). For methylene chloride, the limit is 2.5 times the CRQL. For common SVOC contaminants (phthalate esters such as bis(2-ethylhexyl) phthalate), the limit is 5 times the CRQL.

The analytical testing required for the water to be demonstrated as analyte-free must be performed prior to the start of sample collection; thus, blank water will be supplied by the laboratory.

Table 2 of this QAPP shows QA/QC samples and reporting limits. QA/QC samples are discussed below.

4.3.1 Field Equipment (Rinseate) Blanks

Equipment blanks consist of demonstrated, analyte-free water that show if sampling equipment has the potential for contaminant carryover to give a false impression of contamination in an environmental sample. When blank water is used to rinse a piece of sampling equipment (before it is used to sample), the rinseate is collected and analyzed to see if sampling could be biased by contamination from the equipment.

Rinseate blanks are not required when samples are collected directly into laboratory-provided sample containers (e.g., if specified as such in the SC/RIWP for matrices such as surface water).

Field (Equipment Rinseate) blanks for bailers and pump tubing: For initial sampling, as well as at subsequent rounds of sampling when bailers or tubing is reused, a section of each type of tubing used per sampling batch or one bailer per batch will be used to generate equipment (rinseate) blanks during groundwater sampling. Disposable bailers and tubing will be obtained from a single vendor for this project. One rinseate blank will be collected for each groundwater sampling event to verify that the vendor decontamination was adequate, and that contamination has not occurred during shipment and storage.

Field (Equipment Rinseate blanks for drilling tooling: For each event where soil borings, hand-clearing (i.e. hand auger), or drilling equip (i.e. shoe, acetate sleeves) will be decontaminated, One rinseate blank will be collected for each soil boring collection event to verify that the vendor supplies and equipment decontamination in the field was adequate and that cross-contamination has not occurred during field decontamination.

Typically, one rinseate blank will be collected for every 20 field samples collected or one per week, whichever is more frequent, for each type of sampling equipment and each media type. PFAS equipment blanks will be collected once per day per site and minimum 1 equipment blank per 20 samples. The rinseate blanks will be collected from the soil and groundwater sampling equipment as noted in Table 2.

4.3.2 Field Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method.

Aqueous field duplicate samples are second samples collected from the same location, at the same time, in the same manner as the first, and placed into a separate container (technically, these are co-located samples). Each duplicate sample will be analyzed for the same parameters as the original sample collected that day.

Soil duplicate samples are collected from a single location and device (e.g., split spoon sampler). Soil duplicates for VOC analysis are collected first, without homogenization. If other parameters are being analyzed, the remaining soil is homogenized (e.g., by mixing in a clean stainless steel bowl) and prior to generating the sample and duplicate.

Air field duplicates are typically collected by utilizing a “T” fitting on the sample line and splitting the air between two Summa canisters of the same size and set to the same flow rate.

The default field duplicate precision (RPD) objective is ≤50% percent RPD for all matrices where the sample concentration is at least two times the reporting limit. Where the analyte is detected in both samples but the concentration is less than 2 times the reporting limit, precision is assessed by the absolute difference, which should be less than the reporting limit. The RPD is not calculable when the analyte is not detected in one or both analyses. A more detailed discussion of the calculation is provided in Section 4.2.2 (Precision), above.

Field duplicates will be collected at a frequency of one per 10 environmental samples for aqueous and non-aqueous sample.

4.3.3 Trip Blanks

The purpose of a VOC trip blank (using demonstrated analyte-free water) is to place a mechanism of control on sample bottle preparation and blank water quality, and sample handling. The trip blank travels from the lab to the site with the empty sample bottles and back from the site with the collected samples. There will be a minimum of one trip blank per shipment containing aqueous samples for VOC analysis.

Trip blanks will be collected only when aqueous volatile organics are being sampled and shipped; except that a trip blank is not required when the only aqueous samples in a shipment are QC samples (rinseate blanks).

4.3.4 Temperature Blanks

The laboratory will use either an infrared instrument to measure the temperature of liquid samples, or a temperature blank will be used to measure the temperature of liquid samples. If used, temperature blanks will be supplied by the analytical laboratory. If multiple coolers are necessary to store and transport aqueous samples, then each cooler will contain an individual temperature blank (if used).

4.4 FIELD TESTING QC

Field testing of groundwater will be performed during purging of wells prior to sampling for laboratory samples. Field QC checks of control limits for pH, specific conductance (conductivity), and turbidity are detailed below. The calibration frequencies discussed below are the minimum. Field personnel can and should check calibration more frequently in adverse conditions, if anomalous readings are obtained, or subjective observations of instrument performance suggest the possibility of erroneous readings. Calibration logs for the instruments discussed below will be provided in the SC/RIWP.

4.4.1 pH Meter

The pH meter is calibrated daily, using two standards bracketing the range of interest (generally 4.0 and 7.0). If the pH QC control sample (a pH buffer, which may be the same or different than those used to initially calibrate the instrument) exceeds 0.1 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by more than 0.1 pH units, the instrument will be recalibrated. Expired buffer solutions will not be used.

Note that gel-type probes take longer to equilibrate (up to 15 minutes at near-freezing temperatures); this must be taken into account in calibrating the instrument and reading samples and standards.

4.4.2 Specific Conductivity

A vendor-provided conductivity standard will be used to check the calibration of the conductivity meter daily. Specific conductance QC samples will be on the order of 0.01 or 0.1 molar potassium chloride (KCl) solutions in accordance with manufacturer's recommendations.

4.4.3 Turbidity

The turbidity meter should be calibrated using a standard as close as possible to 50 NTU (the critical value for determining effectiveness of well development and evacuation). The turbidimeter will be checked daily. The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

4.4.4 Temperature

Temperature probes associated with instruments (such as the YSI SCT-33 conductivity and temperature meter) are not subject to field calibration, but the calibration should be checked to monitor instrument performance. It is recommended that the instrument temperature reading be checked against a NIST-traceable thermometer concurrently with checking the conductivity calibration. The instrument manual will be referenced for corrective actions if accurate readings cannot be obtained.

4.5 LABORATORY QUALITY ASSURANCE

4.5.1 Method Blanks

A method blank is laboratory water on which every step of the method is performed and analyzed along with the samples. Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instruments as the sample is prepared and analyzed in the laboratory. Method blanks will be analyzed at a frequency of one for every twenty samples analyzed or as otherwise specified in the analytical protocol.

4.5.2 Laboratory Duplicates

Laboratory duplicates are sub-samples taken from a single aliquot of sample after the sample has been thoroughly mixed or homogenized (with the exception of volatile organics), to assess the precision or reproducibility of the analytical method on a sample of a particular matrix. Laboratory duplicates will be performed on spiked samples as a matrix spike and a matrix spike duplicate (MS/MSD) for volatile organics.

4.5.3 Spiked Samples

Two types of spiked samples will be prepared and analyzed as quality controls: matrix spikes and matrix spike duplicates (MS/MSD), which are analyzed to evaluate instrument and method

performance and performance on samples of similar matrix. MS/MSD samples will be analyzed at a frequency of one (pair) for every 20 samples. In addition, matrix spike blanks (MSBs) will also be prepared and analyzed by the laboratory as required by NYSDEC ASP.

4.5.4 Laboratory Control Sample

A fortified clean matrix (laboratory control sample, or LCS) is analyzed with each analysis. In some cases a “Laboratory-Fortified Blank” (LFB) may serve as the LCS. These samples generally consist of a standard aqueous or solid matrix fortified with the analytes of interest for single-analyte methods and selected analytes for multi-analyte methods according to the appropriate analytical method. The LCS may be analyzed in duplicate for some methods (LCSD). The analyte recovery from each analysis (LCS and LCSD) is used to monitor analytical accuracy; analytical precision can be assessed from evaluation of the LCS/LCSD in the same manner as the MS/MSD.

5.0 FIELD DATA DOCUMENTATION

Field reporting documentation will be performed, including field notes and field data reporting forms. Field notes will be prepared and maintained throughout the course of the investigation. Due to PFAS sampling, only loose paper and forms on metal clipboards will be used for field notes. The field notes will be maintained as a permanent part of the project file.

Field note entries will be recorded in indelible, waterproof ink. If errors are made in any field notes, field record (form), COC, or any other field record document, corrections will be made by crossing a single line through the error, entering the correct information, and initialing and dating the correction.

Standard Forms have been adopted in the SC/RIWP to facilitate the collection of consistent data (see SC/RIWP Appendix D). This will preclude detailed documentation of, for example, lithologic descriptions in the field notes. A reference, however, to use of each specific form must be made in the field notes.

The date will be placed at the top of every page in the left-hand corner. The time of entry recordings will be in columnar form down the left-hand side of the page. At the beginning of each day, the first two entries will be “Personnel/Contractors On Site” and “Weather.” At the end of each day's entry or particular event, if appropriate, the person entering the field notes should draw a diagonal line originating from the bottom left corner of the page to the conclusion of the entry and sign along the line indicating the conclusion of the entry or the day's activity.

Entries in the field notes will be legible (printing is preferable) and will contain accurate and inclusive documentation of project activities (investigation, monitoring remediation, closure, maintenance, etc.). Information pertaining to health and safety aspects, personnel on site, visitor’s names, association, and time of arrival/departure, etc., should also be recorded. Language should be objective, factual, and free of personal feelings or other terminology that might prove inappropriate, since field records are the basis for later written reports. Once completed, these field notes become accountable documents and must be maintained as part of the project files.

Sample collection and handling activities, as well as visual observations, will be documented in the field notes. The sample collection equipment (where appropriate), field analytical equipment, and equipment used to make physical measurements will be identified in the field notes. Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment will also be recorded in the field notes, except where these are referenced as being recorded on approved field forms. Field analyses and measurements must be traceable to the specific piece of field equipment utilized and to the field investigator collecting the sample, making the measurement, or conducting analyses. Field notes will be updated as field work progresses.

The field notes will be stored in the Project File. Copies of specific sections will be made available to personnel upon request.

All field records (e.g., drilling logs, well construction forms, sampling records, COCs, aquifer testing forms) will be completed the day the associated activity occurs. Field data collected using electronic data loggers or computer entry forms, will be downloaded as soon as practical onto CDs or uploaded to office servers. If possible, the person collecting the data will download electronic data on a daily basis. This person will be responsible for verifying that the data collected are adequately represented in electronic media and in the file. A hard copy of the data, and any graphical representation produced by logging software, will also be printed out and duplicated.

6.0 EQUIPMENT CALIBRATION AND MAINTENANCE

Quality assurance for instrumentation and equipment used for a project is controlled by a formal calibration program, which verifies that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity, or whose performance is expected at a stated level, are subject to calibration. Calibration is performed using reference standards or externally by calibration agencies or equipment manufacturers.

6.1 STANDARD WATER AND AIR QUALITY FIELD EQUIPMENT

Field equipment used during the collection of environmental samples typically includes a turbidimeter (turbidity per EPA Method 180.1), pH meter (pH per EPA Method 150.1), conductivity meter (specific conductance per EPA Method 120.1), thermometer, and organic vapor analyzer. See also Section 4.4 of this QAPP for additional discussion.

The organic vapor analyzer (OVA) (i.e., miniRAE 3000 or similar) used for soil screening and health and safety air monitoring will be calibrated following the manufacturer's instructions, at the beginning of the day, whenever the instrument is shut off for more than two hours, and at the field technician's discretion.

6.2 LABORATORY EQUIPMENT CALIBRATION

Laboratory equipment will be calibrated according to the method-specific requirements of the 2005 NYSDEC ASP**,** Exhibit E, Parts II and III, and maintained following professional judgment and the manufacturer's specifications, and additional requirements as specified in the ELAP certification manual.

6.2.1 Calibration Procedure

Written procedures are used for all instruments and equipment subject to calibration. For chemical analyses typically performed for these contracts, the calibration procedures are specified in the methods as compiled in the ASP. If established procedures are not available, a procedure is developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured.

6.2.2 Calibration Frequency

Calibration frequency is based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended data use, specified analytical methods, effect of error upon the measurement process, and prior experience.

6.2.3 Calibration Reference Standards

Two types of reference standards will be used by the analytical laboratory for calibration:

Physical standards, such as weights for calibrating balances and certified thermometers for calibrating working thermometers, refrigerators and ovens, are generally used for periodic calibration.

Chemical standards, such as Standard Reference Materials (SRMs) provided by the National Institute of Standards and Technology (NIST) or USEPA, may also include vendor-certified materials traceable to NIST or USEPA SRMs. These are primarily used for operational calibration.

6.2.4 Calibration Failure

Equipment that cannot be calibrated or becomes inoperable is removed from service. Such equipment must be repaired and satisfactorily recalibrated before re-use. For laboratory equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken and the analyst achieves an acceptable calibration.

Laboratory managers are responsible for development and implementation of a contingency plan for major equipment failure. The plan includes guidelines on waiting for repairs, use of other instrumentation, subcontracting analyses, and evaluating scheduled priorities.

6.2.5 Calibration Records

Records are prepared and maintained for each piece of equipment subject to calibration. Records demonstrating accuracy of preparation, stability, and proof of continuity of reference standards are also maintained. Copies of the raw calibration data are kept with the analytical sample data.

6.3 OPERATIONAL CALIBRATION

Operational calibration is generally performed as part of the analytical procedure and refers to those operations in which instrument response (in its broadest interpretation) is related to analyte concentration. Included are the preparation of a standard response (calibration) curve and often the analysis of blanks.

Preparation of a standard calibration curve is accomplished by the analysis of calibration standards, which are prepared by adding the analyte(s) of interest to the solvent that is introduced into the instrument. The concentrations of the calibration standards are chosen to cover the working range of the instrument or method. For most methods, five calibration standards are used, with the concentration of the lowest calibration standard being the reporting or quantitation limit for that analysis. Sample measurements are made and reported within this working range; apparent concentrations which exceed the high end of the calibrated range (“E”-flagged data for organic analyses) are diluted (or a smaller sample is used) and re-analyzed. The calibration curve is prepared by plotting or performing a linear regression of the instrument responses against the analyte concentration.

7.0 DATA REDUCTION, VALIDATION, AND REPORTING

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the RIWP, pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

7.1 LABORATORY DATA REPORTING AND REDUCTION

Data reduction is the process by which raw analytical data generated from laboratory instrument systems is converted into usable concentrations. The raw data, which may take the form of area counts, instrument responses, or observations, are processed by the laboratory and converted into concentrations expressed in the parts per million (milligram per kilogram [mg/kg] or milligram per liter [mg/L]) or parts per billion (µg/kg or µg/L) range. Raw data from these systems include compound identifications, concentrations, retention times, and data system print-outs. Raw data are usually reported in graphic form, bar graph form, or tabular form. The laboratory will follow standard operating procedures consistent with the data handling requirements of the applicable methods.

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the 2005 revision of the NYSDEC ASP. ASP Deliverables are either Category B (full deliverables; similar to USEPA CLP requirements) or Category A (a reduced deliverable level). For this contract, Category B deliverables are the default and will be provided for all deliverables generated under the contract unless explicitly indicated otherwise on a site-specific basis. Laboratory data reports will conform to NYSDEC Category B deliverable requirements, as specified in Exhibit B, Part II.E, Sections 2 and 3, respectively.

Copies of the laboratory's generic Quality Assurance Management Plan (QAMP, as defined in ASP 2005 Exhibit E, Part I) will be maintained at AECOM's principal contact office (Buffalo, NY for D007622). The laboratory's QAMP will indicate the standard methods and practices for obtaining and assessing data, and how data are reduced from the analytical instruments to a finished report, indicating levels of review along the way.

To meet NYSDEC electronic data deliverable (EDD) requirements, subcontract laboratories will be required to submit electronic deliverables in an EQuIS 4-file format consistent with AECOM standards (see Attachment 1). AECOM's database manager will be responsible for verifying that the file submitted meets these specifications including verifying that current NYSDEC Valid Values were used for sample coding; providing an Excel (or Access) file to the data validator; uploading the validated data into the database; overseeing the uploading of any other data (field data, boring log information, etc.), and submitting a final EQuIS deliverable to NYSDEC that meets NYSDEC EDD requirements.

In addition to the hard copy of the data report, the laboratory will be asked to provide the sample data in spreadsheet form (submitted electronically or on computer diskette). The data spreadsheet will be generated to the extent possible directly from the laboratory's electronic files or information management system to minimize possible transcription errors resulting from the manual transcription of data.

7.2 DATA VALIDATION

Data generated for this RI will be validated by a qualified data validator. The validator, Ann Marie Kropovitch, will follow guidelines established in the USEPA Region 2 SOPs applicable to the analytical method(s) being reviewed. These SOPs are checklists which are designed to formally and rigorously

assess the quality and completeness of SW-846 and air sample TO-15 analysis data packages. The use of these USEPA SOPs will be adapted to conform to the specific requirements of the NYSDEC ASP (e.g., NYSDEC/ASP holding times; matrix spike blank requirements).

Validation reports and DUSRs will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text. Where QC failures caused the laboratory to perform a re-analysis, the data validator will make a recommendation as to which of the two analyses should be used. Data review will also include an assessment of sensitivity (i.e., are reporting limits appropriate to determine if contaminants are present at or above action levels or other applicable threshold values).

There may be some analyses for which there is no established USEPA or NYSDEC data validation protocol. In such cases, validation will be based on the Region 2 SOPs, as well as the laboratory's adherence to the technical requirements of the method, and the professional judgment of the validator. The degree of rigor in such validation will correspond to the nature of the data and the significance of the data and its intended use.

7.3 DATA USABILITY

AECOM's QA staff will prepare a DUSR which to be provided as part of the RI Report, encompassing both quantitative and qualitative aspects, although the qualitative element is the most significant.

The quantitative aspect is a summary of the data quality as expressed by qualifiers applied to the data; the percent rejected, qualified (i.e., estimated), missing, and fully acceptable data are reported. As appropriate, this quantitative summary is broken down by matrix, laboratory, or analytical fraction or method.

The qualitative element of the data usability summary is the QA officer's translation and summary of the validation reports into a discussion useful to data users. The qualitative aspect will discuss the significance of the qualifications applied to the data, especially in terms of those most relevant to the intended use of the data. The usability report will also indicate whether there is a suspected bias (high or low) in qualified data, and will also provide a subjective overall assessment of the data quality. If similar analyses are performed by more than one method, a discussion of the extent of agreement among the various methods will be included, as well as discussion of any discrepancies among the data sets.

The QAO will also indicate if there is a technical basis for selecting one data type over another for multiple measurements which are not in agreement.

Data which has not been validated and field data used for the project will be discussed in the data usability summary, including any limitations on the use of such data.

7.4 FIELD DATA VERIFICATION

Field personnel will record all field data in bound field logbooks and on standard forms. After checking the validity of the data in the field notes, the Project Manager or his/her designee will reduce the data to tabular form, when possible, by entering the data into data files. Where appropriate, the data files will be set up for direct input into the project database. Subjective data will be filed as hard copies for later review by the Project Manager and incorporation into technical reports, as appropriate.

Verification of field data will be performed at two different levels. The first level of data verification will be performed at the time of collection by following standard procedures and QC checks. The second

level of review consists of the Project Manager, Task Manager, or other competent personnel, reviewing the data to confirm that the correct codes and units have been included. After data reduction into tables and arrays is complete, the Site Manager will review data sets for anomalous values. The Project Manager, who will review field reports for reasonableness and completeness, will validate subjective field and technical data.

8.0 PERFORMANCE AND SYSTEM AUDITS

Audits are systematic checks to determine the quality of operation of some activity or function in the field or laboratory. Field audits are conducted to verify adherence to proper field and sampling procedures. Audits are of two types, as described below.

- Performance audits are independent safety and health, procedure, and/or sample checks made by a supervisor or auditor to arrive at a quantitative measure of the quality of the data produced by one section or the entire measurement process.
- System audits are onsite qualitative inspections and reviews of the QA system used by some part of or the entire measurement system. The audits are performed against the QAPP. A checklist is typically generated from the requirements and becomes the basis for the audit. The results of any deficiencies noted during the audit are summarized in an audit report.

Laboratory performance and system audits are performed by the laboratory's QA staff to assess the effectiveness of the quality system. These internal audits are performed on a routine basis. Audits are also performed by certifying agencies. Audit reports and corrective actions are available to NYSDEC for review.

8.1 RESPONSIBILITY, AUTHORITY, AND TIMING

QA audits to be conducted for the project may include system, performance, and data audits. The Project QAO will keep a tentative schedule on record that details the number and types of audits.

8.2 FIELD AUDITS

Field performance audits, if specified, will be conducted during the project as field data are generated, reduced, and analyzed. Numerical manipulations, including manual calculations, will be documented. Records of numerical analyses will be legible, of reproduction quality, and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator.

Indicators of the level of field performance include the analytical results of the blank and replicate samples. Each blank analysis will be considered an indirect audit of the effectiveness of measures taken in the field to maintain sample integrity (e.g., field decontamination procedures).

The results of the field replicate analyses are an indirect audit of the ability of each field team to collect representative sample portions of each matrix type.

System audits of site activities will be accomplished by an inspection of all field site activities. During this audit, the auditor(s) will compare current field practices with standard procedures. The following elements will be evaluated during a field system audit:

- Field activities conducted in substantial compliance with the SC/RIWP;
- Procedures and analyses conducted according to procedures outlined in the QAPP and Addendum;
- Sample documentation;
- Working order of instruments and equipment;
- Level of QA conducted by field personnel;
- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding;
- Decontamination procedures;

- Level of efficiency with which each team conducts planned activities at one site and proceeds to the next; and
- Sample packaging and shipment.

After completion of the audit, any deficiencies will be discussed with the field staff and corrections identified. If any of these deficiencies could affect the integrity of the samples being collected, the auditor(s) will inform the field staff and corrections will be implemented immediately. The audit will be performed by the Project QA/QC Coordinator or the Site Manager.

8.3 LABORATORY PERFORMANCE AND SYSTEM AUDITS

The laboratory assigned to this project will been verified to be certified by the NYSDOH Environmental Laboratory Approval Program for the matrices and analytical protocols to be used. Therefore, no project-specific audit of the laboratory(s) will be performed unless warranted by a problem(s) that cannot be resolved by any other means, or at the discretion of AECOM.

8.4 AUDIT PROCEDURES

Prior to an audit, the designated lead auditor prepares an audit checklist. During an audit and upon its completion, the auditor(s) will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated. The auditor will then prepare and submit an audit report to the manager of the audited group and the project manager.

The manager of the audited group will then prepare and submit, to the Project QAO and the Project Manager, a plan for implementing the corrective action to be taken on non-conformances indicated in the audit report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The auditor will ascertain (by re-audit or other means) if appropriate and timely corrective action has been implemented.

Records of audits will be maintained in the project files.

8.5 AUDIT DOCUMENTATION

A checklist will be completed during each audit so that the previously defined scope of the individual audits is accomplished and that the audits follow established procedures. The checklist will detail the activities to be executed as part of the auditing plan. Audit checklists will be prepared in advance and will be available for review. Following each system, performance, and data audit, the auditor or QAO will prepare a report to document the findings of the specific audit.

9.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Subcontractors providing analytical services should perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, the responsible individual for initiating the corrective action and also the individual responsible for approving the corrective action, if necessary, will be identified.

As part of its quality management system (QMS) program, AECOM provides relevant excerpts and conclusions from data validation reports to the analytical laboratories. The laboratories are therefore made aware of non-critical items and areas where improvement may be made in subsequent NYSDEC ASP work.

The objectives of the corrective action procedures presented below are to ensure that recognized errors in performance of sample and data acquisition lead to effective remedial measures and that those steps are documented to provide assurance that any data quality deficiencies are recognized in later interpretation and are not recurrent.

9.1 RATIONALE

Many times corrective measures are undertaken in a timely and effective fashion but go undocumented. In other cases, corrective actions are of a complex nature and may require scheduled interactions between departmental groups. In either case, documentation in a formal or informal sense can reinforce the effectiveness and duration of the corrective measures taken.

9.2 CORRECTIVE ACTION METHODS

9.2.1 Immediate Corrective Actions

Immediate corrective actions are of a minor or routine nature such as correcting malfunctioning equipment, correction of data transcription errors, and other such activities routinely made in the field, laboratory, or office by technicians, analysts, and other project staff.

9.2.2 Long-Term Corrective Actions

Long-term corrective action will be used to identify and eliminate causes of non-conformances which are of a complex nature and that are formally reported between management groups.

9.2.3 Corrective Action Steps

For long-term corrective actions, steps comprising closed-loop corrective action system are as follows:

- Define the problem;
- Assign responsibility for investigating the problem;
- Investigate and determine the cause of the problem;
- Determine a corrective action to eliminate the problem;

- Assign and accept responsibility for implementing the corrective action; and
- Verify that the corrective action has eliminated the problem.

Non-conformance events associated with analytical work are documented by the laboratories' Non-Conformance Records, which are reviewed and approved by the laboratory's Quality Assurance Manager.

9.2.4 Audit-Based Non-Conformances

Following audits, corrective action is initiated by documenting the audit finding and recommended corrective action on an Audit Finding Report.

9.3 CORRECTIVE ACTION REPORT REVIEW AND FILING

Immediate and long-term corrective actions require review to assure that, during the time of non-conformance, erroneous data were not generated or that, if possible, correct data were acquired instead. Such confirmation and review is the responsibility of the supervisor of the staff implementing the corrective action. Confirmation will be acknowledged by notation and dated signature on the affected data record or appropriate form or by memorandum to AECOM project management.

10.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Fundamental to the success of this QA/QC is the active participation of the Project Manager and the Project QA Officer. The Program QA Officer will be advised of project activities and will participate in development, review, and operation of the project. Project management will be informed of QA activities through the receipt, review, and/or approval of:

- Project-specific QA project plans;
- Corporate and project-specific QA/QC plans and procedures;
- Corrective action notices; and
- Non-conformance records.

Periodic assessment of field and laboratory QA/QC activities and data accuracy, precision, and completeness will be conducted and reported by the laboratory. Items to be included in the QA reports are the summary of results for the performance or the system audit and, where applicable:

- Assessment of adherence to work scope and schedule for the audited task;
- Assessment of the precision, accuracy, and completeness of sample batches and subsequent status of data processing and analyses;
- Significant QC problems and the status of any ongoing corrective actions;
- Changes to the SC/RIWP; and
- Status of implementation of the SC/RIWP.

Project status reporting will include aspects of quality control that were pertinent during the month’s activities. Problems revealed during review of the month’s activities will be documented and addressed. These reports will include a description of completed and on-going activities, and an indication how each task is progressing relative to the project schedule.

The project manager, through task managers, will be responsible for verifying that records and files related to the work assignment are stored appropriately and are retrievable.

The laboratory will submit any memoranda or correspondence related to quality control of this project's samples as part of its deliverables package.

11.0 REFERENCES

New York State Department of Environmental Conservation (NYSDEC), 2005. *Analytical Services Protocol (ASP) Manual*. July.

NYSDEC, 2008. *NYSDEC Modifications to EPA Region 9 TO-15 QA/QC Criteria provided in the July 2005 ASP*. February 2008.

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

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NYSDOH ELAP Web site. https://www.wadsworth.org/regulatory/elap/certified-labs

NYSDOH Center for Environmental Health Bureau of Environmental Exposure Investigation, 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. Final. October.

NYSDOH, 2007. Letter from Gary Litwin (Director) to Dale Desnoyers (NYSDEC DER) re: Soil Vapor/Indoor Air Matrices. (Adds additional chlorinated VOCs to the original matrices in the 2006 SVI guidance). June 25.

USEPA Region 2, Standard Operating Procedures for Data Review. Available at https://www.epa.gov/quality/region-2-quality-assurance-guidance-and-standard-operating-procedures.

USEPA Region 2, 1998. *Ground Water Sampling Procedure – Low Stress (Low Flow) Purging and Sampling*. Final. March 16.

USEPA, 1999. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Second Edition*. USEPA Center for Environmental Research Information. EPA/625/R-96/010b. January.

USEPA, 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third edition. EPA SW-846. With revisions and updates through July 12, 2018. Accessed on line at https://www.epa.gov/hw-sw846

USEPA, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. USEPA Office of Emergency and Remedial Response. OSWER Directive No. 355.3-01. October.

Tables

Table 1

Sample Bottle, Volume, Preservation, and Holding Time Summary
Tank 75 Site Quality Assurance Project Plan
Tonawanda, NY

MATRIX/ANALYSIS	Sample Prep Method [1]	Analytical Method [2]	Sample Bottles [3]				Minimum Vol Rqd	Preservation [4]	Holding Time [4,5]		Comment
			Mat'l	Size	Qty	Source			Extraction	Analysis	
Aqueous Samples											
Volatile Organics + TICs	SW 846 5030C	SW 846 8260C	Glass	40 mL	2 or 3	Lab	40 mL	HCl to pH ≤ 2	NA	14 days	7 days if not preserved.
Semivolatile Organics + TICs	SW 846 3510C/3520C/3535A	SW 846 8270D	Glass	250 mL	2	Lab	250 mL	None	7 days	40 days	
Pesticides	SW 846 3510C/3520C/3535A	SW 846 8081B	Glass	250 mL	2	Lab	250 mL	None	7 days	40 days	
PFAS Compounds	EPA Method 1633	EPA Method 1633	HDPE	500 mL	2	Lab	500 mL	None	14 days	28 days	
1,4-Dioxane	SW 846 3510C/3520C/3535A	SW846 8270D SIM	Glass	1 L	2	Lab	1,000 mL	None	7 days	40 days	
PCBs	SW 846 3510C/3520C/3535A	SW 846 8082A	Glass	250 mL	2	Lab	250 mL	None	365 days	40 days	
Metals (except mercury)	SW 846 3005A/3010A/3020A	SW 846 6010C	Plastic	250 mL	1	Lab	200 mL	HNO_3 to pH≤ 2	NA	180 days	180 days for TAL metals except Hg.
Mercury	SW 846 7470A	SW 846 7470A							NA	28 days	28 days for Hg.
Dissolved Metals (except mercury)	SW 846 3005A/3010A/3020A	SW 846 6010C	Plastic	250 mL	1	Lab	200 mL	HNO_3 to pH≤ 2 (after filtering)	NA	180 days	except Hg.
Dissolved Mercury	SW 846 7470A	SW 846 7470A							NA	28 days	28 days for Hg.
Cyanide	SW 846 9012B	SW 846 9012B	Plastic	250 mL	1	lab	60 mL	NaOH to pH >12	NA	12 days	
Non-Aqueous Samples											
Volatile Organics + TICs	SW 846 5035A	SW 846 8260C	Encore	5 or 25 g	3 or 1	Vendor [7]	5 g	None	NA	48 hours [8]	
Semivolatile Organics + TICs	SW 846 3550C	SW 846 8270D	Glass	8 oz [6]	1	Lab	30 g	None	14 days	40 days	
Pesticides	SW 846 3550C	SW 846 8081B	Glass			Lab	30 g	None	14 days	40 days	
PCBs	SW 846 3550C	SW 846 8082A	Glass			Lab	30 g	None	365 days	40 days	
Metals (except mercury)	SW 846 3050B/3051/3052	SW 846 6010C	Glass			Lab	10 g	None	NA	180 days	except Hg.
Mercury	SW 846 7471A	SW 846 7471B					2 g		NA	28 days	
PFAS Compounds	EPA Method 1633	EPA Method 1633	HDPE	4 oz	1	Lab	4 oz	None	14 days	28 days	
Cyanide	SW 846 9012B	SW 846 9012B	Glass	4 oz	1	Lab	20 g	None	NA	14 days	
TOC	Llyod Khan	Llyod Khan	Glass	4 oz	1	Lab	10 g	None	NA	14 days	
TCLP VOCs	SW1311	SW 846 8260C	Plastic/Glass	25g Encore/4 oz glass jar	3	Lab	25 g	None	14	14 days	
TCLP SVOCs	SW1311	SW 846 8270D	Glass	500 g or 4-8 oz jar	4	Lab	500 g	None		7/40 days	
TCLP Metals (except mercury)		SW 846 6010C								180 days	
TCLP Mercury		SW 846 7470A								28 days	
TCLP Pesticides		SW 846 8081B								7/40 days	
TCLP Herbicides		SW 846 8151A							14	7/40 days	
Corrosivity	NA	SW 846							NA	NA	
Ignitability	NA	40 CFR 261.21							NA	NA	
Flashpoint	NA	SW 846 1010A							NA	NA	
Reactivity	NA	SW 846 9012A/9034							NA	NA	
BTU	NA	ASTM240							NA	28	
GRO	NA	SW8015D Modified							NA	14	
DRO	NA	SW8015D Modified							14	40	
Paint Filter Test (free liquids)	NA	9095B							NA	NA	
pH	NA	SM-4500	Glass						NA	ASAP	

(1) Laboratory may propose alternate extraction/preparation methods, subject to AECOM approval.
(2) More recent versions of SW-846 methods may be used subject to AECOM approval.
(3) Bottles typical. EnCore samplers for VOCs in soil will be provided by laboratory or AECOM on a case-by-case basis.
(4) All samples for chemical analysis should be held at 4 degrees C in addition to any chemical preservation required.
(5) Holding time calculated from day of collection, unless noted as being from time of extraction. Laboratory holding times (ASP 2005, Exhibit I) are two days shorter to allow for field handling and shipping.
(6) A single 8-oz sample is sufficient for SVOCs, pesticides, PCBs, and metals.
(7) Encore samplers are typically purchased from an outside supplier by AECOM but may also be requested (for a fee) from the analytical laboratory.
(8) Encore samplers must be prepared/preserved in the laboratory within 48 hours of collection. Soil samples in glass bottles and preserved Encores have a 14 day (total) holding time.
SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IV, March 2009.
EPA = Compendium of Methods for the Determination of Toxic Organics in Air, Second Edition (EPA/625/R-96/010b; 1999).
TICs - Tentatively Identified Compounds

Table 2

Reporting Limits and QA/QC Sample Quantity Summary
Tank 75 Site Quality Assurance Project Plan
Tonawanda, NY

MATRIX/ANALYSIS	Analytical Method	Laboratory	Reporting Limit -Typical (units as specified)	Field Sample Quantity	Field Duplicate [2]	Matrix Spike (MS) or LCS [2]	MS Duplicate or Matrix Duplicate [2]	Equipment Blank [2]	Trip Blank	Total Analyses
Investigation Samples, Aqueous - Surface and Groundwater										
Volatile organics + TICs	SW 846 8260C	Eurofins	1.0 µg/L	12	2	2	2	2	3	23
Semivolatile organics + TICs	SW 846 8270D	Eurofins	10 - 20 µg/L	12	2	2	2	2	-	20
Pesticides	SW 846 8081B	Eurofins	0.05 - 0.5 µg/L	12	2	2	2	2	-	20
PFAS Compounds	EPA Method 1633	Eurofins	2.0 - 50.0 ng/L	5	2	2	2	2	-	13
1,4-Dioxane	SW846 8270D SIM	Eurofins	0.21 µg/L	5	2	2	2	2	1	14
PCBs	SW 846 8082A	Eurofins	33 µg/L	12	2	2	2	2	-	20
Metals (TAL except Hg)	SW 846 6010C	Eurofins	Analyte-specific	12	2	2	2	2	-	20
Mercury	SW 846 7470A	Eurofins	0.2 µg/L	12	2	2	2	2	-	20
Dissolved Metals (TAL except Hg)	SW 846 6010C	Eurofins	Analyte-specific	12	2	2	2	2	-	20
Dissolved Mercury	SW 846 7470A	Eurofins	0.2 µg/L	12	2	2	2	2	-	20
Cyanide	SW 846 9012B	Eurofins	10 ug/L	12	2	2	2	2		20
Investigation Samples, Soild - Soil/Sediment										
Volatile organics + TICs	SW 846 8260C	Eurofins	5 µg/kg [1]	44	5	3	3	3	-	58
Semivolatile organics + TICs	SW 846 8270D	Eurofins	330 µg/kg [1]	61	7	4	4	3	-	79
Pesticides	SW 846 8081B	Eurofins	1.7-3.3 µg/kg [1]	61	7	4	4	3	-	79
PFAS Compounds	EPA Method 1633	Eurofins	0.2-5.0 µg/kg	13	2	2	2	3	-	22
1,4-Dioxane	SW 846 8270D SIM	Eurofins	100 ug/kg	13	2	2	2	3	-	22
PCBs	SW 846 8082A	Eurofins	57 - 70 µg/kg [1]	61	7	4	4	3	-	79
Metals (TAL except Hg)	SW 846 6010C	Eurofins	Analyte-specific	61	7	4	4	3	-	79
Mercury	SW 846 7471B	Eurofins	0.2 µg/kg [1]	61	7	4	4	3	-	79
TOC (sediment only)	Lloyd Kahn	Eurofins	1000 mg/kg	15			1	-	-	16
Cyanide	SW 846 9012B	Eurofins	1 µg/kg	61	7	4	4	3	-	79
Waste Characterization Samples, Sediment										
TCLP VOCs	SW 846 8260C	Eurofins	1.0 µg/L	15	-	-	-	-	-	15
TCLP SVOCs	SW 846 8270D	Eurofins	10 - 20 µg/L	15	-	-	-	-	-	15
TCLP Metals (except mercury)	SW 846 6010C	Eurofins	Analyte-specific	15	-	-	-	-	-	15
TCLP Mercury	SW 846 7470A	Eurofins	0.2 µg/L	15	-	-	-	-	-	15
TCLP Pesticides	SW 846 8081B	Eurofins	0.05 - 0.5 µg/L	15	-	-	-	-	-	15
TCLP Herbicides	SW 846 8151A	Eurofins	0.05 - 0.5 µg/L	15	-	-	-	-	-	15
Corrosivity	SW 846	Eurofins	-	15	-	-	-	-	-	15
Ignitability	40 CFR 261.21	Eurofins	-	15	-	-	-	-	-	15
Flashpoint	SW 846 1010A	Eurofins	-	15	-	-	-	-	-	15
Reactivity	SW 846 9012A/9034	Eurofins	-	15	-	-	-	-	-	15
BTU	ASTM240	Eurofins	-	15	-	-	-	-	-	15
GRO	SW8015D Modified	Eurofins	Analyte-specific	15	-	-	-	-	-	15
DRO	SW8015D Modified	Eurofins	Analyte-specific	15	-	-	-	-	-	15
Paint Filter Test (free liquids)	9095B	Eurofins	pass/fail	15	-	-	-	-	-	15
pH	SM-4500	Eurofins	-	15	-	-	-	-	-	15

Notes

(1) Reporting limits for soils, when adjusted for dry weight, will be higher. Detections above the MDL but less than reporting limits will be reported and flagged estimated (J).

(2) Duplicates will be collected at a rate of 1 per 10 samples. Matrix Spike, and Matrix Spike Duplicate samples will be collected at a rate of 1 per 20 samples. Rinse Blanks will be taken on a basis of one per week per media.

TICs - Tentatively Identified Compounds
TAL = Target Analyte List (23 Metals)
µg/L - micrograms per liter
µg/kg - micrograms per kilogram
mg/kg - milligrams per kilogram

Table 3

PFAS Compound Reporting Limits By EPA Draft Method 1633
Tank 75 Site Quality Assurance Project Plan
Tonawanda, NY

Group	Analyte Description	Abbreviation	CAS Number	Groundndwater, Surface Water			Soil, Sediment		
				RL	MDL	Units	RL	MDL	Units
Perfluoroalkyl sulfonic acids	Perfluorobutanesulfonic acid	PFBS	375-73-5	2.00	0.300	ng/L	0.200	0.0500	µg/kg
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	Perfluorohexanesulfonic acid	PFHxS	355-46-4	2.00	0.570	ng/L	0.200	0.0500	µg/kg
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8	2.00	0.400	ng/L	0.200	0.0500	µg/kg
	Perfluorooctanesulfonic acid	PFOS	1763-23-1	2.00	0.500	ng/L	0.200	0.0510	µg/kg
	Perfluorononanesulfonic acid	PFNS	68259-12-1	2.00	0.400	ng/L	0.200	0.0500	µg/kg
	Perfluorodecanesulfonic acid	PFDS	335-77-3	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	Perfluorododecanesulfonic acid (PFDoS)	PFDoS	79780-39-5	2.00	0.900	ng/L	0.200	0.0500	µg/kg
Perfluoroalkyl carboxylic acids	Perfluorobutanoic acid	PFBA	375-22-4	8.00	2.00	ng/L	0.800	0.100	µg/kg
	Perfluoropentanoic acid	PFPeA	2706-90-3	4.00	1.00	ng/L	0.400	0.100	µg/kg
	Perfluorohexanoic acid	PFHxA	307-24-4	2.00	0.500	ng/L	0.200	0.0590	µg/kg
	Perfluoroheptanoic acid	PFHpA	375-85-9	2.00	0.520	ng/L	0.200	0.0500	µg/kg
	Perfluorooctanoic acid	PFOA	335-67-1	2.00	0.640	ng/L	0.200	0.0510	µg/kg
	Perfluorononanoic acid	PFNA	375-95-1	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	Perfluorodecanoic acid	PFDA	335-76-2	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	Perfluoroundecanoic acid	PFUnA	2058-94-8	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	Perfluorododecanoic acid	PFDoA	307-55-1	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	Perfluorotridecanoic acid	PFTrDA	72629-94-8	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	Perfluorotetradecanoic acid	PFTeDA	376-06-7	2.00	0.500	ng/L	0.200	0.0500	µg/kg
Per- and Polyfluoroether carboxylic acids	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6	8.00	2.00	ng/L	0.800	0.0510	µg/kg
	4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	ADONA	919005-14-4	8.00	1.50	ng/L	0.800	0.200	µg/kg
	Perfluoro-3-methoxypropanoic acid (PFMPA)	PFMPA	377-73-1	4.00	0.500	ng/L	0.400	0.100	µg/kg
	Perfluoro-4-methoxybutanoic acid (PFMBA)	PFMBA	863090-89-5	4.00	1.00	ng/L	0.400	0.100	µg/kg
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6	4.00	1.00	ng/L	0.400	0.104	µg/kg
Fluorotelomer sulfonic acids	1H,1H,2H,2H-perfluorohexanesulfonic acid (4:2)	4:2-FTS	757124-72-4	8.00	1.70	ng/L	0.800	0.200	µg/kg
	1H,1H,2H,2H-perfluorooctanesulfonic acid (6:2)	6:2-FTS	27619-97-2	8.00	2.50	ng/L	1.00	0.350	µg/kg
	1H,1H,2H,2H-perfluorodecanesulfonic acid (8:2)	8:2-FTS	39108-34-4	8.00	2.60	ng/L	1.00	0.350	µg/kg
Fluorotelomer carboxylic acids	3:3 Fluorotelomer carboxylic acid	3:3 FTCA	356-02-5	10.0	1.50	ng/L	1.00	0.250	µg/kg
	5:3 Fluorotelomer carboxylic acid	5:3 FTCA	914637-49-3	50.0	10.0	ng/L	5.00	1.000	µg/kg
	7:3 Fluorotelomer carboxylic acid	7:3 FTCA	812-70-4	50.0	10.0	ng/L	5.00	1.000	µg/kg
Perfluorooctane sulfonamides	Perfluorooctanesulfonamide	PFOSA	754-91-6	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	N-methylperfluorooctane sulfonamide	NMeFOSA	31506-32-8	2.00	0.500	ng/L	0.200	0.0500	µg/kg
	N-ethylperfluoro-1-octanesulfonamide	NEtFOSA	4151-50-2	2.00	0.500	ng/L	0.200	0.0500	µg/kg
Perfluorooctane sulfonamidoacetic acids	N-methylperfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9	4.00	1.20	ng/L	0.200	0.0500	µg/kg
	N-ethylperfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6	2.00	0.700	ng/L	0.200	0.0500	µg/kg
Perfluorooctane sulfonamide ethanols	2-(N-methylperfluoro-1-octanesulfonamido) ethanol	MeFOSE	24448-09-7	20.00	5.00	ng/L	2.00	0.500	µg/kg
	2-(N-ethylperfluoro-1-octanesulfonamido) ethanol	EtFOSE	1691-99-2	20.00	5.00	ng/L	2.00	0.500	µg/kg
Ether sulfonic acids	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid	9Cl-PF3ONS	756426-58-1	8.00	1.00	ng/L	0.800	0.200	µg/kg
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	11Cl-PF3OUdS	763051-92-9	8.00	2.00	ng/L	0.800	0.200	µg/kg
	Perfluoro (2-ethoxyethane) sulfonic acid	PFEESA	113507-82-7	4.00	0.500	ng/L	0.400	0.100	µg/kg

Notes:
RL = Reporting Limit
MDL = Method Detection Limit
ng/L = nanograms per liter
µg/kg = micrograms per kilogram

Attachment 1

ATTACHMENT 1

AECOM Electronic Data Deliverable Specification

Documentation of the structure and contents of the EDD is now provided directly by the EQuIS Data Processor (EDP). Click the **EDD Description** button in the **Tools** section of the **Home** ribbon section of EDP. The AECOM format file and EDP software (for data providers that do not have it already) are available from http://www.earthsoft.com/products/edp/edp-format-for-aecom/. The format will have to be "registered" when first launched in EDP.

Each EDD will comprise 4 files, to describe samples, tests, results, and batches. The format file has two different sections for samples, Field and Lab, only one of which can be included in the EDD. Which sample section to use will be communicated by the AECOM data manager at project setup.

Submittal

The EDD file can be in one of the following formats:

- ZIP archive of tab-delimited text files (.txt)
- spreadsheet (.xls or .xlsx)
- database (.mdb)

Regardless of the method of EDD Submittal, EDD Packages must be named using a specific naming convention.
EDD File Name:
<Unique ID>.<Facility Code>.AECOM.{zip | xls | xlsx | mdb}

ZIP archive text file EDD section names:
<Unique ID>.<EDD Section Name>.txt

XLS worksheet MDB table EDD section names:
<EDD Section Name>

Where:
<Unique ID> = A unique identifier which will be the Sample Delivery Group name unless other arrangements have been made.
<Facility Code> = The facility code for the facility to which this EDD will be loaded, will be communicated by the AECOM data manager at project setup.
<EDD Section Name> = The name of the section within the EDD (i.e. AECOMLabSMP or AECOMFSample, AECOMLabTST, AECOMLabRES, AECOMLabBCH) as it appears in EDP.
Between each of the name elements is a "." (period). It is very important that it is a period and not a "-" (dash), "_" (underscore), or any other character.

Resubmittal

EDD packages may be resubmitted. However, in order to resubmit corrected EDDs, the files must each be renamed, regardless of the reason(s) for resubmittal.
Example: A lab originally submits an EDD Package (.zip) file named "20100129.MySite.AECOM.zip" which contains EDDs named "20100129.AECOMFSample.txt," etc. If the lab later makes a change to one of the EDDs, it would have to submit a new EDD Package named "20100129R.MySite.AECOM.zip" with EDDs named "20100129R.AECOMFSample.txt," etc.

Reference Values

A Reference Values file should be delivered from the AECOM data manager to the data provider at project setup. No EDDs will be accepted that do not strictly adhere to the project-specific reference values. If new values need to be used, they must be identified and explained to the AECOM data manager who will provide approval or alternate codes to use before any EDD should be submitted.

For the NYSDEC projects, the reference values can be accessed at
http://www.earthsoft.com/products/edp/edp-format-for-nysdec/

APPENDIX G

Health and Safety Plan

Universal Health & Safety Plan (Revised 8/2022)

Ashland Tank 75

4625 River Road
Tonawanda, Erie County, NY
USA

Prepared For:

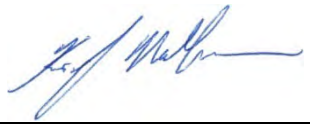
Client Name:	Ashland LLC
Client Address:	5200 Blazer Parkway Dublin, Ohio 43017
Project #:	60669081

Prepared By:

AECOM
One John James Audubon Pkwy, Site 210
Buffalo, New York 14228

Preparer:

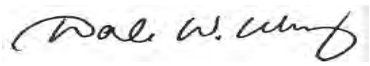
Name: Kevin J. McGovern, PG, CHMM, STS
Title: Sr. Environmental Scientist
Date Prepared: August 4, 2022



Signature

Reviewer *(Office SHER; Area/Regional SHEM, or Business Line SHEM)*

Name: Dale "Pete" Wray, CSP, CHMM, STS
Title: SH&E Manager, AME ENV U.S. East
Date Reviewed: August 5, 2022



Signature

Approver: *(Project Manager, Project Director, or BL Lead)*

Name: Colin Wasteneys
Title: Project Manager
Date Approved: August 4, 2022

Signature

Expiration:	**August 4, 2023**	Valid for one (1) year maximum or until the scope of work, subcontractor(s), methods and/or equipment change.

HASP Summary

Note: This Summary is intended to provide key information only and cannot be substituted for reading, understanding and complying with the full HASP, including the Emergency response section. This summary may be continually updated as tasks and personnel change. Use Continuation Sheets if necessary.

Client Name:	Ashland LLC
Site Name:	Ashland Tank 75
SH&E Incident Reporting	**SH&E Incident Hotline 1-800-348-5046** TOLL-FREE | 24 HOURS PER DAY | 7 DAYS PER WEEK Immediately report all incidents including any potential work-related injuries, illnesses, discomfort/pain, property damage, security issues, regulatory inspections and environmental impacts/spills.

Medical Treatment Resources

Identify the closest hospital to the site to be used in emergency situations. For non-emergency situations, identify the nearest Occupational Clinic to the site that accepts AECOM Workers Compensation Insurance (see **Attachment A** for instructions and to attach maps and directions).

AECOM Occupation Nurse:	**1-512-419-5016 |** *24 HOURS PER DAY | 7 DAYS PER WEEK*		
Nearest Occupational Clinic	WellNow Urgent Care		
Address:	1751 Sheridan Drive, Tonawanda, NY 14223		
Clinic Hours of Operation:	08:00 AM – 08:00 PM	**Phone Number:**	716-541-0234
Nearest Hospital:	Kenmore Mercy Hospital		
Address:	2950 Elmwood Avenue, Kenmore, NY 14217		
Hospital Hours of Operation:	Open 24 Hours	**Phone Number:**	716-447-6100

Key Personnel

Project Manager (PM):	Colin Wasteneys	**Contact No.:**	716-225-4396
Site Supervisor (SS):	John Boyd	**Contact No.:**	716-449-1717
Site Safety Officer (SSO):	John Boyd	**Contact No.:**	716-449-1717
Regional SH&E Manager	Tony Indorato	**Contact No.:**	757-298-1563
Area SH&E Manager:	Pete Wray	**Contact No.:**	302-660-9178
Client Contact:	Shannon Lloyd	**Contact No.:**	614-315-7401

Table of Contents

Attachments

1. Introduction

This written Health and Safety Plan (HASP) is designed to identify, evaluate, and control safety and health hazards, and to outline emergency response actions for AECOM-managed activities. This HASP must be kept on site during work activities and made available to all workers including subcontractors and other site occupants for informational purposes. AECOM subcontractors are expected to independently characterize, assess and control site hazards created by their specific scope of work.

This section of the HASP summarizes important AECOM SH&E Procedures that apply to all DCS Americas jobs. See **Attachment C** for the project Task Hazard Assessment (THA) forms and **Attachment D** for a list of applicable field SH&E Procedures. These field SH&E procedures must be readily available to the field employees (i.e., PDF, electronically, etc.).

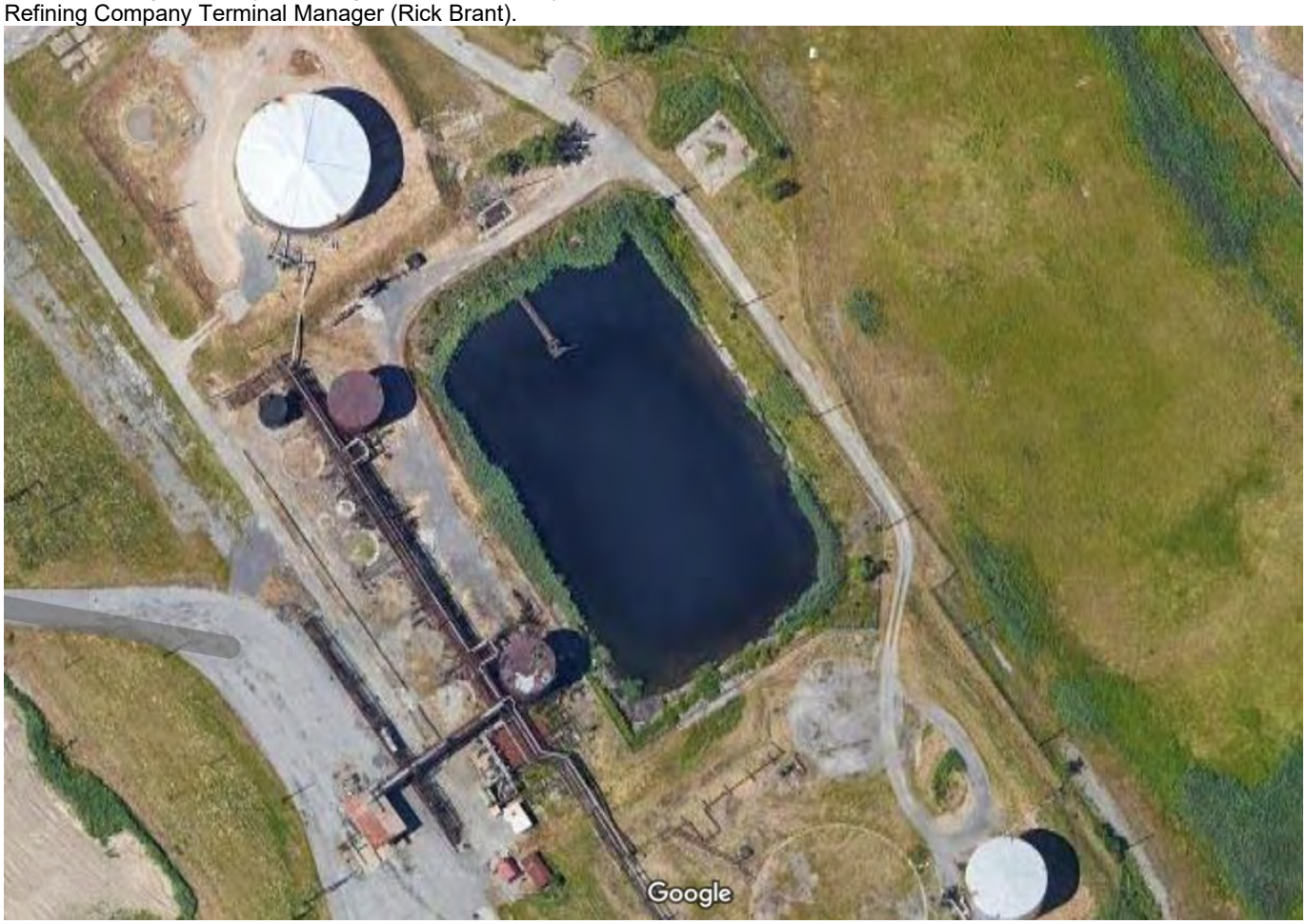
1.1 Applicable References

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Federal Occupational Safety and Health Administration (OSHA) Code of Federal Regulation Title 29, Part 1910 (29 CFR Part 1910), Safety and Health Regulations for General Industry and 29 CFR 1926, Safety and Health Regulations for Construction.
- Title 8 of the California Code of Regulations (8 CCR), with special attention to Section 5192 Hazardous Waste Operations and Emergency Response, and Section 3202, Injury Illness Prevention Program and to Sub Chapter 4, Sections 1500 - 1938 Construction Safety Orders.
- 29 CFR 1926, Safety and Health Regulations for Construction.
- 8 CCR, with special attention to Sub Chapter 4, Sections 1500 - 1938 Construction Safety Orders.
- ACGIH-0028, 2006 TLVs and BEIs - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- ACGIH-0376, Guide to Occupational Exposure Values - 2006.
- ACGIH-0460, Guidelines for the Selection of Chemical Protective Clothing, 3rd Edition.
- 29 CFR Part 1904, Recording and Reporting Occupational Injuries and Illnesses.
- 49 CFR Part 171, General Information, Regulations, and Definitions.
- 49 CFR Part 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
- NIOSH Pocket Guide to Chemical Hazards (https://www.cdc.gov/niosh/npg/).
- National Institute for Occupational Safety and Health/Occupational Safety and Hazards Administration/U.S. Coast Guard/U.S. Environmental Protection Agency, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Publication No. 85-115, 1985.
- The requirements in this HASP also conform to AECOM's Safety for Life Program requirements as specified in the AECOM Safety, Health and Environment (SH&E) Manual.

2. Site Description

The Site, Ashland Tank 75 , is located at 4625 River Road, Tonawanda, Erie County, NY, accessed by driving through an active United Refining Company oil storage/distribution facility. AECOM will coordinate site access and onsite activities with the United Refining Company Terminal Manager (Rick Brant).



2.1 Site Background/History

The Ashland Tank 75 Site is located at 4625 River Road in the Town of Tonawanda, Erie County, New York (the “Site”; Figure 1) and is listed on the New York State Registry of Inactive Hazardous Waste Disposal Sites as a Class 3 site (Site ID #915008B). This Site is approximately 1.25 acres in size and consists of a former in-ground product storage tank owned by Ashland Inc. The tank is located on an industrial property where Ashland formerly operated an oil refinery and major oil storage facility; the property is currently operated by United Refining Company as an oil storage/distribution facility. The property is bounded by Interstate I-190 to the south, The Seaway/Niagara Landfill to the north, River Road to the west, and vacant commercial property to the east. The Site must be accessed by entering the front gate of the United Refining Company Terminal at 4545 River Road.

Tank 75 was constructed in the early 1940's during World War II (WWII) for the storage of No. 6 fuel oil. Because steel was scarce during WWII, the tank was constructed as an open-top, in-ground gunite-lined product storage tank. The tank dimensions are approximately 200 feet wide by 300 feet long with side slopes of 1.5H:1V to a flat bottom approximately 26 feet below surrounding

grade. The gunite liner is approximately 3 to 4 inches thick and is reinforced with steel mesh. There are no construction or record drawings available for Tank 75. The tank is situated in a Glacial Lacustrine Clay typically logged as a clayey silt to silty clay soil deposit.

Ashland purchased the Tank 75 property in 1950. Tank 75 was taken out of service in 1980. The refinery itself discontinued production in July 1982. During the shutdown of the Ashland Refinery, hazardous wastes, including K-listed petroleum refinery industry wastes (K049 [slop oil emulsion solids], K050 [heat exchanger bundle cleaning sludge], and K052 [tank bottoms, leaded]), were placed in the tank. The sludge also meets the criteria for the RCRA ignitability characteristic (D001). Previous site investigations indicate that approximately 4,250,000 gallons of water, 500,000 gallons of a pumpable sludge, and 4,000 cubic yards of non-pumpable sludge are present in the tank. During the summers of 1992 and 1993, approximately 1,500,000 gallons of floating No. 6 fuel oil was removed and transferred to Ashland's Catlettsburg Kentucky refinery.

Six groundwater monitoring wells were installed at the site in 1986, and groundwater samples were collected annually from 1993 through 1998. Five of these wells (MW2S, MW2D, MW3, MW4S, and MW4D) are located in the immediate vicinity of Tank 75, and one well (MW5) is located in the southeast portion of the refinery property (Figure 2). In 2005, AECOM (as URS) installed four additional shallow monitoring wells (MW-05-01, MW-05-02, MW-05-03, and MW-05-04) in the immediate vicinity of Tank 75. AECOM conducted one round of groundwater sampling of the nine wells located in the immediate vicinity of Tank 75 in 2005. Historically (i.e., 1993 to 2005), the following parameters have been detected in groundwater at concentrations exceeding their respective New York State Department of Environmental Conservation (NYSDEC) groundwater standard; no other parameters have been detected at concentrations above their NYSDEC groundwater standard.

Analyte	NYSDEC Groundwater Standard (ug/L)	Maximum Concentration Detected in Groundwater Samples (ug/L)
Methylene Chloride	5	5.3
Phenol	1	39
Pentachlorophenol	1	130
Cadmium	5	65
Iron	300	15,000
Lead	25	66
Manganese	300	450
Sodium	20,000	120,000

The results from previous groundwater sampling in the vicinity of Tank 75 indicate that tank contents have not impacted surrounding groundwater quality, likely attributable to the clayey soil conditions in which the tank was built.

2.2 Client and/or Third-Party Operations at Site

The facility is currently used by United Refining Company as an oil storage/distribution facility. Access to the site and monitoring well locations must be coordinated with the United Refining Company Terminal Manager. Vehicle traffic near the River Road entry gate is the most significant hazard at the site; there is little to no traffic in the vicinity of Tank 75.

2.3 Scope of Work

This HASP covers the Site Characterization/ Remedial Investigation (SC/RI) activities at this site. The Scope of Work (SOW) for this SC/RI consists of direct push activities to collect soil samples (over water) and re-develop existing monitoring wells. Additional work scope elements also include requirements for surface soil sampling, groundwater sampling, transportation and off-site disposal of investigation-derived waste (IDW), geophysical utility clearance, and a site survey (including a gamma survey). The tasks involved in this SOW are as follows:

- Mobilization, brush clearing and utility location to support completion of SC/RI activities
- Complete a Site boundary survey confirming the special relationship between the Site and the surrounding parcels
- Complete a Gamma Walkover Survey and other radiological screenings for soil and sediment borings.
- Complete soil borings for Site characterization, including both geoprobe locations and shallow hand auger locations.
- Complete Redevelopment for 9 site wells around Tank 75.
- Collect water samples from multiple depths within the center of Tank 75 (Note* a boat will be needed for this).
- Collect sediment samples via vibracore for the SC/RI and for waste characterization and classification of sludges and sediments within Tank 75. (Note* a boat will be needed for this).
- Collect a round of water levels and groundwater samples from the existing site groundwater wells around the Tank.
- Perform Aquifer testing to evaluate Site hydraulic properties in the overburden.
- Properly manage and dispose of investigation derived waste.

A Task Hazard Assessment (THA) for each operation being performed by AECOM is included in **Attachment C**, while those performed by the managed subcontractors should be prepared by the subcontractor.

Task Name	Permit(s) Required		Primary Task Performed By		
			AECOM	SUB	Third-Party
Coronavirus Ground Travel THA	☐ Yes	☒ No	☒	☒	☐
Driving To and From the Site	☐ Yes	☒ No	☒	☒	☐
Groundwater Sampling – Low Flow	☐ Yes	☒ No	☐	☐	☐
Gauging Monitoring Wells	☐ Yes	☒ No	☐	☐	☐
Vegetative Brush and Debris clearing	☐ Yes	☒ No	☐	☒	☐
Direct-Push Soil Sampling	☐ Yes	☒ No	☐	☒	☐
Well Development	☐ Yes	☒ No	☒	☐	☐
Investigation Derived Waste Management	☐ Yes	☒ No	☒	☒	☐
Geophysical Survey/ Utility Location	☐ Yes	☒ No	☐	☒	☐
Gamma Walkover Survey/ Screening	☐ Yes	☒ No	☐	☒	☐
Land Survey	☐ Yes	☒ No	☐	☒	☐
Hand Augering	☐ Yes	☒ No	☐	☒	☐

2.4 Key Dates

Project Start Date:	May 2, 2022
Field Work Start Date:	May 2, 2022
Project Completion Date:	May 2, 2023

2.5 High Potential Hazard Activities

In general, the following tasks are considered High Potential (HiPo) Hazard Activities, as identified in S3AM-209-PR1, Risk Assessment, based on the factors contributing to the severity and probability of credible outcomes resulting from ineffective mitigation of their hazards. Additional tasks or activities could be added to the list below based on a similar assessment of their hazards and associated control measures. The following HiPo tasks will be required to complete the approved scope of work.

High potential hazard activities may require additional documents such as: permit to work, site specific plans, task/equipment-specific training, pre-use inspections, a competent person, etc. These requirements are listed under the high potential hazard activities as a reminder that you must implement them prior to performing the activity.

All procedures referenced in the table below MUST be included in **Attachment D** for implementation into this HASP.

☒	**Drilling, Boring and Direct Push Probing** Qualified/trained operators, pre-use inspection (S3AM-321-FM1) and THA required. Follow requirements in S3AM-321-PR1.
☒	**Hand/Power Tools – Working with Power Tools/Equipment (drill, chainsaw, grinder, power saw, pressure washer, etc.)** – Qualified/trained operators, pre-use inspections (see inspection checklists in S3AM-305-FM2) and THA required. Follow the requirements in S3AM-305-PR1.
☒	**Hazardous Materials Communication** – Written hazardous materials communication program, chemical inventory list and SDSs required for all chemicals on site. Follow the requirements in S3AM-115-PR1.
☒	**Hazardous Waste Operations – Working with Hazardous Substances or Materials (including all HAZWOPER projects)** – Completion of this site-specific HASP required. Follow the requirements in S3AM-117-PR1.
☒	**Heavy Equipment – Working with/Operating or Working near Heavy Equipment, Mobile Equipment or Drill Rigs** – Qualified/trained operators, competent person, pre-use operations inspections (S3AM-309-FM02) and THA required. Follow the requirements in S3AM-309-PR1.
☒	**Radiation – Work near Ionizing and Non-ionizing Radiation** Permit to work for ionizing radiation (S3AM-218-PR1), competent person and THA required. Follow the requirements in S3AM-120-PR1 and S3AM-121-PR1.
☒	**Working On and Near Water** – Qualified/trained personnel, personal flotation devices (S3AM-315-ATT1) and THA required. Follow the requirements in S3AM-315-PR1.

2.6 Physical and Biological Hazards

Physical and biological hazards are hazards that threaten the physical safety of an individual; contact with the hazard typically results in an incident or injury. The following table summarizes the physical and biological hazards present at the site and the associated procedures that address protection and prevention of harm.

If a there is a potential of physical or biological hazard when performing a specific task, it must be addressed in the THA.

All checked procedures MUST be included in **Attachment D** for implementation and reference. The following hazards and their site-specific description are anticipated based on the scope of work and project site:

	Hazard/ Activity (Note: Text in this column links to procedure)	Site Specific Description (Where, What Phase of Work, Frequency, Etc.)	Applicable Procedure
☒	**Bloodborne Pathogens**	First Aid Providers	S3AM-111-PR1
☒	**Cold Stress** (Continuous exposure when ambient air temperature is below 32°F (0°C) **or** when ambient air temperature is below 50°F (10°C) with wet/damp conditions.)	Working/sampling in cold weather	S3AM-112-PR1
☒	**Compressed Gases**	Isobutylene calibration gas for PID	S3AM-114-PR1
☒	**Corrosive Reactive Materials**	Preservatives in sample bottles	S3AM-125-PR1
☒	**Driving Safety**	Driving to and from site	S3AM-005-PR1
☒	**Flammable and Combustible Liquids**	Fuel for portable generator	S3AM-126-PR1
☒	**Gauge Source Radiation**	Gamma Survey	S3AM-122-PR1
☒	**Generator Use**	Portable generator use	S3AM-302-ATT2
☒	**Hand Safety**	Hand tools for water sampling; bolt cutters to cut fence to create access to wells MW3 & MW05-04	S3AM-317-PR1
☒	**Heat Stress** (Continuous exposure when ambient air temperature is above 80°F (26.6°C) and a standard work uniform is worn **or** when ambient air temperature is above 70°F (21.1°C) and impermeable chemical protective clothing is worn.)	Working in sunny, hot and or humid weather	S3AM-113-PR1
☒	**Hazardous Waste Operations**	Groundwater on site have low-level contamination	S3AM-117-PR1
☒	**Machine Guarding Safe Work Practice**	Skid steer use during vegetation brush clearing	S3AM-326-PR1
☒	**Marine Safety and Vessel Operations**	Use of boat/barge for sampling over water	S3AM-333-PR1
☒	**Noise** (Competent Person required)	Loud noise from brush clearing powered tools/machinery	S3AM-118-PR1
☒	**Non-Ionizing Radiation**	Frequent exposure to sunlight during daylight hours	S3AM-121-PR1
☒	**Pandemic Virus**	Potential exposure during travel and field task(s)	SR1-003-PR2
☒	**Slips, Trips, Falls**	Working near Tank 75	S3AM-013-PR1
☒	**Underground Utilities**	Soil borings.	S3AM-331-PR1
☒	**Wildlife, Plants and Insects**	Potential tick exposure in overgrown areas	S3AM-313-PR1

2.6.1 COVID-19 Pandemic

COVID-19 is a disease that results from infection of the virus identified as SARS-CoV-2. SARS-CoV-2 is a Coronavirus, one of a large family of viruses found in both animals and humans, and one which has caused significant loss of life in the past year. As of early 2021, infection rates remain high, though several vaccines are now available and vaccination efforts are ongoing.

Key AECOM resources can be found at the AECOM Ecosystem Coronavirus Information Centre on the Ecosystem homepage or at this link, the Coronavirus Smart Card, and the AECOM Pandemic Procedure: SR1-003-PR2. Additional resources can be found at the following non-AECOM websites:

- Centre for Disease Control and Prevention (CDC).
- World Health Organization (WHO).

As of August 2021, AECOM's policies require a face covering for unvaccinated individuals unless they can maintain a social distance of 6 feet at all times. Unvaccinated individuals may forgo masks. However, many clients, cities, counties, regions, and states have stricter requirements. AECOM defaults to stricter requirements wherever mandates are in effect.

2.7 Hazards/ Constituents of Concern

Based on information obtained from historical investigations and other sources, the chemicals in the table below are known or suspected to be present at the site.

Summary of Hazardous Properties of Contaminant Exposure Hazards

***Notes: PEL** = Permissible Exposure Limit | **TLV** = Threshold Limit Value | **IP** = Ionization Potential | **eV** = Electron Volt*

Chemical Name	Media	Primary Routes of Exposure	PEL	TLV	IP (eV)
Metals					
Cadmium	☐ Soil ☒ Groundwater ☐ Vapor ☐ Other OR N/A	Dermal	0.005 mg/m^3	0.01 mg/m^3	n/a
Lead	☐ Soil ☒ Groundwater ☐ Vapor ☐ Other OR N/A	Dermal	0.05 mg/m^3	0.05 mg/m^3	n/a
Manganese	☐ Soil ☒ Groundwater ☐ Vapor ☐ Other OR N/A	Dermal	5 mg/m^3	0.2 mg/m^3	n/a
Iron	☐ Soil ☒ Groundwater ☐ Vapor ☐ Other OR N/A	Dermal	0.05 mg/m^3	0.05 mg/m^3	n/a
Sodium	☐ Soil ☒ Groundwater ☐ Vapor ☐ Other OR N/A	Dermal	15 mg/m^3	10 mg/m^3	n/a
Other Common Site COCs					
Phenol	☐ Soil ☒ Groundwater ☒ Vapor ☐ Other OR N/A	Inhalation, Dermal	5 ppm	5 ppm	8.5
Methylene Chloride	☐ Soil ☒ Groundwater ☒ Vapor ☐ Other OR N/A	Inhalation, Dermal	25 ppm	50 ppm	11.32
Pentachlorophenol	☐ Soil ☒ Groundwater ☒ Vapor ☐ Other OR N/A	Dermal	0.5 mg/m^3	0.5 mg/m^3	n/a

Notes: 1. Exposure limits based on DDT.
2. Exposure limits based on Chlordane. No PELs are set for alpha or gamma chlordane.

2.8 Decontamination

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities. Decontamination steps are outlined in the Hazardous Waste Operations procedure S3AM-117-PR1.

- All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to exiting to clean areas of the site.
- Avoid reactions between the solutions and contaminated materials. Review the applicable SDS.

- All contaminated PPE and decontamination materials shall be contained, stored and disposed of in accordance with site-specific requirements determined by site management.
- Use caution while working around decontamination stations, including the decontamination pad, which may be a slip or trip hazard.
- Use disposable equipment when possible and practical.
- All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors.
- All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ).

Decontamination Procedures & Equipment	
Procedure	**Equipment Needed**
Disposable sampling equipment (i.e., tubing, foot valves) and PPE – containerize for disposal	Trash bags
Non-disposable sampling equipment and PPE – decontaminate with Alconox and water (if necessary)	Alconox solution; potable water; deionized water; spray bottles; 5-gallon buckets; brushes; plastic sheeting

Waste Handling for Decontamination	
Waste Streams/Products	**Disposal Procedures**
Investigation derived wastes (IDW) (e.g., purge water, decon fluids; disposable sampling equipment, PPE)	Purge water from groundwater monitoring well development and sampling activities and any decontamination fluids will be contained in DOT-approved 55-gallon metal drums, which will be properly labelled and staged onsite on pallets pending characterization and proper disposal. Because of the low concentrations of contaminants in groundwater, it is assumed that disposable sampling equipment/PPE will be non-hazardous and will be disposed at a non-hazardous landfill or recycling facility.

Equipment Decontamination Procedures		
Type Equipment	**Decontamination Solution**	**Procedure**
Non-disposable sampling equipment and PPE	Alconox solution; potable water rinse; deionized water rinse	Wash with an Alconox solution; rinse with potable water to remove all traces of detergent; final rinse with deionized water; containerize decon fluids for disposal

2.9 Air Monitoring

2.9.1 Real Time Exposure Measurements/Equipment

Monitoring shall be performed within the work area on site to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in the work permit and THA as work is performed. All instrumentation needs to be rated intrinsically safe to prevent fire or explosion.

Instrument		Manufacturer/Model	Substances Detected
☒	**Photo Ionization Detector (PID)**	■ RAE Systems mini-RAE 3000 (minimum 11.7 eV bulb)	■ Petroleum hydrocarbons ■ Phenol ■ Methylene Chloride

2.9.2 Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. In general, readings are considered actionable if sustained readings are observed for 5 minutes or more or if intermittent peaks are seen in excess of 1 time the action level. A reading in excess of action level outlined below will require additional ventilation (natural or mechanical) for 30 minutes, followed by re-monitoring.

Monitoring Procedures and Action Levels

	Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity
☒	**Volatile Organic Compounds (VOCs) and Volatile Hydrocarbons** (total by PID)	Breathing zone, continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	< 5 ppm	■ Continue monitoring, may continue work in required PPE
			5- 25 ppm (sustained for 5 minutes)	■ **STOP WORK** and notify PM. Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). Work activities shall only continue once levels have decreased to or below 5 units above background. If levels continue above 5 units, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with Project Manager approval. Don Level C PPE (organic vapor respirator cartridges), continue monitoring, and initiate continuous air monitoring for benzene.
			> 25 ppm (sustained for 5 minutes)	■ Cease work, exit, and contact the Site Safety Officer, Site Supervisor, and Project Manager.

3. Personnel Responsible for Safety

Enter the personnel responsible for safety:

Role	Person Assigned to Role (Required)	Contact No. Primary (Required)	Contact No. Alt (Recommended)
AECOM Project Manager:	Colin Wasteneys	716-225-4396	716-923-1164
AECOM Site Supervisor:	John Boyd	716-449-1717	NA
AECOM Site Safety Officer:	John Boyd	716-449-1717	NA
AECOM SH&E Manager:	Pete Wray	302-660-9178	302-318-2880

4. Subcontractor Management

4.1 Subcontractor Pre-Qualification

Ensure all subcontractors including lower tier subcontractors are prequalified to perform work for AECOM. SubPort is the preferred method for pre-qualifying subcontractors. If a subcontractor is conditionally approved, ensure the subcontractor meets all conditions of approval.

If a subcontractor requires a variance, complete the Subcontractor Variance form, S3AM-213-FM2.

Complete the table below, identifying all AECOM-Controlled subcontractors working in the field (any contractor paid directly by AECOM or otherwise under our responsibility is considered AECOM—Controlled, even if we do not directly control their day-to-day operations or supervise their work).

Subcontractor 1:	Ontario Specialty Contracting Inc (Provide exact Subcontractor name as listed in Subport)	
Scope of Work:	**High-Risk Tasks performed?**	**Contractor Site Safety Officer & Contacts:**
Describe Contractor's Scope of Field Work	See SWP Cover Sheet for List of High-Risk Tasks	Provide Name and Cell Phone
Clearing of Vegetative Brush and Debris	☐ Yes (List) Click here to list ☒ No	Dan Flanigan 716-560-3006

Required Subcontractor Documents: PM must verify that the following documents are in-place for each subcontractor; check to verify.		
☐ Copy of their Project/Site-specific health and safety plan	☒ Copy of task specific THAs/JHAs and inspection/tailgate forms	☒ Copy of the signed contract
☐ Copy of their business license and training certificates (task specific)	☒ Copy of their Corporate Safety Management Manual	☐ Other Click here to Describe OR type N/A

Subport Review: ☐ Approved – Skip to next Subcontractor
☒ Conditionally Approved - Identify conditions and controls below.

Check 'common subport conditions' that apply, add additional conditions, and describe how the conditions will be met

Subport Conditions (check or add any that apply)	**How will the condition be met?**
☒ AECOM Safety Plan must cover Subcontractor's work, and Subcontractor must provide a THA for their tasks	Subcontractor to prepare THAs for each task being performed.
☐ PM must verify that Subcontractor adheres to AECOM safety plan	N/A
☐ Subcontractor variance is required - the form can be found at this link: https://myecosystem.aecom.com/ppf/forms/Forms/S3NA_213_FM2_Subcontractor%20Variance%20Form.docx	N/A
☐ Supervision required	N/A
☐ Special Conditions apply (related to Demolition, Diving, Underbridge Inspection Unit work, and Rope Access Work	N/A
☒ Other conditions apply (Identify)	Subcontractor must use their own site-specific quality plan. This is not applicable for this scope of work.

The subcontractors for the remaining tasks (i.e., site survey, gamma survey, geoprobe operator, etc.) have yet to be selected. However, any potential subcontractor will be approved/conditionally approved on SubPort prior to entering the Site.

5. Training and Documentation

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure S3AM-003-PR1 establishes the general training requirements for AECOM employees.

5.1 Site-Specific Training Requirements

Check all required training on the table below. Verify training records of employees and subcontractors.

Site Specific Training Requirements

	Training	Applies to
☒	**ERP/HASP and Site Orientation**	All Employees and Subcontractors
☒	**Vehicle/Driver Safety & Defensive Driving**	All Employees who drive on behalf of AECOM
☒	**Field Safety**	Employees visiting the field that does not require HAZWOPER
☒	**Speak Up/Listen Up (SULU)**	All AECOM field employees and supervisors
☒	**First Aid / CPR**	Designated employees or employees performing high risk activities and medical attention is more than 4 minutes away
☒	**HAZWOPER 40-Hour and 8-Hr. Annual Refresher**	On HAZWOPER sites, in EZ, exposed to hazardous contamination
☒	**HAZWOPER Supervisor**	Employees managing others in HAZWOPER activities or at HAZWOPER Sites
☒	**Annual Medical Surveillance/Clearance**	Employees working in an exclusion zone and the regulatory required exposure limit **is** exceeded for 30 or more days a year

6. Site Control

6.1 Site Work Zones

Site layout and site control need to be coordinated to achieve a productive work environment and efficient work process while minimizing exposure of employees and the public to hazards associated with the work. Consider the following items when planning the site layout and controls. Check the description of the site controls **already** in place:

- ☒ Work area is within a facility/property with secure and restricted access provided by client or third party
- ☐ Work area is enclosed within a facility/property, but access is not restricted via locks, guards, or gates
- ☐ Work area is on a property that is open, but access by the public is unlikely
- ☐ Work area is on a property that is open and access by the public is likely
- ☐ Work area is in a roadway or right of way of a roadway (Traffic Control/Protection Plan required S3AM-306-PR1)
- ☐ Work area is in a parking lot or driveway
- ☐ Work area is on or near railroad, including right of way, active lines and crossings
- ☐ Other: N/A

Consider the following items when planning the site layout and controls:

- "Line of Fire" hazards- overhead utilities, falling/ tipping equipment, release of energy/ pressure, flying debris
- Noise, dust, odor suppression
- Contamination containment and decontamination area layout
- Traffic control for site vehicles/ equipment (public traffic control requires Traffic Control Plan)
- Restricted access for areas requiring special training, skills, or certifications
- Restriction of work near railroads
- Presence or creation of excavations
- Loading/unloading areas
- Portable restrooms
- Dumpsters and bins
- Equipment lay down
- Heavy equipment parking
- Overnight safety and security needs

Check and describe the site controls that need to be added to protect the public and the AECOM work team.

Control Item	Description of Type and Application
☒ **N/A**	Site is secured. No further site controls needed.

6.2 Simultaneous Operations

Simultaneous and neighboring operations, including activities performed by the general public, our clients, and other workers or contractors working near our employees, often present a need for added co-ordination and communication to address hazards that are presented by multiple operations.

Simultaneous Operations – Within the Site

☐ Yes, see table below for details
☒ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)	
				☐ Yes	☐ No
				☐ Yes	☐ No
				☐ Yes	☐ No

Simultaneous Operations – Neighboring Sites

☐ Yes, see table below for details
☒ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)	
				☐ Yes	☐ No
				☐ Yes	☐ No
				☐ Yes	☐ No

6.3 Site Control Maps/Diagrams

6.4 Lone Worker

AECOM discourages employees from working alone (i.e., where AECOM personnel are out of visual and audio range of others) when performing field tasks (see Working Alone SHE Procedure S3AM-314-PR). If lone work is to be performed, a communications/check-in plan must be developed and implemented using the table below.

Lone Worker:	**No lone worker will be permitted during this phase of work.**

7. Emergency Contact Information

For more information on emergency management, see the Emergency Contact Information in this HASP Summary.

7.1 Emergency Management

7.1.1 Emergency Response Plan

A Project Emergency Response Plan must be developed by the AECOM Project Manager for its staff as per the project location like remote areas, industrial areas, city areas, etc. This plan and any alterations to this plan will be communicated to all AECOM project staff, subcontractors and visitors. Depending on the duration of the project, AECOM shall perform mock drills accordingly.

Subcontractors will provide their own Project Emergency Plan to AECOM for review and acceptance. Any alterations to this plan must be communicated to all parties. Both AECOM and the subcontractor shall perform mock drills periodically in accordance with the length of the project.

Refer to the **AECOM Project Emergency Response Plan (Attachment I)**. For additional information on Emergency Response Planning, please review the Emergency Response Planning procedure, S3AM-010-PR1.

7.1.2 Emergency Planning

AECOM requires that all projects, plan for reasonably foreseeable emergencies. Prior to the start of site mobilization, all AECOM personnel shall review the site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures.

8. Personal Protective Equipment

The use of Personal Protective Equipment (PPE) forms the final barrier of protection between the employee and the hazard and applies to all employees at the work site, including Subcontractors, visitors and client or customer representatives. For additional information on PPE, please review the Personal Protective Equipment, S3AM-208-PR1.

The minimum PPE required on an AECOM project is as follows: hard hat, safety toe boots, high visibility vest, safety glasses, long pants and shirts with sleeves that cover the shoulders. If any materials are to be handled, then gloves shall be worn as well.

Specific PPE shall also be specified in Task Hazard Analyses (THAs) such as glove type (i.e., material, level of protection, etc.). Where possible, hazards will be eliminated or controlled to reduce the risk associated with a specific task.

These controls include:

- Elimination of the hazard
- Isolation of the hazard
- Engineering Controls
- Administrative Controls

With the exception of prescription safety eyewear and safety toed boots (there may be allowances for the purchase of these items), AECOM will make available all required PPE for its employees. All employees will receive training in the use, care, maintenance and storage of the PPE issued to them.

All personal protective equipment will meet the requirements of local, state, federal, client and AECOM SH&E regulations and procedures. Where site-specific PPE requirements exist, all AECOM employees, Subcontractors and visitors, who work on the Project, will follow those requirements.

PPE will **not** be modified or changed.

All PPE that is damaged or in need of service or repair will be removed from service immediately.

All PPE that has been removed from service will be tagged “OUT OF SERVICE” and will not be returned until repaired and inspected by a qualified person. Defective PPE must be removed from site to prevent it from being used.

8.1 SH&E Technology

At AECOM, we encourage the use of new technology to eliminate or reduce the risk our employees are exposed to. Mark the technology you will be using in this project (if any):

- ☐ **Wearable Technology/Smart PPEs** (e.g., clothes, helmets, glasses, harness)
- ☐ **Ergonomics Technology** (e.g., tracking or managing ergonomics data, use of technology to make a task safer ergonomically)
- ☐ **Site Sensors** (e.g., Movement, angle, noise, carbon monoxide, Dust)
- ☐ **Fatigue Monitoring**
- ☐ **Vehicle related Technology** (e.g., Telematics, Driver Training, backing cameras/sensors, collision avoidance)
- ☐ **Phone/Tablet Applications** or software: N/A

- ☐ **Connected Worksites** (i.e., connection between employees or project elements to be successful)
- ☐ **Drones**
- ☐ **Virtual Reality (VR) or Augmented Reality (AR)**
- ☐ **GPS** – Location devices: N/A
- ☐ **Radio Frequency Identification** (RFID)
- ☐ **Autonomous Equipment**
- ☐ **Other:** N/A
- ☑ **None of these:** We will not use any technology in this project to reduce hazards

Find available tools and/or share the tools you will be using in the AECOM Technology Toolbox or let us know what would be interesting to assess by **clicking here**.

9. Safety, Health and Environment Program

9.1 AECOM SH&E Policy

AECOM's Safety, Health and Environment Policy, which establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance in the interest of benefitting AECOM's employees and stakeholder in the global marketplace, is available on AECOM's Ecosystem (intranet).

9.2 Safety for Life

"Safety for Life" is a comprehensive integrated AECOM Safety Management System that drives our employees toward AECOM's commitment to achieving zero work-related injuries and/or illnesses; preventing damage to property and the environment; and maintaining an environmentally friendly and sustainable workplace. Our Safety for Life program is supported by nine Life Preserving Principles that apply to all AECOM activities.

9.3 Life Preserving Principles

AECOM has adopted these "Life-Preserving Principles" to help demonstrate the commitment of our Safety for Life program. We firmly believe these "Life-Preserving Principles" will enable AECOM to achieve its goal of zero employee injuries, property damage and an environmentally friendly and sustainable workplace. The nine Life-Preserving Principles, along with their descriptions, can be found on AECOM's Ecosystem (intranet).

Commitment:
Managers will lead on safety, continuously demonstrating commitment to the highest standards.

Participation:
All employees are encouraged to engage in helping to control the risks we face.

Budgeting and Staffing for Safety:
The costs of managing SH&E are budgeted into every project. Our safety staff are fully trained to provide expert guidance.

Pre-planning:
We assess risks and produce detailed plans to control them during design, planning, and execution of work.

Contractor Management:
We carefully select and collaborate with all our partners to create a safe working environment.

Recognition and Rewards:
Employees are rewarded for safety excellence and we share best practices.

Orientation and Training:
Our employees will be provided with effective safety training in order to identify and mitigate hazards in the workplace to prevent injuries to themselves and others who may be affected by their actions.

Incident Investigation:
We investigate recordable incidents and serious near misses to understand the causes and take action to prevent recurrence.

Fit for Duty:
All staff come to work each day fit and well, so they do not pose a hazard to themselves or others.

9.4 Fitness for Duty

One of AECOM's nine Life-Preserving Principles is Fitness for Duty (see Fitness for Duty procedure (S3AM-008-PR1). Fitness for Duty means that individuals are in a state (physical, mental, and emotional) that enables them to perform assignments competently and in a manner that does not threaten the health and safety of themselves or others. On certain projects or for specific tasks, fit for duty certifications may be requested of medical providers by SH&E Managers or Human Resources (HR). Employees should ensure they are fit for duty prior to leaving home and unimpaired by substances or fatigue, and if necessary,

contact your supervisor rather than attempting to report to work in unfit condition. Supervisors must observe their employees and work with the employee, SH&E staff, and HR to address deficiencies. AECOM will **NOT** tolerate retaliation against any employee for filing a complaint or concern regarding their fitness for duty or participating in any way in an investigation.

9.5 Proactive Health

AECOM is committed to promoting proactive health activities in addition to the planning for prevention of safety and environmental incidents. Proactive health activities will be completed on an on-going basis at AECOM on a corporate-wide basis (i.e., the wellness program associated with employee benefits), at offices, and at this project site. Management will be actively involved in providing and encouraging opportunities for health and wellness education and improvement. Health initiatives and education will be discussed periodically during office-based meetings as the safety moment or during the daily tailgate meeting as a toolbox talk. Topics may be related to, but are not limited to, the following:

- ✓ Heart health
- ✓ Stress management
- ✓ Smoking cessation
- ✓ Diabetes prevention
- ✓ Diet
- ✓ Exercise benefits

Topics and educational materials can be located on the AECOM Wellness page, National Institutes of Health website, Centers for Disease Control and Prevention website, and other reputable sources online.

In addition, the field team will be encouraged to participate in a daily stretch and flex routine (a standardized way to avoid soft tissue damage from work activities) to the best of their abilities, given their own personal limits. It is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The Stretch and Flex manual and poster (**Attachment E**) serve as guidance for the leader to follow.

9.6 Fatigue

One aspect of fit for duty is fatigue management. AECOM has developed procedures that limit work periods or requires additional rest under certain circumstances, including during long-distance travel or when working at high altitudes. These procedures also set limits on extended work periods of 14 hours per day or 60 hours per week. A fatigue management plan is required if longer working hours are necessary (see Fatigue Management Procedure S3AM-009-PR1).

9.7 Driving and Vehicle Safety

The proper operation of vehicles is critical to protecting the safety of AECOM employees and subcontractors. Drivers face numerous hazards while operating vehicles. Some of the hazards include collision with another vehicle, collision with a fixed object, vehicle break down or failure, or falling asleep or becoming otherwise incapacitated while driving. All employees will adhere to Driving procedure S3AM-005-PR, which includes the following key practices:

1. **Authorized Drivers**
   Managers must authorize drivers following evaluation of driver criteria to drive and maintain an AECOM-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting AECOM business.

2. **Electronic Devices Prohibited**
   AECOM prohibits use of all portable electronic devices while operating a motor vehicle/ equipment, which includes being stopped at a traffic light or stop sign. Electronic devices include, but are not limited to, all mobile phones, two-way radios, pagers, iPods, MP3s, GPS, DVD players, tablets laptops, and other portable electronic devices that can cause driver distraction. Hands-free device use is **NOT** allowed.

   - GPS units and devices used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Electronic devices shall be setup for operation prior to commencing driving activities and shall NOT be changed by the driver while driving.

3. **Vehicle Inspections**
   The driver shall conduct pre-trip vehicle inspections prior to each trip. A vehicle inspection checklist, S3AM-005-FM2, can be used to guide and document the inspection process. Vehicle inspection is to include a 360-degree walk around and visual inspection under the vehicle for leaks and obstructions prior to moving the vehicle.

4. **Training**
   All drivers shall complete defensive driver training. Additional training (i.e., hands-on defensive driver training) may apply for medium and high-risk drivers; see Driving procedure S3AM-005-PR and SHE Training procedure S3AM-003-PR for more details.

5. **Journey Management Plan**
   Drivers who undertake trips in excess of 250 miles (400 kilometers) one way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan using S3AM-005-FM1 or equivalent.

6. **Secure Loads**
   Cargo is only to be carried within the passenger compartment of a vehicle when segregated and restrained to prevent objects from becoming distractions, obstructions, or projectiles to occupants should emergency vehicle maneuvers be required (e.g., harsh braking or crash). All goods transported on flatbed trucks or in pickup beds must be securely fastened to prevent them from becoming hazards. All applicable laws and regulations regarding securing of loads must be met. It is prudent to check the load after a few miles to ensure that load has not shifted or loosened prior to completing the remainder of the trip.

9.8 Fatigue and Driving Safety

The effect of fatigue is both physiological and psychological and can severely impair a driver's judgement. Fatigue can cause lapses in concentration which could prove fatal. Fatigue is not just a problem for drivers on long trips, as drivers can also suffer from fatigue on short trips.

- ✓ After strenuous fieldwork, consider overnight accommodation or vehicle sharing for staff who are not acclimatized to the type of work.
- ✓ Microsleep can occur with a limited warning, and may be linked to several factors, for example:
  - Microsleep is most likely to occur during times when the circadian rhythm dictates the body should be asleep, such as at dawn, late at night, or in the mid-afternoon (e.g., 1 and 4 am and 1 and 4 pm.).
  - Potential to feel drowsy after a meal.
  - Driving long distances (considered potentially monotonous) even with sufficient sleep.
  - Prolonged sitting and warm ambient temperature may also increase the feeling of sleepiness.
- ✓ If safe to do so, consider undertaking actions to disrupt the microsleep event while identifying a safe place to stop, e.g., open a vehicle window, listen to upbeat music/change music source or ask the passenger (if present) to engage in conversation.
- ✓ Ensure field staff are familiar with the signs of fatigue and mitigation factors.

The most common visible signs of microsleep include the following:

- Eyelid drooping
- Eyelid closure
- Head nodding
- Brief periods of snoring
- Wandering thoughts

If any of the above become apparent, immediately pull over to a safe location and contact your PM or SH&E representative.

9.9 Hand Safety

The hands are exposed to hazards more than any body part. SH&E Hand Safety Procedure S3AM-317-PR describes requirements and best practices including these notable practices:

- **All personnel shall have gloves in their immediate possession 100%** of the time when in a shop or on a work site. Gloves that address the hazard shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc. Use the Gloves Needs Assessment (S3AM-317-FM1) to help determine the appropriate glove for the hazard(s).
- **Fixed open-blade knives are prohibited** from use during the course of AECOM work. Examples of fixed open-blade knives include pocket-knives, multi-tools, hunting knives, and standard utility knives. For more information about cutting tools, see S3AM-317-ATT1 Safe Alternative Tools.

9.10 Substance Abuse

Drug and alcohol abuse pose a serious threat to the health and safety of employees, clients, and the general public as well as the security of our job sites, equipment and facilities. AECOM is committed to the elimination of illegal drug use and alcohol abuse in its workplace and regards any misuse of drugs or alcohol by employees to be unacceptable. AECOM Substance Abuse Prevention Procedure (S3AM-019-PR1) prohibits the use, possession, presence in the body, manufacture, concealment, transportation, promotion or sale of the following items or substances on company premises. Company premises refer to all property, offices, facilities, land, buildings, structures, fixtures, installations, aircraft, automobiles, vessels, trucks and all other vehicles and equipment - whether owned, leased, or used.

- Illegal drugs (or their metabolites), designer and synthetic drugs, mood- or mind-altering substances, and drug use related paraphernalia unless authorized for administering currently prescribed medication;
- Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances; and
- Alcoholic beverages while at work or while on any customer- or AECOM-controlled property.

This policy does not prohibit lawful use and possession of current medication prescribed in the employee's name or over-the-counter medications. Employees must consult with their health care provider about any prescribed medication's effect on their ability to perform work safely and disclose any restrictions to their supervisor.

Although some states may pass laws legalizing medical or recreational marijuana use, the use, sale, distribution and possession of marijuana are violations of federal law and AECOM policy and will subject an employee to disciplinary action up to and including termination in accordance with controlling law. In Canada, where medical and recreational marijuana use is legal, employees must still follow Federal and Provincial laws, and AECOM policy with regards to use and possession. Employees found to be in contravention of legal requirements or AECOM policy will be subject to disciplinary action up to and including termination.

9.11 Rewards and Recognition

One of AECOM's Life Preserving Principles is Recognition and Rewards for proactive safety, health and environmentally focused behaviors. All projects are expected to participate in the rewards and recognition programs available on the Corporate and DCS Americas SH&E ecosystem pages. Large, long term projects are encouraged to establish a project specific rewards and recognition program which incorporates project specific goals and activities (template available S3AM-020-FM1). ***All rewards and recognition programs must emphasize the 9 Life Preserving Principles and proactive SH&E activities NOT solely the achievement of lagging metrics ("injury/incident-free" hours, etc.) as those may discourage incident reporting.***

There are several possible appropriate methods of rewarding and recognizing employees and contractors:

1. **Informal** – recognition via verbal acknowledgement, email, spot awards, luncheons, etc.
2. **Formal** – recognition via DCS Americas Programs:
   - AECOM Safety Star Recognition Program
   - AECOM Making a Difference (MAD) Award
   - Executive Challenge Coins

9.12 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (see Stop Work Authority Procedure (S3AM-002-PR1) if an incident appears imminent, or when hazardous behaviors or conditions are observed. A stop work request can be informal if the situation can be easily corrected or may require shutting down operations if revised procedures are necessary to mitigate the hazard. If an AECOM employee observes an imminently hazardous situation on a site controlled by others (i.e., a client-managed contractor), the employee can always stop work for themselves by removing themselves from the situation. Employees also may attempt to stop work to avoid allowing the contractor to come to harm by immediately notifying the contractor foreman or site engineer, or if necessary, the client or party managing the contractor.

No employee should object to the issuance of a stop-work request, nor can any disciplinary action be levied against the employee. All employees must agree that the situation has been mitigated before resuming work. No employee will be disciplined for refusing to work if they feel it is unsafe.

10. Roles and Responsibilities

10.1 AECOM Project Manager

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The PM will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations. Some of the PM's specific responsibilities include:

- Develop a defined scope of work and project schedule with clear objectives and reasonable milestones.
- Budget and allocate the appropriate resources to safely and efficiently complete the work, including technical, safety and quality reviews.
- Prepare a project risk register to support project planning and risk management.
- Identify requirements and expectations applicable to the scope of work, site access, client and host facility.
- Assemble qualified project and field teams, including subcontractors, with the appropriate training, education and experience.
- Ensure subcontractors are approved in subport and obtain variances for those that have been conditionally approved.
- Review and approve the AECOM safe work plan (SWP) or health and safety plan (HASP) and task hazard assessments (THAs).
- Obtain and review subcontractor SWP/HASP and THAs or equivalent task risk assessment documents.
- Conduct a project kick-off meeting to convey information, requirements, and expectations to the field team.
- Ensure the field team has all the tools, equipment, instruments, and supplies, including PPE, to perform the work safely.
- Coordinate field activities with the client and/or host facility.
- Be visible to and maintain regular communication with the field team.
- Verify that technical, safety, and quality reviews are completed as planned.
- Verify that AECOM's SH&E policies and procedures are fully implemented.
- Coordinate the management of changes identified by the field team.
- Address and correct unsafe acts/behaviors and conditions.
- Confirm observation, near miss and incident notification and reporting are completed internally, to site and client, as required.
- Conduct a post project review.
- Lead by example – walk the talk.

10.2 AECOM Site Supervisor

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans and HASP. The Project Manager may act as the Site Supervisor while on site. The Site Supervisor's responsibilities include:

- Verify the personnel, equipment/machinery and instruments anticipated to mobilize to site.
- Communicate project roles and responsibilities.
- Discuss planned activities for the day and any potential simultaneous operations (SIMOPs).
- Establish staging and work areas for planned activities.
- Confirm crews have reviewed and updated, as necessary, task hazard assessments prior to beginning the task.

- Coordinate and document project activities.
- Monitor for deviations and changes in scope, personnel, methods, materials, equipment/machinery, instrumentation, and site conditions.
- Notify the AECOM project manager of changes and coordinate change management.
- Escort or delegate the escorting of site visitors.
- Serve as AECOM's point of contact with the host facility and person-in-charge for simultaneous operations (SIMOPs).
- Delegate stop work authority to all project employees and report all unsafe acts/behaviors and conditions, near misses and incidents to the AECOM project manager.
- Lead by example – walk the talk.

10.3 AECOM Site Safety Officer

The Site Safety Officer supports the Site Supervisor in providing a safe work environment. Not all sites will have a designated Site Safety Officer; the decision should be made by the Project Manager and SH&E Manager taking into consideration the complexity and risks of the scope of work. The Site Supervisor may act as the Site Safety Officer on sites without one. The Site Safety Officer's responsibilities include:

- Conduct the site safety orientation for the entire field team, including subcontractors, and site visitors.
- Lead the tailgate safety meeting.
- Discuss hazards present at the site and/or within environmental media and their control measures.
- Communicate air monitoring methods and action levels.
- Explain emergency response and reporting procedures, including emergency contacts and muster and shelter-in-place locations.
- Establish exclusion and contamination reduction zones, as needed.
- Verify SWP/HASP, THA and safety requirements and expectations are being met.
- Confirm hazard control measures are in-place and effective.
- Perform housekeeping and site inspections to ensure a safe working environment.
- Engage outside safety, health & environment resources, as needed, to allow for the safe performance of the work.
- Assist in incident investigations and identification and implementation of corrective actions.
- Lead by example – walk the talk.

10.4 AECOM SH&E Manager

Responsibilities of the SH&E manager is to:

- Promote the AECOM Safety for Life Program and our Nine Life Preserving Principles.
- Understand the application of SH&E regulatory requirements relevant to SH&E in the company's operations and be aware of changes in regulations which may affect the company.
- Be formally trained, licensed or certified where the regulations require.
- Assist with the budgeting and staffing process to ensure project teams have the knowledge and resources needed to perform their work safely.
- Be aware of all incidents, near misses, observations, unsafe acts and unsafe conditions that are reported and participate in the investigation process where required.
- Verify incidents are reported to regulatory bodies in accordance with local legislation.
- Review investigation findings to confirm identified corrective actions are appropriate and subsequently implemented.

- Review and accept site-specific SH&E Plans and Task Hazard Analyses (THAs).
- Assist in the preparation of risk assessments.
- Assist in the review of SH&E training needs.
- Verify necessary training as required by AECOM policies and procedures and/or the regulations.
- Assist in the setting of SH&E expectations at project level and review them periodically.
- Perform project SH&E audits on a periodic basis.
- Monitor the corrective actions taken, where audits identify non-conformance or opportunities for improvement, for confirmation of their completion and effectiveness.
- Lead by example, walk the talk.

10.5 AECOM Employees

Responsibilities of employees associated with this project include, but are not limited to:

- Arrive onsite fit for duty and dressed for weather conditions.
- Actively participate in tailgate safety meetings and crew THA reviews.
- Perform only assigned tasks consistent with training & competency.
- Follow SWP/HASP, THA and safety requirements & control measures.
- Use 4-sight as a last-minute risk assessment tool.
- Notify the AECOM site supervisor prior to any deviation from the planned activity (i.e., change in personnel, methods, materials, equipment, etc.).
- Use stop work authority and report all unsafe acts/behaviors and conditions, near misses and incidents to the AECOM site supervisor.
- Always conduct yourself in a professional and ethical manner.

10.6 Visitors

Authorized visitors (e.g., client representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the Project Manager, Site Supervisor, or Site Safety Officer on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

If the site visitor requires entry to any exclusion zone (EZ), but does not comply with the above requirements, the visitor will be denied access to the EZ. If the visitor disregards instructions to remain outside the EZ, work activities will be immediately suspended, and the situation reported and documented.

Unauthorized visitors, and visitors not meeting the specified qualifications, will **NOT** be permitted within established controlled work areas. If unauthorized visitors and/or visitors not meeting the specified qualifications enter a controlled work area and/or EZ, work activities will be immediately suspended, and the situation reported and documented.

11. Subcontractor Management

11.1 AECOM Roles/Responsibilities for Sub Management

When managing an AECOM Subcontractor of any tier, AECOM management and supervision will follow the requirements in S3AM-213-PR1 and are responsible for the following:

- Direct all activities of the facility, site, or project location.
- Ensure appropriate training and experience of AECOM personnel responsible for overseeing subcontractor work.
- Verify subcontractors have the appropriate trained and competent personnel to perform their activities in a safe, healthful, and environmentally responsible manner.
- Pre-qualification of Subcontractor – Prior to performing work on an AECOM project, management and supervision must verify the Subcontractor has been pre-qualified. AECOM's preferred method of prequalification is Subport, but there are other ways to prequalify a subcontractor.
- Ensure all subcontractor employees attend the AECOM daily tailgate safety meeting.
- If you have any questions about subcontractor pre-qualification, reach out to an AECOM SH&E professional.

11.2 Subcontractor Roles/Responsibilities for Safety

Subcontractors must provide AECOM with a designated Subcontractor Safety Representative (SSR). Their responsibilities are as follows:

- Direct employees' means and methods of work and how to work safely.
- Be knowledgeable of and understand the safety requirements of the subcontractor's activities.
- Staff the project with employees that are trained and knowledgeable of the tasks they will be performing.
- Have the ability to recognize hazards and the authority to take prompt corrective actions.
- Implement the subcontractor safety program.
- Serve as the direct contact with AECOM regarding resolution of SH&E issues.
- Immediately report all work-related injuries/illnesses/incidents, environmental incidents and regulatory inspections/violations to AECOM according to AECOM procedures and/or client requirements.

11.3 Subcontractor HASP/THAs

If the subcontractor's scope of work includes hazards that are not covered by the AECOM Health and Safety Plan (HASP), the subcontractor will need to provide AECOM with their site-specific HASP and task-specific Task Hazard Analyses (THAs). All subcontractor procedures must at a minimum comply with client and AECOM requirements to ensure that hazards associated with the performance of their work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior mobilization to the site.

12. Training and Documentation

The following sections describe the standard practices or programs that AECOM will establish to prepare employees to perform work safely and consistent with AECOM policy and Procedures. For additional information on SH&E Training, review the Safety, Health and Environment Training, S3AM-003-PR1.

12.1 HASP/Site Safety Orientation

The Project Manager shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, Site Safety Officer, or Site Supervisor. This meeting will involve representatives from all organizations with a direct contractual relationship with AECOM on the job site. Minimum items to be covered are listed in **Attachment F**. Participants will then sign the HASP Personnel Acknowledgement register at the end of the HASP.

12.2 Worker Training and Qualifications

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure S3AM-003-PR1 establishes the general training requirements for AECOM employees.

See **Section 5.1** of this HASP for site-specific required safety training and documentation.

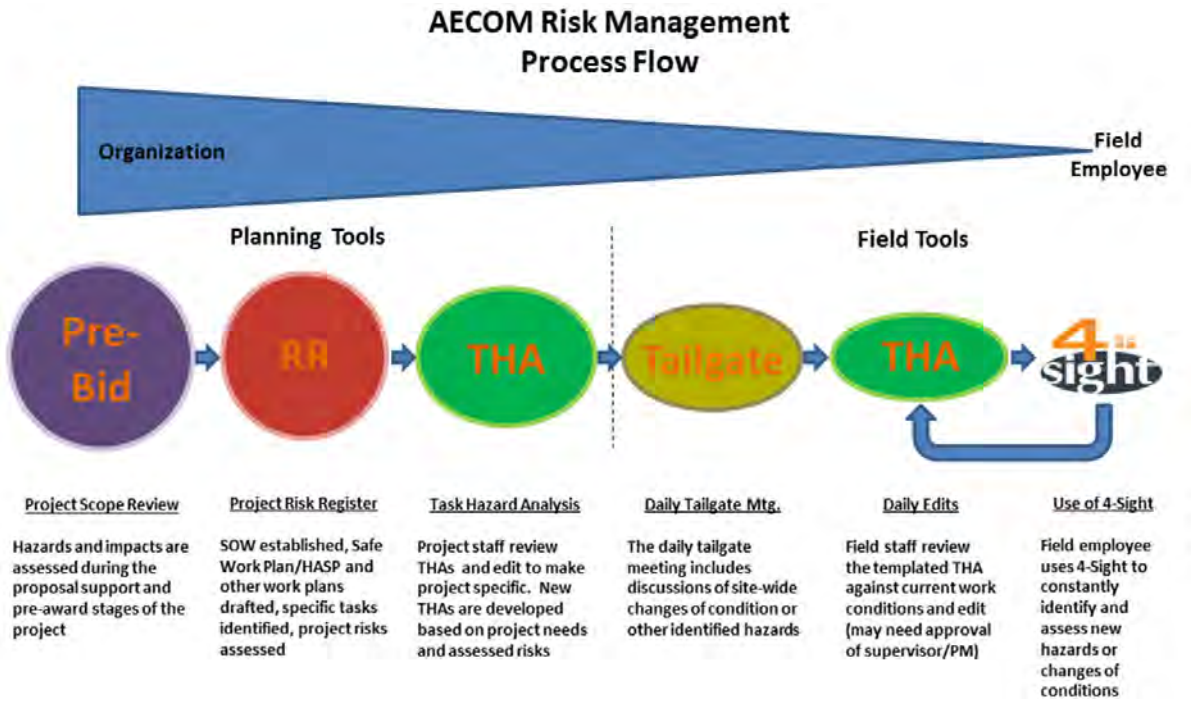
12.3 Competent Person(s)

A competent person is an employee who, through education, training, and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

AECOM's Competent Person Designation Procedure, S3AM-202-PR1, explains the roles, responsibilities and procedures of naming a competent person. Review **Attachment L** of this HASP for a list of site-specific competent person(s) required for this scope of work.

13. Hazard Assessment and Control

AECOM has adopted an approach to hazard assessment and control that incorporates both qualitative and quantitative methods to identify hazards and the degree to which they may impact employees and AECOM operations. See S3AM-209-PR1, Risk Assessment and Management, for details regarding AECOM's process. This approach is illustrated below and described in the following section.



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13.1 SH&E Procedures

All AECOM SH&E procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures ecosystem page. Programmatic procedures referenced in this document (for example SH&E Training) do no need to be printed for inclusion in this HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment D**.

13.2 Task Hazard Assessments and Daily Tailgate Meetings

THA forms (a blank version is located in S3AM-209-PR1) shall be prepared for each task to be performed as part of the scope of work. This includes driving to the site, parking, and walking as well as the hazards, associated risk, and appropriate controls for all other work activities. The DCS Americas Templated THA Library may also be used to find previously approved THAs, though these should be modified to be project and site-specific. The preparer shall have one THA form for each task in the Scope of Work found in this work plan (**Attachment C**) and shall also include blank copies.

In the field, all employees and visitors shall review the daily THAs and conduct and attend the daily tailgate meeting. When employees arrive on site, conditions may be different than originally planned or additional job steps may be required. The THA requires workers to update or 'dirty up' the THA in the 'On-Site Edits' rows to assess the risks presented by the changed condition(s) and requires the worker to describe steps to reduce the risk. If the hazard(s) cannot be successfully mitigated, the work will **NOT** proceed.

A Site Safety Officer (SSO) or field supervisor shall conduct a daily tailgate meeting to review the specific requirements of this HASP prior to the commencement of daily project activities. Attendance at the daily tailgate meeting is mandatory for all employees and subcontractors at the site covered by this HASP. Simultaneous operations are encouraged to attend each other's tailgate meetings or at the very least the supervisors shall discuss the coordination of activities and associated hazards of each other's tasks. The tailgate meeting must be documented by the field Supervisor or SSO, using the New Daily Tailgate Meeting App. Use the appropriate QR code to download the App and/or go to the Daily Tailgate Meeting App Ecosystem page for details, guides, training sessions and/or other information:

iOS

Android

As an alternative you can also use or the Daily Tailgate Meeting form (S3AM-209-FM5), a blank copy of which is included in **Attachment C**.

13.3 Hazard Categories

THAs should include consideration of the following hazard categories when identifying hazards and task specific controls:

Category	Definition
Biological	A biological hazard is any living organism that could cause irritation, allergic reaction, bites, stings, illness, infection, or other injury.
Chemical	A chemical hazard is any chemical substance that could potentially cause harm to humans, equipment, or the environment either through contact, ingestion, absorption, inhalation, or reaction.
Electrical	Electrical hazards are present whenever there is potential for contact with an electric charge.
Gravity	Gravitational force can cause tools, equipment, materials, and people to fall either to the same level or from heights to the earth or a lower surface.
Mechanical	A mechanical hazard when there is energy within the components of a mechanical system within an otherwise stationary piece of equipment/machinery.
Motion	Objects or substances that can move or are moving not due to gravity create a motion hazard. Motion hazards also include body motions and positioning such as bending, stretching, kneeling, etc.

Category	Definition
	Noise hazards are sounds that may prevent effective communication or cause hearing loss.
	Any physical matter such as gases, liquids, and springs that is compressed or under a vacuum creates a pressure hazard.
	Radiation hazards include both ionizing and non-ionizing energy emitted from radioactive elements or sources.
	Thermal hazards can cause injury or damage due to their temperature.

13.4 4-Sight

When preparing hazard assessments and throughout the day workers should use 4-Sight. This is a mental process through which workers ask themselves (and each other) four questions designed to effectively assess hazards. Using these questions during each task, especially those without established THAs, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.

- **What am I about to do?**
- **What could go wrong?**
- **What could be done to make it safer?**
- **What have I done to communicate the hazard?**

13.5 Speak Up/Listen Up

All AECOM employees have a responsibility to help create the environment where the expectation is Safety for Life. Speak Up/Listen Up (SULU) is a technique to steward jobsite safety by utilizing 4-Sight as a basis for safety feedback conversations. SULU has two main parts:

- **Speak Up** where employees use three simple steps when providing feedback to others about unsafe acts:
  - Ask to discuss their hazard assessment or 4-Sight for the task;
  - Get a commitment from the employee to apply the hazard controls and perform the task according to the accepted procedures; and
  - Follow up to ensure the employee is working safely
- **Listen Up** where employees use two simple steps when responding to safety feedback:
  - Listen – Focus on the message, not the messenger; and
  - Commit to performing the task the safer way

SULU conversations should happen consistently throughout the workday to create clear expectations of how work should be performed. All employees should recognize safe work behaviors in order to reinforce them and keep them going. An occasional correction is much more effective when employees are frequently encouraged and positively recognized for their safe actions. Managers and supervisors should be having SULU conversations during site visits and ensure peer to peer and site supervisor to crew SULU conversations are being held.

14. Incident Reporting

14.1 Incident Notifications and Reporting

NOTE! In the event of a life-threatening emergency, call 911 FIRST. A life-threatening emergency can include:

- Loss of consciousness
- Head or spinal cord injury
- Cardiac arrest
- Seizures
- Severe allergic reaction
- Broken bones
- Uncontrolled loss of blood
- Abdominal trauma
- Heat Stroke
- Difficulty breathing

Once immediate actions have been taken, if safe to do so, notifications (verbal) must be completed immediately and the involved employee, site supervisor or site safety officer most call the AECOM Incident Reporting Hotline at 1-800-348-5046. Notifications serve to engage additional resources in the management of the emergency and initiate additional processes such as medical case management, spill response, incident investigation, etc. Reporting initiates the formal documentation process and supports the development of key learnings to prevent a reoccurrence.

14.1.1 AECOM Internal Notifications

For any incident or near miss, the involved employee must notify their site supervisor or site safety office. The site supervisor or site safety officer must notify their Project Manager. Depending on the severity of the incident, the Project Manager may need to notify the following individuals:

- Regional, area, business line, practice group or account SH&E manager.
- Program Manager or Client Account Manager
- Senior Leaders

14.1.2 Client Specific Notifications

Notify our clients of incidents in accordance with their incident notification requirements.

See client contact information in the Key Personnel table at the bottom of the **HASP Summary** on Page i.

14.1.3 Incident Investigation

All incidents and near misses will be investigated and documented to determine the contributing and root causes. The investigation will verify the need for corrective actions and identify opportunities for Lessons Learned and continuous improvement. For more information in incident investigations, please review the Incident reporting, Notifications and Investigation procedure, S3AM-004-PR1.

As soon as it is safe to do so after an incident occurs, the following information will be gathered:

- An incident timeline;
- Witness statements;
- Photos of the incident;
- Police reports, if applicable;
- Any additional information that will assist in the investigation; and
- Copies of daily safety documentation and/or field notes.

14.2 Incident and Near Miss Reporting

All incidents and near misses (i.e., incidents without consequences), regardless of type and perceived severity, must be reported in accordance with the Incident Reporting, Notifications and Investigation, S3AM-004-PR1 and entered into **IndustrySafe** (AECOM's SH&E Database) within the timeframes listed below:

Incident Type	IndustrySafe Reporting Timeframe
Significant Incident, including any injury to an AECOM employee or Subcontractor	Within **4 hours**
All Other Incidents	Within **24 Hours**

Note: Only the basic facts, who, what, when, where and how, are needed to complete the initial IndustrySafe report. SH&E Managers will assist you in updating the report as additional information becomes available.

Significant incidents include:

- Fatality;
- Amputation;
- Hospitalization for treatment for more than 24 hours (admission);
- Any single event resulting in more than one employee requiring medical treatment or more than one employee being away from work for more than 3 days;
- Any SH&E-related Consent Agreement/Order/Lawsuit or enforcement action seeking more than $10,000 or alleging criminal activity;
- Any spill or release of a hazardous material that is reportable to a regulatory agency;
- Any Notices of Violation resulting from not operating within a regulatory agency permit/license or consent;
- Any incident resulting in property damage expected to exceed $10,000 United States dollars (USD);
- Any security-related incident that could have caused significant harm to an AECOM employee; and/or
- Any near miss event that may have resulted in any of the above consequences, but because of "luck" did not result in harm to persons, property or the environment.

Other incidents include:

- Any injury or illness to an AECOM employee or subcontractor, even if it does not require medical attention, including non-work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public or client representative occurring on an AECOM-controlled work site;
- Re-occurring conditions such as back pain or cumulative trauma disorders (e.g., carpal tunnel syndrome);
- Fire, explosion or flash that is not an intended result of a planned event (e.g., remediation process, laboratory procedure);
- Any incident involving company-owned, rented or leased vehicles (including personal vehicles used for company business); and/or
- Any failure to comply with requirements of a regulatory permit issued to AECOM.

14.2.1 Motor Vehicle Incidents

Collisions: All vehicles should be rented through Trip Actions (accessible via Ecosystem) to ensure that AECOM insurance is included in the rental rate. All other insurances should be declined. AECOM's rental vehicle insurance policy for National/Enterprise or Avis can be found on the DCS Americas United States or Canada travel pages. **Drivers MUST print and carry the applicable insurance policy for the rental. For company owned vehicles, drivers MUST also print and carry proof of insurance.**

Breakdowns: If safe to do so, remove the car from the traveled way. To the extent possible, AECOM personnel should **NOT** change flat tires or perform similar repairs.

- For rental vehicles, contact the rental company
- For fleet vehicles, contact **ARI Fleet Management: 1-800-422-7647**
  - Prompt 1 – Roadside Assistance
  - Prompt 3 – Maintenance Management
- For personal vehicles used on AECOM business, contact an emergency provider.

14.2.2 Safety Observation Reporting

All safety observations must be entered into **IndustrySafe™ or Lifeguard™** (AECOM's SH&E Databases).

14.2.3 SH&E Database Access

Incidents, near misses, and audits/inspections must be entered into **IndustrySafe™**, which is one of AECOM's SH&E Databases. Safety observations may also be entered into **IndustrySafe™** at the AECOM Project Manager's discretion. **IndustrySafe™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. IndustrySafe may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.

Incidents, Near Misses, Audits/Inspections and Safety Observations

Safety observations may also be entered into **Lifeguard™**, which is one of AECOM's SH&E Databases, at the AECOM Project Manager's discretion. **Lifeguard™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. **Lifeguard™** may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.

14.2.4 Reporting Assistance

If your field schedule, access to internet, and/or limited cellular phone coverage have the potential to impact timely incident, near miss, and/or safety observation reporting, please contact your AECOM Project Manager and/or SH&E Manager for assistance.

15. Environmental Management

15.1 Scope

AECOM implements policies and procedures to reduce risk of land and/or water pollution and other environmental concerns during the life of the project. The AECOM Project Manager will ensure compliance with all local, state, federal and client environmental laws and/or regulations. For additional information on Environmental Management, please review the Environmental Compliance procedure, S3AM-204-PR1.

15.2 Roles and Responsibilities

All AECOM staff through the leadership of the AECOM Project Manager are responsible for reducing or eliminating environmental impacts by AECOM personnel. The site supervisor and/or the site safety officer will be immediately notified of any spills, leaks, or other impacts to the ground and/or water, or other environmental emergencies, after emergency respondents have been called, if necessary. The Project Manager will be responsible for making any further notifications as required.

15.3 Staffing and Awareness

AECOM staff will receive relevant awareness training to ensure proper knowledge and training when performing activities with the potential to impact the environment, as well as the requirement of this plan for proper preparedness and response.

15.4 Pollution Prevention

Pollution/impact to the environment could be caused by the following sources:

- Air emissions
- Wastewater
- Hazardous materials
- Solid waste
- Hydrocarbons
- Storm water and sediment/erosion

AECOM will employ prevention and control measures to prevent impacts to the environment. In addition, a spill kit consisting of sorbent socks, pads, shovels and personal protective equipment (PPE) will be maintained on site by AECOM and each subcontractor.

Solid waste will be collected, segregated (recyclable, non-flammable, and flammable) and removed on a regular basis.

16. AECOM Audits and Inspections

The AECOM audit and inspection process establishes the protocol for the assessment the Safety, Health and Environment (SH&E) program and its application, as well as the process to identify and monitor corrective actions. The goal is to minimize risk and enhance operational SH&E performance. For more information on audits and inspections, please review the Compliance Assurance procedure, S3AM-216-PR1.

16.1 Project Manager Self Assessments

AECOM Project Managers will perform quarterly SH&E site audits using the DCSA Project Manager Self-Assessment form (available in IndustrySafe.

16.2 Senior Management Activities (SMAs)

AECOM Senior Managers will perform Senior Management Activity inspections on the projects under their area of responsibility. These SMAs will be entered into Lifeguard.

16.3 Project Safety Reviews (PSRs)

AECOM SH&E Managers will perform periodic Project Safety Reviews on projects in their area of responsibility. These PSRs will be entered into IndustrySafe.

16.4 Site Safety Inspections (OSHA Type)

AECOM Project Managers and SH&E Managers will perform periodic site safety inspections (OSHA type) on projects in their area of responsibility as required. These site safety inspections will be entered into IndustrySafe.

16.5 External Regulatory Inspections

If a regulatory inspector shows up on site, AECOM will follow the requirements in our Regulatory Inspections procedure S3AM-211-PR1.

17. Project Closeout

Completing a project requires procedures to close out Project Contractual and Administrative activities. The closeout process ensures all documentation is finalized and any Contractual Obligations are met. The Project is ready for close-out once it has been accepted by the end user organization. Project close-out is complete after all physical, regulatory, contractual, and financial close-out activities are complete.

17.1 Health and Safety File

The Health and Safety File will normally include:

- Brief description of the work carried out.
- Residual hazards which remain and how they have been dealt with (e.g., surveys, or information on asbestos, contaminated land, water bearing strata, buried services etc.).
- Key structural principles incorporated in the design (e.g., bracing) safe working loads etc.
- Any hazards associated with the materials used.
- Nature, location and markings of significant services including underground cables, gas supplies, firefighting etc.
- Information and ‘as built’ drawings including safe access to and from confined spaces etc.
- Daily Tailgate Meeting Forms
- Lessons Learned

18. Personal Acknowledgement

By signing below, the undersigned acknowledges that he/she has reviewed the AECOM Health and Safety Plan for the Ashland Tank 75 site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work and will comply with the provisions contained therein. The employee understands that they are **NOT** to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the employee understands to notify the Site Supervisor and the **Incident Hotline at 800-348-5046** for any incident, ***including ANY injury even if no first aid or medical treatment is required.***

Print Name Clearly	Signature	Organization	Date

18.1 Disclaimer

This HASP, and each of its provisions, is applicable only to, and for use only by, AECOM, its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third-party contractors on industrial sites or projects where AECOM is providing engineering, construction management, or similar services, without the express written permission of AECOM, will be at that party's sole risk, and AECOM Corporation shall have no responsibility. The existence and use of this Plan by AECOM shall not be deemed an admission or evidence of any acceptance of any safety responsibility by AECOM for other parties unless such responsibility is expressly assumed in writing by AECOM in a specific project contract.

Attachment A

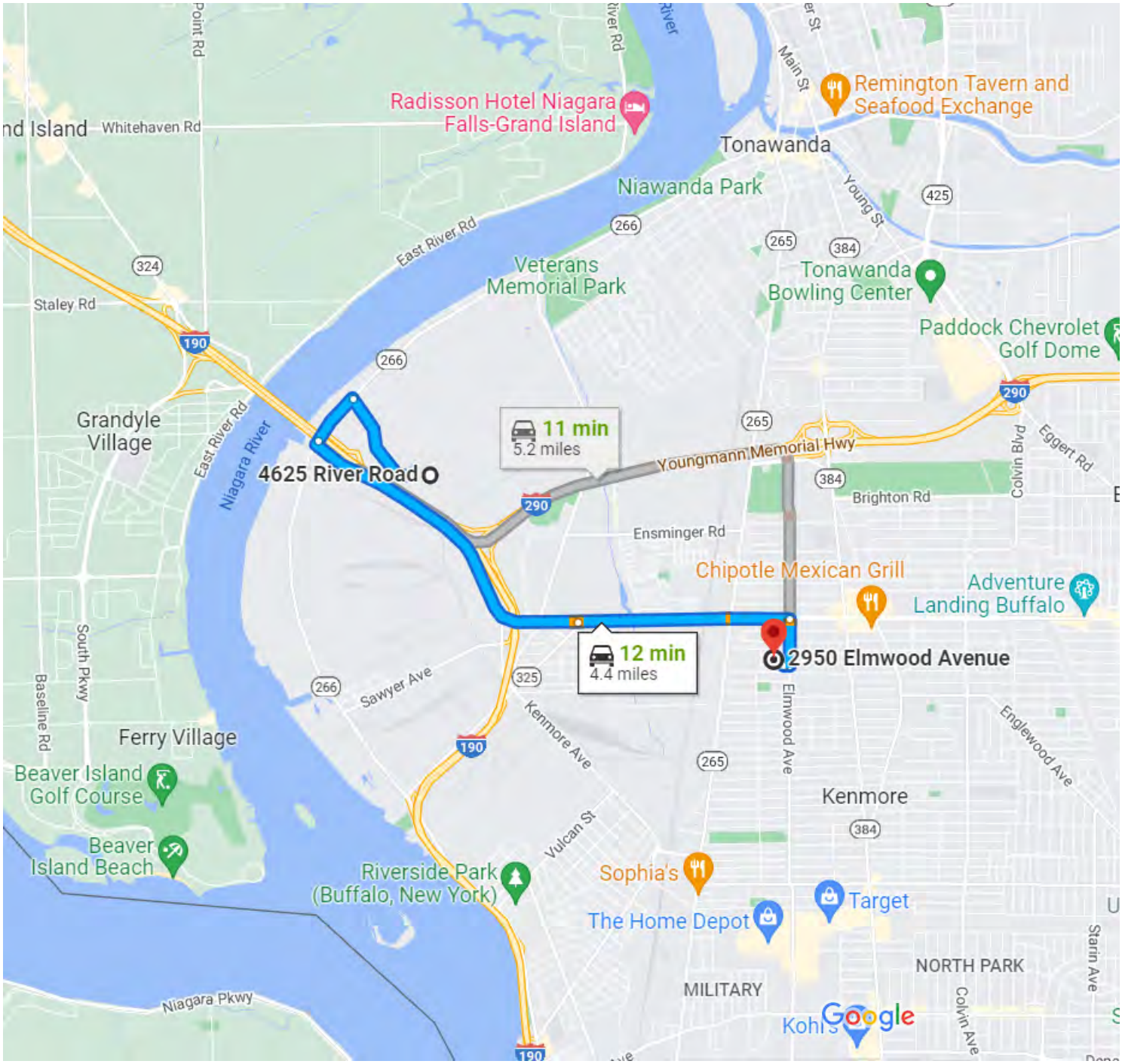
Hospital/Clinic Maps and Incident Reporting Flow Chart

Attachment A: Hospital/Clinic Maps

Google Maps

4625 River Rd, Tonawanda, NY 14150 to 2950 Elmwood Avenue, Kenmore, NY

Drive 4.4 miles, 12 min



Map data ©2022 Google 1 mi

4625 River Rd
Tonawanda, NY 14150

1. Head west toward River Rd — 0.6 mi
2. Turn left onto River Rd — 0.3 mi

3. Turn left onto Grand Island Blvd

2.0 mi

4. Merge onto Sheridan Dr

1.2 mi

5. Turn right onto Elmwood Ave

0.3 mi

6. Turn right

177 ft

7. Turn right

112 ft

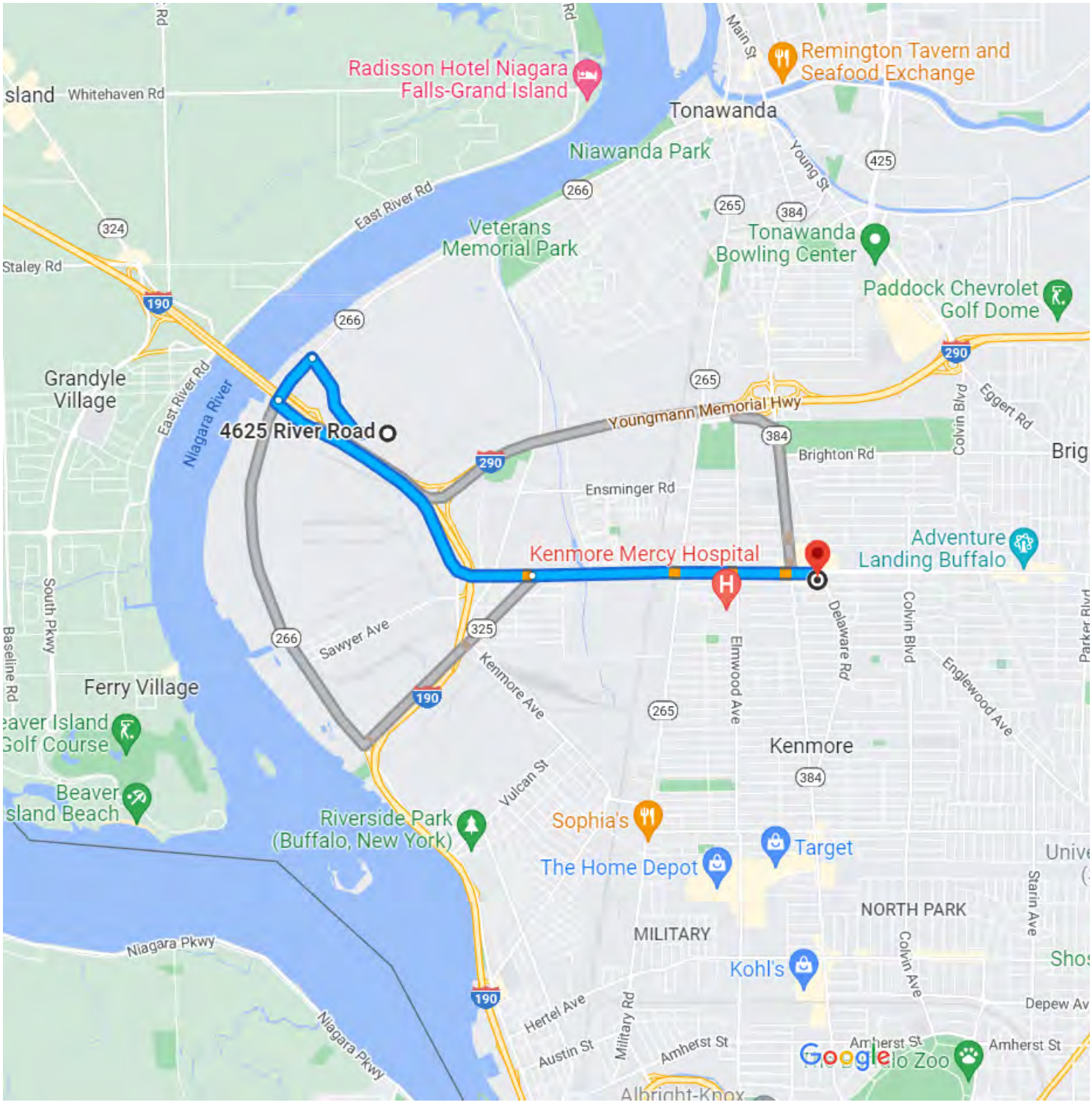
2950 Elmwood Ave
Kenmore, NY 14217

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

Google Maps

4625 River Rd, Tonawanda, NY 14150 to 1751 Sheridan Dr, Buffalo, NY 14223

Drive 4.6 miles, 13 min



4625 River Rd
Tonawanda, NY 14150

↑ 1. Head west toward River Rd

0.6 mi

2. Turn left onto River Rd

0.3 mi

3. Turn left onto Grand Island Blvd

2.0 mi

4. Merge onto Sheridan Dr

1.7 mi

5. Turn right

Destination will be on the left

194 ft

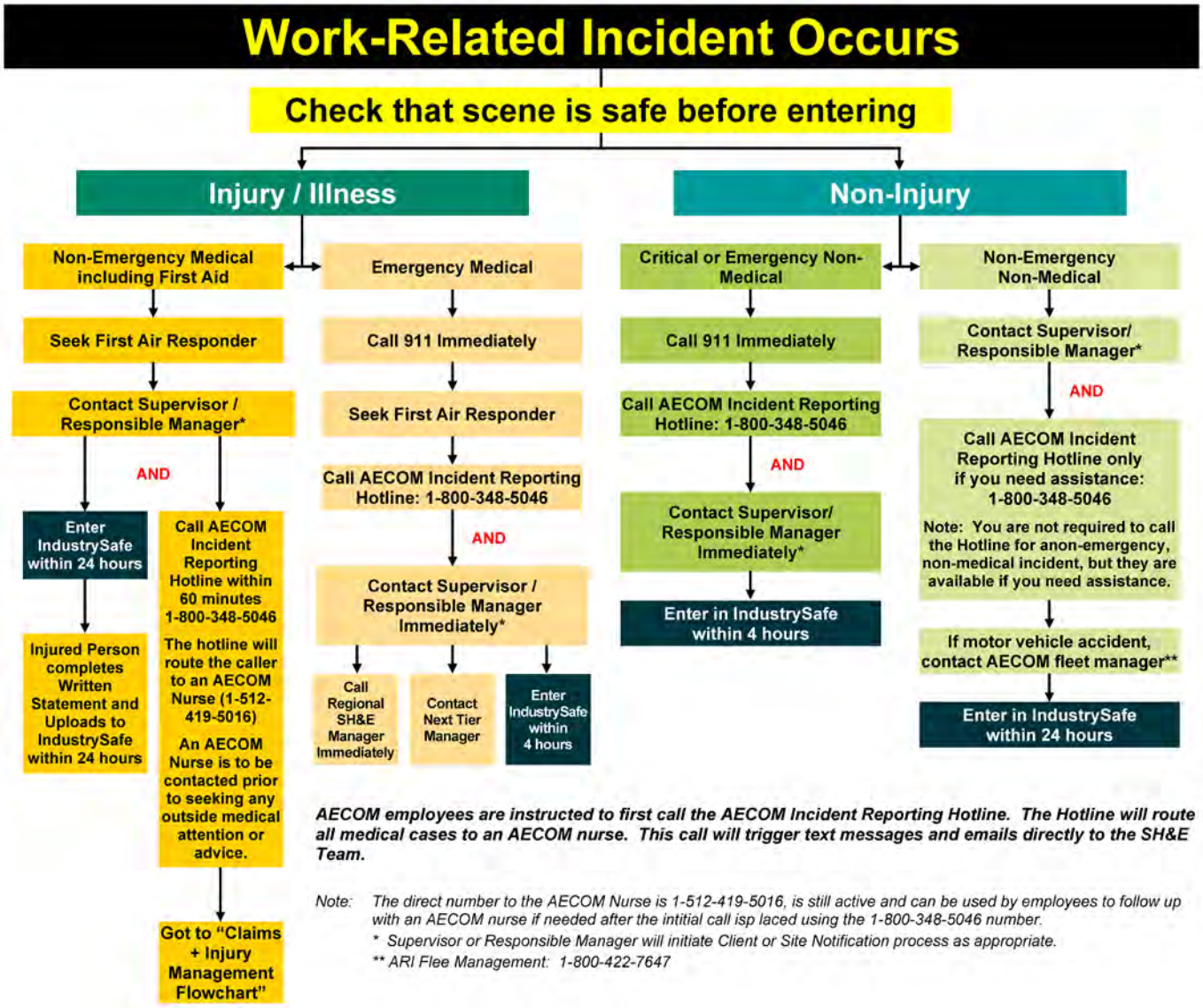
1751 Sheridan Dr
Buffalo, NY 14223

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

Attachment B

Incident Reporting Flow Chart

Attachment B: Incident Reporting Flow Chart



AECOM employees are instructed to first call the AECOM Incident Reporting Hotline. The Hotline will route all medical cases to an AECOM nurse. This call will trigger text messages and emails directly to the SH&E Team.

Note: The direct number to the AECOM Nurse is 1-512-419-5016, is still active and can be used by employees to follow up with an AECOM nurse if needed after the intitial call isp laced using the 1-800-348-5046 number.

** Supervisor or Responsible Manager will initiate Client or Site Notification process as appropriate.*

*** ARI Flee Management: 1-800-422-7647*

AECOM

Attachment C

THA Forms, and Tailgate Safety Meeting Form

Attachment C: THA Forms, and Tailgate Safety Meeting Form

Task Hazard Assessment Instructions:

Each unique task or work group should have their own THAs. If workers have a THA for their task(s) in hand, they should simply review it and document the site-specific edits in the appropriate section. If workers do ***not*** have a THA for all tasks to be performed, a THA must be obtained or drafted *prior to starting work* on that task. Use additional pages as needed.

- Identify the basic steps of the task that must be performed in order and their associated hazards. Identify controls or barriers to mitigate each identified hazard.
- Clearly identify any **STOP WORK** triggers.
- Document stop work and change management if conditions/ scope changes.
- Use 4-Sight to identify and mitigate site-specific hazards throughout the day. Modify the THA as needed. Contact site supervisors or the PM for any significant scope changes or changes of expected conditions.
- All THAs shall be 3 pages (maximum) or less (preferred). If they are longer, the task is too broad.
- All hazards will use standardized nomenclature (Hazard Wheel), should be specific, detail how someone could be hurt and what the outcome could be.
- All actions to mitigate hazards must be specific, clearly aligned with its respective hazard and not generic. Avoid words such as "*proper", "correct*", or "*appropriate*"). Use specifics and numerical values (i.e., wear disposable nitrile gloves, stand back 6 feet/1.8 meters, take a 10-minute break every hour).
- PPE cannot be the only line of defense - PPE is always the last line of defense, so think through what other controls (engineering, administrative, etc.) could mitigate hazards.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Driving to and From Site	**Control #:**	01-01-12-02

Project Name:	Ashland Tank 75	Client:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☐ Safety Glasses ☐ HiVis Vest ☐ Safety Toe Boots ☐ Gloves: Leather / Nitrile ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Emergency kit Communication device (cell phone) Navigation system

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Trip Planning	1a. Unauthorized driving	9	1a. You must be an AECOM authorized driver to drive for AECOM business purposes. Consult the requirements of S3AM-005-PR1. Authorized Drivers shall maintain a current driver's license with full privileges applicable to the vehicle to be operated. Develop a Journey Management Plan if applicable.	4
	1b. Inclement weather	6	1b. Evaluate weather conditions prior to beginning the travel to determine if travel should proceed. Verify your vehicle is equipped to travel in poor weather. Have supplies on hand in the event that you become stranded, including a communication device to call for help.	4
	1c. Getting Lost	6	1c. Review route in advance and program GPS prior to leaving	3
	1d. Inadequate vehicle for the site/trip	7	1d. Understand what type of vehicle is necessary to transport tools & equipment to the site. Know site conditions before departure and obtain proper vehicle, 4-Wheel drive if necessary	4
	1e. Vehicle malfunction	8	1e. Inspect vehicle prior to leaving. Verify that maintenance records are current.	4
On-Site Edits:				
2. Driving	2a. Fatigue	**15**	2a. Start trip well rested & take breaks when needed. Share driving responsibilities where possible. **STOP DRIVING AND PULL OVER** in a safe place if you begin nodding off or showing other signs of fatigue.	4

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Driving to and From Site**	**Control #:**	**01-01-12-02**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	2b. Risky driving practices	**15**	2b. Practice defensive driving techniques and avoid bad driving habits • Allow for adequate time to make the trip • Do not speed or attempt to multi-task • Do not use cell phone or text or attempt to program GPS while driving	4
On-Site Edits:				
3. Stops/breaks during transit	3a. Theft of equipment/materials	6	3a. Place any likely theft items out of sight and lock vehicle when leaving it. Do not leave vehicle unattended for longer than necessary. If at all possible, avoid leaving packed vehicles in public parking areas overnight, unload if possible. Park in well lighted areas.	4
	3b. Personal security risk	**10**	3b. Be alert and aware of surroundings when making stops. Stop at areas which are well lit and have security if possible.	3
On-Site Edits:				
4.	4a.		4a.	
On-Site Edits:				

Additional Notes:

Task Hazard Assessment

AECOM Imagine it. Delivered.

All Employees:

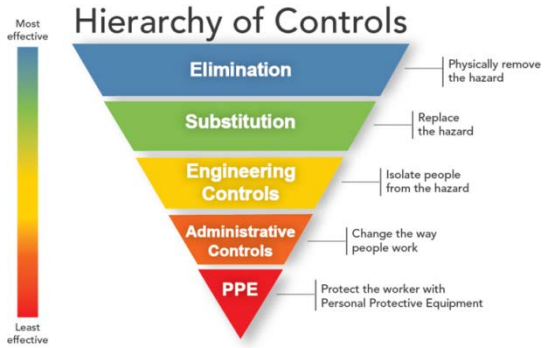
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Clearing of Overgrowth (manual)	**Control #:**	01-01-11-04

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots with class 3 cut protection and metatarsal protection ☒ Gloves: leather with ballistic nylon reinforcement on back ☒ Hearing Protection rated for 95-115 dBA ☒ Other: Trousers or chaps with sewn-in ballistic nylon pads to the belt line (cut protection), Face shield
Tools & Equipment:	Chain Saw

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Prepare work area	1a. Slips/Trips/Falls when walking on uneven ground	4	1a. Clear brush and debris, visually examine area to establish secure footing	2
	1b. Injuries to bystanders and co-workers	4	1b. Warn people in or near area; utilize barricades, cones, or caution tape to keep bystanders a safe distance from job; consider the shape and lean of tree; consider wind force; plan escape route from work area in case of danger.	2
	1c. Overhead electrical line – electrocution / fire	**10**	1c. Obtain necessary permits - contact utility provider, if required; LOOK UP and ASSESS	2
On-Site Edits:				
2. Operation of Chain Saw	2a. Kickback, blade bucking away from wood	8	2a. Make sure blade is moving before making contact with material; use wedge when necessary to keep blade from binding; make sure solid objects like rocks or concrete do not contact blade; use 90-degree notch and back cut techniques on standing trees >5 inches in diameter.	2
	2b. Equipment Malfunction/Operation	3	2b. Inspect saw prior to use and make sure all safety functions are operating properly (ie. chain break and chain catcher) – check that the saw has an adequately installed spark arrester	1
	2c. Laceration from running saw/chain to hands, feet and body	4	2c. When starting the chainsaw use the leg lock method or the ground method – always ensure the brake is on before starting the saw. Never "drop start" the saw. Wear cut retardant gloves, pants and boots	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Clearing of Overgrowth (manual)**	**01-01-11-04**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
			Shut the saw off when carrying through brush, slippery surfaces or greater than 50 feet. Avoid handling cutting edges and keep body parts away from cutting surface Maintain proper stance (one foot – shoulder width, knees slightly bent – proper lock out throttle) and hold; keep left arm and elbow straight, two hands on saw, body to the left of saw; maintain secure footing; never cut above shoulder level; cut with the underside of saw blade as much as possible. Stop engine for all cleaning, refueling, adjustments, and repair of saw Be aware of surroundings, make sure others are not within the potential fly zone for wood cuttings or in line with the chain and use caution to not create projectiles	
	2d. Projectiles – injury to body/eyes	8	2d. Wear safety glasses with side protection, and face shield as appropriate Keep the chain out of the dirt and make sure there are no nails, wire, or other imbedded material in the material to be cut that can cause flying particles or kickback.	3
	2e. Hearing loss/damage (Noise)	2	2e. Wear approved hearing protection	1
	2f. Muscle strain, fatigue, hand/arm vibration	4	2f. Utilize proper body position ((one foot – shoulder width, knees slightly bent – proper lock out throttle)); stretch, take frequent breaks to maintain alertness; stay hydrated; wear gloves that reduce the amount of vibration impact	2
On-Site Edits:				
3. Felling trees	3a. Crushed by fallen tree	**10**	3a. Plan out the line of fall, no one should enter the fall zone of the tree, ensure that no tools equipment or other property are in this area. Start cutting only after two clear escape paths have been made.	4
	3b. Being hit by a falling object (tree branch)	8	3b. Adequately delineate the red zone and only have critical worker within it; wear CSA hard hat, visually inspect the tree before removal to determine dead or dying areas on the tree. Determine where the tree/limb will fall prior to cutting.	4
	3c. Fire from working in dry condition	6	3c. Ensure spark arrestor is in place and working. Ensure an appropriately sized fire extinguisher or fire-fighting equipment is readily available. Obtain operating permit, if required (ie. Natural Resources -during fire season)	4
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Clearing of Overgrowth (manual)	01-01-11-04

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions To Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
4. Cross cutting – bucking the trunk into lengths	4a. Lacerations from running saw/chain to hands/feet and body parts 4b. Log or limb rolling into body	**10** 6	4a. Always stand to one side of the limb to be cut, never straddle it. Do not stand on the log or make cuts with the saw between your legs; always cut with the saw to the outside of your legs. 4b. Stand upslope so cut pieces roll away from feet, legs, and body.	4 3
On-Site Edits:				
5. Move trunk lengths out of the work area	5a. Back and leg strain resulting from moving logs.	4	5a. Cut tree into manageable lengths, utilize mechanical means if possible to push logs out of the way.	2
On-Site Edits:				
	6a.		6a.	
On-Site Edits:				
	7a.		7a.	
On-Site Edits:				

Task Hazard Analysis

Task Name:	Clearing of Overgrowth (manual)	01-01-11-04

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Clearing of Overgrowth (manual)	01-01-11-04

All Employees:

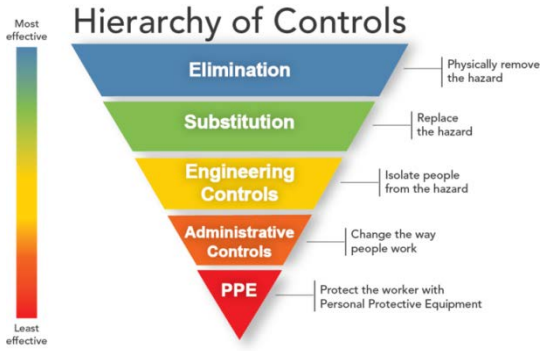
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com

Task Hazard Analysis

Task Name:	Clearing of Overgrowth (manual)	01-01-11-04

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	**Control #:**	01-01-05-07

Project Name:	Ashland Tank 75	Client:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Hand Tools Liquid level/Interface probe Decon materials

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Visually clear proposed gauging locations	1a. Exposure to biologic hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reaction, rabies	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant; use a broom or a rake to move vegetation, not your hand or foot; move slowly	4
	1b. Damage to equipment or vehicles due to surface / subsurface obstructions	6	1b. Investigate travel path. Look for surface obstructions such as rubble, debris, old foundations or rebar. Use spotter is available or park in such a manner as to not have to back-up.	4
	1c. Slips / trips / falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1c. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from the ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well gauging in the area safe.	4
	1d. Struck by vehicle resulting in severe trauma or death	**10**	1d. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest	4
On-Site Edits:				
2. Opening well casings / flush-mount covers and well plug lock	2a. Cuts / lacerations / crushing, bruises	6	2a. Avoid touching sharp materials/ edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling, d on knee pads.	2
	2b. Back strain	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	**Control #:**	01-01-05-07

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	2c. Vapor exposure resulting in inhalation hazards or illness	4	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.	2
	2d. Biologic hazards: insects, poisonous plants, and animals	6	2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:				
3. Lowering fluid meter probe and measuring tape to detect fluid level and total depth	3a. Cuts / lacerations / bruises to knees (flush mount)	4	3a. Inspect ground before kneeling. Remove any objects. Don knee pads	2
	3b. Aches and strains from repetitive motion	4	3b. Do not use awkward positioning. Keep back straight, take regular rest/stretch breaks. Change position regularly.	2
	3c. Exposure to chemical hazards in groundwater resulting in skin irritation or illness	3	3c. Use smooth movements to avoid splashes. Don nitrile gloves over cut resistant gloves and safety glasses with side shields. Check gloves for damages/ rips.	2
On-Site Edits:				
4. Removing fluid meter measuring tape and probe from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness	4	4a. Stay upwind to avoid vapor exposure.	2
	4b. Cross contamination of equipment	4	4b. Clean the tape and probe using non-phosphate soap and distilled water. Wipe with clean paper towel. Collect decontamination materials for waste disposal. Wear disposable nitrile gloves.	2
	4c. Cuts / lacerations / bruises to knees (flush mount)	4	4c. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch.	2
	4d. Aches and strains from repetitive motion	4	4d. See Step 3b.	2
	4e. Trips / falls from entanglement in measuring tape	3	4e. Check for location of measuring tape before walking or moving around.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	**Control #:**	01-01-05-07

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
5. Closing well casings / flush-mount covers	5a. Cuts / lacerations / crushing / bruises	4	5a. Avoid touching sharp materials/ edges. Keep face, hands, fingers, and feet clear when opening and closing well cover. Don knee pads and inspect ground before kneeling down.	2
	5b. Back strain from heavy / awkward materials handling	4	5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly. * Verify that well covers are secure upon departure.	2
On-Site Edits:				
6. Gather gauging equipment and tools, place in work vehicle	6a. Cuts / lacerations / crushing / bruises from gathering or dropping equipment	3	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing.	2
	6b. Aches and strains from improper lifting	4	6b. Bend and lift with legs. Keep back straight. Take regular rest/ stretch breaks. Change position regularly. Team lift is required for items over 50 lbs. (or awkward items). * Verify all tools and equipment are removed from the site.	2
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	Control #:	01-01-05-07

All Employees:

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Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

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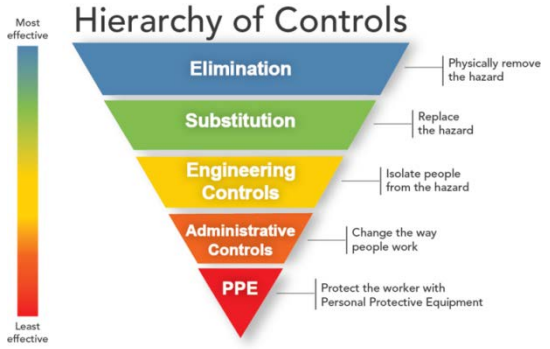

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Visitors review task hazards and acknowledge understanding
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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	**Geoprobe Drilling Oversight**	**Control #:**	**01-01-03-01**

Project Name:	Ashland Tank 75	Client:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile ☒ Hearing Protection ☐ Other:
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Mobilization	1a. Striking unidentified underground utilities	15	1a. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location.	4
	1b. Striking overhead utilities	15	1b. Follow the requirements of S3AM-322-PR1 Overhead Lines. Verify adequate clearance of all drilling locations prior to setting up at drilling location.	4
On-Site Edits:				
2. Setting up at drilling location	2a. Biological hazards causing bites, stings or other injury	8	2a. Examine ground surface for biological hazards prior to setting up equipment. If biological hazards exist, move equipment to a different area for set up if possible. Machetes, or other fixed open blade tools, are not permitted for clearing vegetation. Use insect repellent and check clothing for ticks periodically when applicable.	4
	2b. Struck by traffic	10	2b. Be alert to other vehicles or pedestrians if work area is in an area with public access. Communicate with any heavy equipment operators in the area to ensure they know where you and the equipment are located. Don high visibility vest.	4
	2c. Unstable Rig platform	10	2c. Verify with contractor that rig is set up level and properly chocked and blocked.	2
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Geoprobe Drilling Oversight**	**Control #:**	**01-01-03-01**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

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3. Oversight of rig inspection	3a. Mechanical failure of equipment	**10**	3a. Verify that drilling contractor inspects equipment daily using S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection or equivalent.	4
	3b. Emergency shut off disabled	6	3b. Verify that kill switch on rig is tested and operational	3
On-Site Edits:				
4. Drilling Oversight	4a. Flying debris, caught by/ struck by injuries	8	4a. Keep a safe distance away during rig operation. Do not talk on cell phone or be distracted by paperwork when in immediate proximity to rig. Wear PPE including hard hats, steel-toe safety boots, safety glasses, and hearing protection.	4
	4b. Caught in/by equipment	**10**	4b. Keep hands, feet and other body parts shall be kept away from moving parts. Do not approach operator without making eye contact and getting approval.	4
	4c. Exposure to contaminants	8	4c. Position yourself upwind of the borehole whenever possible. Perform air monitoring using a PID as described in the HASP. **STOP WORK** if the action level is exceeded, and don the appropriate PPE (i.e., full face APRs with combination P100/organic vapor cartridges, etc.), if allowed.	4
	4d. Noise-induced hearing loss	5	4d. Setup away from noisy operations. Don't be near the rig when hammering. Wear hearing protection.	3
On-Site Edits:				
5.	5a.		5a.	
On-Site Edits:				
6.	6a.		6a.	
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Geoprobe Drilling Oversight	Control #:	01-01-03-01

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7.	7a.		7a.	
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Geoprobe Drilling Oversight	Control #:	01-01-03-01

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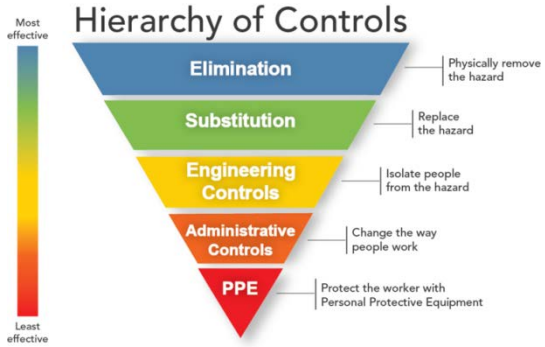

- ***Most hazards need more than one control***
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Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Groundwater Sampling – Low Flow	**Control #:**	01-01-05-12

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile, cut resistant ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Hand tools YSI Pump

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Visually clear proposed sampling locations	1a. Exposure to biological hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reactions, rabies.	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant, use a broom or a rake to move vegetation, not your hand or foot, move slowly	4
	1b. Slip/trips, falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1b. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well sampling in the area safe.	4
	1c. Struck by vehicle resulting in severe trauma or death	**10**	1c. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest.	4
On-Site Edits:				
2. Open well casing/flush-mount covers and well plug lock.	2a. Cuts/lacerations/crushing, bruises	6	2a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling. Don knee pads.	2
	2b. Back strain from improper lifting	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2
	2c. Vapor exposure resulting in	4	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Groundwater Sampling – Low Flow**	**Control #:**	**01-01-05-12**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!			
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	inhalation hazards or illness			
	2d. Biologic hazards; insects, poisonous plants, and animals	6	2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:				
3. Installing tubing in well and setting up equipment.	3a. Cuts/lacerations/crushing, bruises	6	3a. Avoid touching sharp material/edges. Keep face, hands, fingers feet clear when cutting tubing and setting up equipment. Wear cut resistant ANSI 2 gloves with disposable nitrile over gloves	2
On-Site Edits:				
4. Removing tubing from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness	4	4a. Stay upwind to avoid vapor exposure	2
	4b. Cuts/lacerations/bruises to knee (flush mount)	4	4b. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch	2
On-Site Edits:				
5. Closing well casings/flush mount covers	5a. Cuts/ lacerations/crushing, bruises	4	5a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers feet clear when closing well cover. Don knee pads and inspect ground before kneeling down.	2
	5b. Back strain from heavy/awkward material handling	4	5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Groundwater Sampling – Low Flow**	**Control #:**	**01-01-05-12**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
6. Gather sampling equipment and tools, place in work vehicle	6a. Cuts/lacerations/crushing/bruises from gathering or dropping equipment 6b. Aches and strains from improper lifting	3 4	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing. 6b. Bend and lift with legs. Keep back straight. Take regular rest/stretch breaks. Change position regularly. Team lift is required for items over 50 lbs (or awkward items)	2 2
On-Site Edits:				
7.	7a.		7a.	
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Groundwater Sampling – Low Flow	Control #:	01-01-05-12

All Employees:

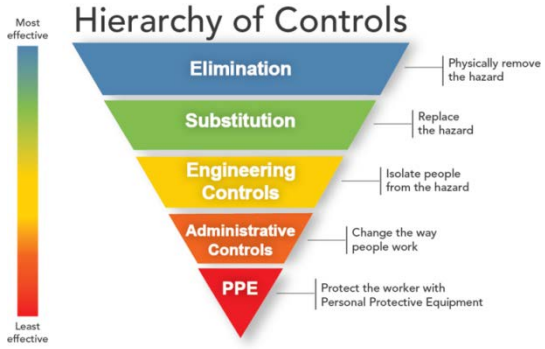
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Investigation Derived Waste Management	**Control #:**	01-01-14-02

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☐ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather or work gloves with Nitrile undergloves	☐ Hearing Protection	☒ Other: Tyvek as needed to protect skin and clothing	
Tools & Equipment:	Socket set	55-gallon open top drum	Emergency eyewash and rinse water	Spill kit Photoionization detector with 11.7 eV lamp

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Secure work area from traffic	1a. Struck by traffic	**10**	1a. Establish work area so that each site vehicle used for activity are in close proximity of each other; this would prevent unnecessary trips outside of work zone and into potential traffic area. Establish barricaded area using cones and barricade tape. Wear required highly visible clothing.	**4**
On-Site Edits:				
2. Prepare work area	2a. Trips & falls 2b. Tools and emergency equipment not present	6 8	2a. Clear any trip/fall hazards from work area. Scan ground prior to moving or walking 2b. Obtain tools and emergency equipment and stage adjacent to work area	4 4
On-Site Edits:				
3. Remove drum lid	3a. Pinch points at drum ring 3b. Sharp edges on drum ring or rim	6 7	3a. Use socket set to loosen drum ring, avoid placing fingers in to pinch points. Make sure cut-resistant gloves fit properly (not too big so fingertips get caught) 3b. Evaluate rim and ring for sharp edges, avoid handling as much as possible. Wear cut resistant gloves	4 4

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Investigation Derived Waste Management**	**Control #:**	**01-01-14-02**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!			
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
4. Load soil into drums	4a. Exertion/sprains/strains	8	4a. Exertion/sprains/strains • Use proper lifting techniques; this consists of bending your knees and lifting with your back straight. • Shovel loads heavier than 50 lbs or awkward to handle use a mechanical loading device or ask for help. • Grasp shovel handle properly: Position one hand at base of shovel handle and your other hand near the top of the handle. • Rotate task with others if needed and take breaks.	7
	4b. Exposure to contaminants	6	4b. Exposure • Set up upwind of drum. • Wear PPE (e.g., eye protection-goggles, long pants, Nitrile exam gloves, Nitrile over-gloves (11-mil), long wrist) Tyvek coveralls, shirt with sleeves, steel-toed shoes with boot covers, half-face air purifying respirator fitted with an organic vapor, acid, HEPA filter combination cartridge). • Perform air monitoring as per HASP. **STOP WORK** if action level is exceeded.	4
	4c. Slips/trips/falls	6	4c. Be alert for uneven and slippery terrain. Keep tools and equipment away from walking paths.	4
	4d. Sharp edges on drum rim	6	4d. Inspect rim for sharp and rough edges, avoid leaning into drum or placing hands onto rim edge Wear cut-resistant gloves	2
On-Site Edits:				
5. Replacing drum ring	5a. Pinch points	7	5a. Use socket set to tighten drum ring, avoid placing fingers in to pinch points. Make sure gloves fit properly (not too big so fingertips get caught)	5
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Investigation Derived Waste Management**	**Control #:**	**01-01-14-02**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
6. Moving/relocating drums	6a. Exertion	**15**	6a. Exertion • If drums must be moved utilize a drum dolly. • DO NOT ATTEMPT TO "WALK" or "ROCK" DRUMS TO MOVE THEM. • Drums can become unstable and easily tip-over causing possible damage and personal injury as well as releasing the material contained.	4
	6b. Trips and Falls	**6**	6b. See 2a above	5
On-Site Edits:				
7.	7a.		7a.	
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Investigation Derived Waste Management	Control #:	01-01-14-02

All Employees:

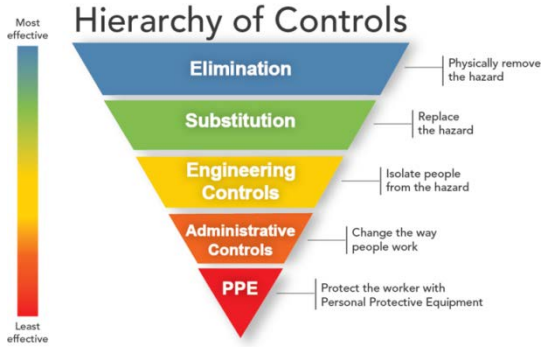
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Land/Geophyical/Gamma Walkover Survey – At-Grade	**Control #:**	01-01-10-06

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather/mechanic ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Survey Equipment Hammer Stakes/pins

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Setup and use typical survey equipment	1a. Straining back or other parts of body due to improperly lifting or moving heavy objects	4	1a. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from over the side of the truck bed	2
	1b. Bruising or broken bone in finger due to getting caught in a pinch point in the survey equipment.	4	1b. Avoid placing hands near the sides or bottom of the tailgate. Ensure no other workers have their hands near the pinch points and that hands should be all clear. Carefully use the survey equipment watching for pinch points. Wear leather or Kevlar gloves	3
	1c. Straining, tearing or fracturing body parts from slipping, tripping or falling from carrying too much equipment at one time	4	1c. Do not try to carry too much. If you are carrying something over your shoulder and in both hands, you are at a much greater chance to trip and cannot catch yourself. Make multiple loads or get assistance.	2
	1d. Straining a wrist, arm or neck or sustaining other ergonomic injury due to prolonged survey work	4	1d. Survey work can be repetitive – stretch regularly and report ergonomic injuries (strain, etc) as soon as you notice them.	3
	1e. Injury or illness caused by unwanted contact with various animals, insects or other biological hazards	4	1e. There are many different types of biological hazards that can be encountered on a work site. These include ticks, spiders, mosquitoes, chiggers, poisonous or other noxious plants, alligators, bears, small mammals, bird droppings, small mammals, snakes, etc. Consult S3AM-313-PR1 and the multiple attachments to determine the biological hazards that may be present and the mitigation measures for each.	3

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Land/Geophyical/Gamma Walkover Survey – At-Grade**	**Control #:**	**01-01-10-06**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	1f. Sunburn caused by over-exposure to direct sunlight	4	1f. Have sunblock available and apply and reapply as per directions. Avoid direct solar exposure when possible. Seek breaks in shaded areas	2
On-Site Edits:				
2. Hammering stakes/nails/benchmarks into ground	2a. Sustaining serious personal injury or utility damage from contacting nearby utilities	8	2a. Ensure subsurface clearance protocol and permit requirements are being followed (in many states one-call must be performed before driving benchmarks – which can be 36 inch long- into ground) before beginning work. If a utility, pea gravel, or non-native fill material is encountered, **STOP WORK** and call the PM	3
	2b. Straining back or pulling other muscles from repetitive hammering action	4	2b. Do not turn at waist, turn with arms and shoulders and keep both feet square. Be mindful to take breaks and rotate shifts.	3
	2c. Pinching hands or developing blisters from improper use of hammers and other equipment.	4	2c. Note line of fire and position hands where you cannot get struck by the hammer. Pay attention to the task at hand and avoid distractions. Wear gloves to avoid blisters and reduce chance of injury.	2
	2d. Eye injury due to flying debris	4	2d. Inspect tools and stakes/pins for chips, burs, and "mushrooming". Ensure no one is standing within 10' of your work area. Wear safety glasses when using the hammer to prevent flying debris from hitting eyes	2
On-Site Edits:				
3. Working near roadway	3a. Sustaining critical injuries caused by being struck by oncoming vehicles	**15**	3a. Place "Surveyor Ahead" signs when possible. Work outside guardrail whenever possible. Keep AECOM vehicle parked between you and oncoming traffic, with wheels pointed away from road, and all flashing lights on. Place cones between traveled way, and you. If working adjacent to high-speed roadway (55 mph or above), you MUST have a spotter who is observing traffic at all times. Wear high-visible vest.	4
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Land/Geophyical/Gamma Walkover Survey – At-Grade**	**Control #:**	**01-01-10-06**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!			
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4.	4a.		4a.	
On-Site Edits:				
5.	5a.		5a.	
On-Site Edits:				
6.	6a.		6a.	
On-Site Edits:				
7.	7a.		7a.	
On-Site Edits:				

Additional Notes:

Task Hazard Assessment

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Land/Geophyical/Gamma Walkover Survey – At-Grade	Control #:	01-01-10-06

All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
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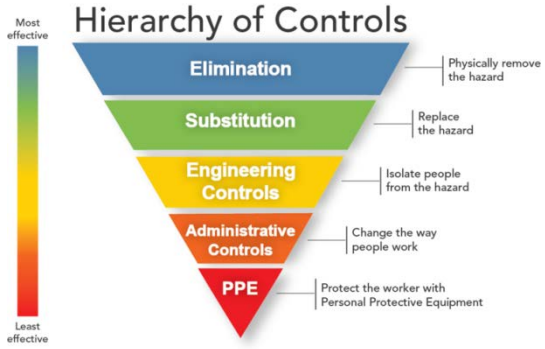

- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
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Printed Name	**Signature**
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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	**Load and Unload Vehicle**	**Control #:**	**01-01-12-04**

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: High vis mechanix style gloves ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Hand truck or dolly

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Load & Unload Vehicle	1a. Sprains/strains/ overexertion	8	1a. To minimize the risk: • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist. Do not lift over 49 lbs. without assistance. Seek assistance when needed and know your lifting limit • Minimize distance needed to move materials and stage loading and unloading areas as close as possible.	4
	1b. Pinch points between load and vehicle or between load items	**10**	1b. Know where your hands and other people's hands are at all times. Wear high vis gloves as a reminder. Avoid placing fingers under load while positioning. Use caution with tailgates and vehicle doors, especially under windy conditions.	4
	1c. Slips/trips/falls	**10**	1c. Inspect and clear walking path prior to beginning loading. Do not stack loads that impair visibility.	4
	1d. Nicks and cuts from equipment edges	6	1d. Inspect materials and equipment for rough edges and burrs. Wear cut resistant gloves.	4
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Load and Unload Vehicle**	**Control #:**	**01-01-12-04**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
2. Secure & cover exposed loads	2a. Line of fire hazards from straps/bungee cords	**15**	2a. Do not throw straps toward other personnel. Using extreme caution when stretching the bungee cord over a load. ALWAYS use safety glasses when handling bungee cords. Securing hook ends carefully and never extend the cord beyond its capacity of length or load. Keep your face and other parts away from the cord's rebound path just in case of failure or recoil.	4
	2b. Load shift in transit	**10**	2b. Use straps or bungee cords to properly secure load. Use a bulkhead to prevent heavy loads from shifting upon sudden stops.	4
	2c. Theft of tools & equipment	8	2c. Place any likely theft items out of sight and lock vehicle when leaving it. Do not leave vehicle unattended for longer than necessary. If at all possible, avoid leaving packed vehicles in public parking areas overnight, unload if possible. Park in well lighted areas.	4
On-Site Edits:				
3.	3a.		3a.	
On-Site Edits				
4.	4a.		4a.	

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Load and Unload Vehicle	Control #:	01-01-12-04

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Load and Unload Vehicle	Control #:	01-01-12-04

All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

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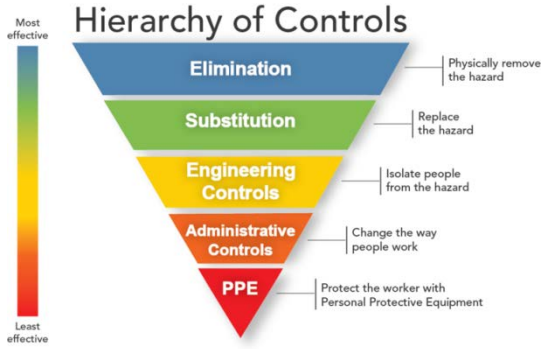

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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Monitoring Well Development (Utilizing Surge Blocks)	**Control #:**	01-01-05-13

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather/Nitrile ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Tubing Surge Block Pump

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Inspect and Open Wells	1a. Pinch Points between cover and ground, abrasion while opening lid with ratchet.	4	1a. UtRemove/replace manhole covers so that they do not pinch fingers. Wear leather gloves for this task.	2
	1b. Back Strain	6	1b. Utilize proper lifting procedure when removing covers – Bend at the knees and lift with your legs rather than bending/lifting with your back.	2
On-Site Edits:				
2. Attach surge block to tubing and lower in well.	2a. Pinch points	4	2a. Note and avoid pinch points between block and well casing. Wear coated nitrile gloves, or leather gloves when handling tubing.	2
	2b. Overhead hazards, back strain.	6	2b. Watch out for overhead hazards. If well is at deeper depth to be performed comfortably by one person it may be necessary to use two people to insert/handle tubing.	4
On-Site Edits:				
3. Surge well.	3a. Repetitive Motion injury from moving surging up and down.	6	3a. Take frequent breaks as needed to prevent fatigue to shoulder/arm/back muscles caused by surging well. Be aware of the signs/symptoms of repetitive stress injuries (tingling, sharp pains, numbness) and report all symptoms immediately.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Monitoring Well Development (Utilizing Surge Blocks)**	**Control #:**	**01-01-05-13**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
4. Bail or pump water from well. Purge Water Handling	4a. Repetitive motion bailing/pumping well.	6	4a. Take frequent breaks as needed to prevent fatigue to shoulder/arm/back muscles caused by surging well. Be aware of the signs/symptoms of repetitive stress injuries and report all symptoms immediately.	2
	4b. Exposure from splashes during bailing/pumping activities.	4	4b. Wear additional PPE (Tyvek) if deemed necessary, pace bailing actions. Wear eye protection, long pants, nitrile gloves, and steel-toed boots.	2
	4c. Spill or release of impacted water.	4	4c. Have spill pillows/socks available to contain any release or impacted water spill.	2
	4d. Slip, trip, fall.	6	4d. Wear appropriate PPE (eye protection, long pants, leather gloves, long sleeves, steel-toed boots.	2
	4e. Back strain.	6	4e. Use proper lifting technique (lift with the knees) while handling purge water containers/buckets. Secure bucket lids to prevent splashes/spills.	2
On-Site Edits:				
5. Remove tubing from well.	5a. Exposure to contaminants.	4	5a. When removing tubing use nitrile gloves and paper towels (if necessary to wipe down tubing) as removed. Wipe tubing in downward motion.	2
	5b. Overhead/Horizontal hazards.	4	5b. Remove and coil tubing as removed or lay-out on ground surface. Ensure that tubing on ground surface does not hinder any nearby operations.	2
	5c. Back strain.	6	5c. Depending on depth of well, two people may be needed to hold/guide tubing out of the well. Dispose of tubing within a contractor trash bag.	2
On-Site Edits:				
6. Decontamination - Soak/spray durable equipment to prevent cross-contamination between multiple well locations;	6a. Exposure to decontamination chemicals	4	6a. Wear appropriate PPE (eye protection, long sleeves and pants, nitrile gloves, steel-toed boots). Avoid contact with all decontaminated chemicals (Liquinox, Alconox, Simple Green, methanol, and any other solvents used on development equipment). Store decontaminated equipment in clean dry area.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Monitoring Well Development (Utilizing Surge Blocks)**	**Control #:**	**01-01-05-13**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
properly store disposable equipment				
On-Site Edits:				
7. Replace well cap and cover	7a. Pinch Points	4	7a. Refer to **1b** and **2a** above.	2
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Monitoring Well Development (Utilizing Surge Blocks)	Control #:	01-01-05-13

All Employees:

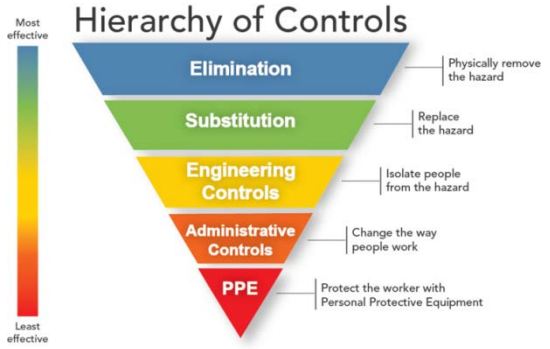
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Slug Test	**Control #:**	01-01-05-10

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, Nirtrile ☒ Hearing Protection If ambient noise lever > 85dbA ☐ Other: _____
Tools & Equipment:	Transducer, PBC slug or pump Absorbent material Interface probe Carbon bucket

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. 1. Load tools and slug test supplies	**1a**. Injury from exertion, fall, exposure, and contact **1b.** Damage or injury from shifting equipment in transit	6	**1a.** Review list of material required. Load enough supplies and materials for completion of the job to avoid unnecessary trips. ➢ Load vehicle close to materials location in a clear, well-lighted area ➢ Use proper lifting techniques (Bend and lift with the knees, not the back. Get a firm grip and do not twist while lifting the transducer or other objects) ➢ Don work gloves when handling objects. **1b.** Secure objects and supplies prior to travel	4
On-Site Edits:				
2. Access to well vault; remove lock and protective cap from well	**2a**. Pinch points/abrasion **2b**. Exposure to site contaminants and biological hazards **2c.** Inhalation injury from organic vapor, risk of fire or explosion from elevated organic vapor levels.	6 6 **10**	**2a**. Wear leather or similar work gloves while removing locks or opening well caps. **2b**. Don appropriate PPE (i.e., nitrile gloves). ➢ Inspect well cap for insects (i.e., bees, etc.). ➢ Use insect spray if needed. **2c**. Review and understand action levels in the HASP. ➢ Monitor breathing zone of workers with PID if product odors are present. ➢ Monitor any enclosure with PID if product odors are present. ➢ Ensure Level C PPE is available for potential upgrade as required in the HASP	4 4 4

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Slug Test	**Control #:**	01-01-05-10

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
3 . Introduce transducer, PVC slug, or pump into well to change water level elevation and collect readings	**3a.** Exposure to site contaminants **3b**. Exertion resulting in muscle strain / sprain	**10** 8	**3a.** See 2c. above. **3b**. Use proper lifting techniques, do not lift > 50 pounds without assistance.	4 4
On-Site Edits:				
4. Introduce the PVC slug. ***Note:*** *The PVC slug must remain submerged for a falling head slug test or remove the PVC slug for a rising head slug test.*	**4a**. Exposure to site contaminants **4b**. Exertion **4c**. Product release	**10** 8 8	**4a.** See 2c. above **4b.** See 3b. above Use proper lifting techniques that consists of bending at the knees and lifting with your legs while maintaining your back in a straight position. ➢ Wear PPE including gloves when handling transducer and other equipment and supplies. **4c.** Place absorbent pads around well	4 4 4
On-Site Edits:				
5. Demobilize to next location or complete scope; Retrieve transducer, PVC slug, or pump if applicable from the well	**5a.** Muscle Strain and Sprain form Exertion **5b.** Exposure to groundwater contaminate **5c.** Exposure to decontaminating materials	6 8 6	**5a.**See 3b. above **5b.** Avoid splashing. Pull pump slowly. Wear nitrile gloves, safety glasses, long sleeve shirt **5c.** As above	4 4 4
On-Site Edits:				
	6a.		6a.	

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Slug Test**	**Control #:**	**01-01-05-10**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Slug Test	Control #:	01-01-05-10

All Employees:

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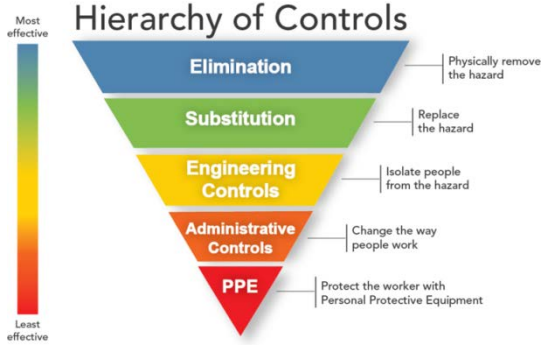

- ***Most hazards need more than one control***
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- ***PPE can NEVER be your only means of protection***

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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Soil Sampling with Hand Auger	**Control #:**	01-01-09-01

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile, CR ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Hand auger w/extensions Sampling kit

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Setup equipment	1a. Cuts or hand injuries from pinch points	3	1a. Inspect for broken welds on auger. If broken welds or cracks – **STOP WORK**. Wear cut resistant gloves at all times and avoid handling the sharp edges of the auger cup. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools	2
	1b. Back strain/ overexertion when unloading equipment	4	1b. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from the side of the truck bed	2
On-Site Edits:				
2. Advancing hand auger	2a. Contacting utilities causing serious personal injury or death.	**10**	2a. Ensure subsurface clearance protocol and permit requirements are being followed before beginning work. Turn the auger slowly and if refusal is met, remove the auger from the borehole and inspect the cause of refusal. If a utility, pea gravel, or non-native fill material is encountered, **STOP WORK** and call the PM.	4
	2b. Back strain or pulled muscle from rotating hand auger.	6	2b. Do not yank on the auger handle. Do not turn at waist, turn with arms and shoulders, keep feet square and lift with legs, do not work with arms above head. Take breaks and rotate work. Use short extensions as you advance to avoid.	4
	2c. Injury from slip, trip, fall.	4	2c. Clear the work area of trip hazards. Walk around bore hole, never over it and cover hole with delineator when unattended.	3
	2d. Injury to eyes from flying debris.	3	2d. If it is windy, stand upwind and switch to goggles to prevent dirt entering eye.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name: Soil Sampling with Hand Auger	**Control #:** 01-01-09-01

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

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On-Site Edits:				
3. Collecting soil samples	3a. Contact with contaminated soil.	4	3a. Use clean sampler to touch soil. Wear nitrile gloves over the cut resistant gloves at all times. If nitrile tears, stop work and replace glove. For samples with high volatile organics content (PID in breathing zone is constantly above site limits stated in HASP (>5 ppm)) wear breathing protection as stated in HASP. Change Nitriles between samples to avoid cross contamination	2
	3b. Cut from handling auger, sampling tools, jars	6	3b. Inspect containers before and during filling. Do not use if chipped or cracked. Pack containers in coolers so that they will not shift (spacers/ packing materials as needed). Do not over pack coolers.	3
	3c. Muscle strain in back or legs from bending over or squatting	3	3c. Evaluate work surface height (see if chair/ table needed) and sample jar placement to eliminate ergonomic issues. Avoid squatting and bending	2
On-Site Edits:				
4. Adding extensions to auger	4a. Cuts or hand injuries from pinch points	3	4a. Avoid placing hands near connection points of extensions and avoid the sharp edges of the auger cup. Wear cut resistant gloves at all times	2
	4b. Striking another person	3	4b. Check that the swing radius of the auger is clear before moving it	2
	4c. Contacting overhead structure	**10**	4c. Before raising the auger vertically, verify that no overhead lines or structures are present **STOP WORK** and move if electrical lines are in the area	4
On-Site Edits:				
5. Breakdown and decontaminate equipment.	5a. Contact with contaminants and cut hazards	5	5a. Inspect before handling for chips or cracks in glass containers. Wear nitrile gloves over cut resistant gloves. If nitrile tears, stop work and replace glove.	2
	5b. Breaking a sample container resulting in cut, or contact with contents/preservatives	3	5b. Handle containers with care and position over padded or soft surface in case it slips from hand. Place in packing materials that will protect against collisions.	2
	5c. Striking another person	4	5c. Before disassembling auger, verify that no one is in the swing radius.	3

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name: Soil Sampling with Hand Auger	**Control #:** 01-01-09-01

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
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On-Site Edits:				
6.	6a.		6a.	
On-Site Edits:				
7.	7a.		7a.	
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Soil Sampling with Hand Auger	Control #:	01-01-09-01

All Employees:

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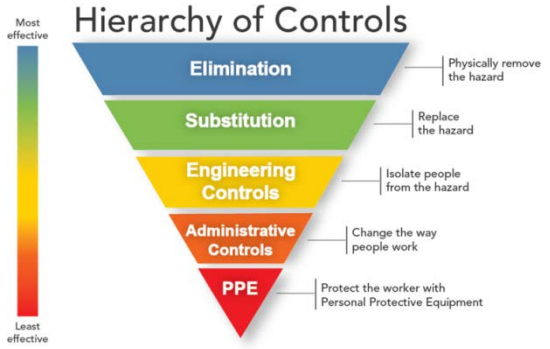

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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	**Soil Sampling (Surface) with Trowel**	**Control #:**	**01-01-09-13**

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile, CR ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Trowel Sampling kit

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Setup equipment	1a. Cuts or hand injuries from pinch points	3	1a. Inspect tools. If broken welds or cracks – **STOP WORK**. Wear cut resistant gloves when working with tools. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools	2
	1b. Back strain/ overexertion when unloading equipment	4	1b. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from the side of the truck bed	2
On-Site Edits:				
2. Collecting samples	3a. Contact with contaminated soil/water.	4	3a. Use clean sampler to touch soil. Wear nitrile gloves over the cut resistant gloves at all times. If nitrile tears, stop work and replace glove. For samples with high volatile organics content (PID in breathing zone is constantly above site limits stated in HASP (>5 ppm)) wear breathing protection as stated in HASP. Change Nitriles between samples to avoid cross contamination	2
	3b. Cut from handling auger, sampling tools, jars	6	3b. Inspect containers before and during filling. Do not use if chipped or cracked. Pack containers in coolers so that they will not shift (spacers/ packing materials as needed). Do not over pack coolers.	3
	3c. Muscle strain in back or legs from bending over or squatting	3	3c. Evaluate work surface height (see if chair/ table needed) and sample jar placement to eliminate ergonomic issues. Avoid squatting and bending	2
	3d. Falling into water/drowning	**10**	3d. Wear personal flotation device and have a buddy present when within 3 feet of water.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name: Soil Sampling (Surface) with trowel	**Control #:** 01-01-09-13

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
3. Breakdown and decontaminate equipment.	5a. Contact with contaminants and cut hazards	6	5a. Inspect before handling for chips or cracks in glass containers. Wear nitrile gloves over cut resistant gloves. If nitrile tears, stop work and replace glove.	2
	5b. Breaking a sample container resulting in cut, or contact with contents/preservatives	6	5b. Handle containers with care and position over padded or soft surface in case it slips from hand. Place in packing materials that will protect against collisions.	2
	3e. Striking another person	4	3e. Before moving equipment, verify that no one is in the swing radius.	3
On-Site Edits:				
4.	4a.		4a.	
On-Site Edits:				
5.	5c.		5c.	
On-Site Edits:				
6.	6a.		6a.	

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name: Soil Sampling (Surface) with trowel	**Control #:** 01-01-09-13

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
7.	7a.		7a.	

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Soil Sampling (Surface) with trowel	Control #:	01-01-09-13

All Employees:

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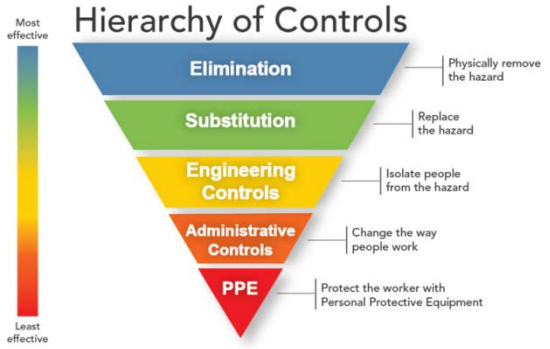
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com
Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Surface Water Sampling	**Control #:**	01-01-26-05

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather/mechanic, Leather / Nitrile ☐ Hearing Protection ☒ Other: PFD and waders nitrile, CR
Tools & Equipment:	Sample device PID Unit Bottled water and eyewash

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Inspect area of approach	1a. Slips, trips, fall hazards	8	1a. Evaluate approach: • Investigate planned approach for rocks, branches, debris and other slip/trip/fall hazards. • Evaluate angle of approach and minimize as best as possible. If necessary, secure self to a stationary object using a back belt to provide additional stability. • Have a buddy system in place. • Use a pack to secure tools, sample jars, etc. to have hands free	4
	1b. Animals/Insect bites	6	1b. Inspect area for snakes, insects, and small animals.	4
	1c. Exposure/drowning from falling into water	**15**	1c. Use the buddy system. Stay back from the water's edge as far as possible. Wear a PFD if within 6' of water 3' deep or deeper. Maintain awareness of surroundings and maintain communication between team members; identify potential hazards prior to entering area and avoid, when possible	4
On-Site Edits:				
2. Insert swing sampler with swing jar holder into water body and collect liquid samples in sampling container	2a. Exposure to sample preservatives causing burns to skin/eyes	8	2a. Avoid contact with preservatives. If contacted: • Flush skin/eyes with water. • Refer to the SDS for specific information relating to the type of preservative • Wear long sleeves, nitrile gloves over cut-resistant gloves and safety glasses	4
	2b. Cuts to skin from cracked			

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Surface Water Sampling (Swing Sampler)**	**Control #:**	**01-01-26-05**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	or broken glassware	6	2b. Inspect all glassware before handling. Wear cut resistant gloves when handling broken glassware.	4
On-Site Edits:				
3. Soak/spray durable equipment to prevent cross-contamination	3a. Exposure to decontamination chemicals	6	3b. Avoid contact with all decontamination chemicals including (Liquinox, Simple Green, Methanol and any other solvents used on sampling equipment. Avoid splashing. Wear disposable nitrile gloves.	4
On-Site Edits:				
4.	4a.		4a.	4 4
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Surface Water Sampling (Swing Sampler)	Control #:	01-01-26-05

All Employees:

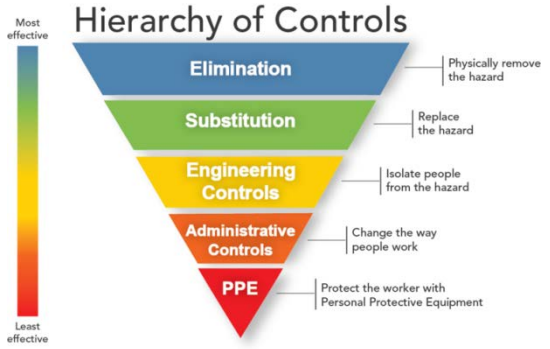
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	**Working Over Water**	**Control #:**	**01-01-18-01**

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☒ Safety Glasses ☐ HiVis Vest ☐ Safety Toe Boots	☒ Gloves: Leather work gloves or mechanix style gloves	☐ Hearing Protection : ☒ Other— PFD, Float Coat, or Mustang Suit depending on temperature
Tools & Equipment:			

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Pre-work planning	1a. Unprepared for performing work	**15**	1a. Follow the requirements of S3AM-315-PR1, Work Over Water and S3AM-333-PR1, Marine Safety Operations **INCLUDING ALL APPLICABLE ATTACHMENTS.**	**10**
	1b. Untrained/unqualified Captain of vessel	**12**	1b. Verify that captain of vessel is fully qualified to operate the class of vessel to be deployed. he boat operator must possess sufficient experience for the boat operation and trained in the following: ▪ Know the hazards that may be faced during the operation. ▪ Proper use of all equipment. ▪ Recognizes any warning signs of a dangerous or prohibited situation. ▪ Safety requirements for boat launching and exiting from the waterway. ▪ Knowledgeable in how to summon rescue and other emergency services as soon as the operator determines that the boat occupants may need assistance to escape from the waterway hazards.	8
	1c. Inadequate or missing safety or emergency equipment	**10**	1c. Verify that the vessel is inspected and all emergency equipment specified in the marine Safety Equipment procedure, S3AM-333-ATT5.	4
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Work Over Water	01-01-18-01

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions To Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
2. Boarding vessel	2a. Exposure or drowning from falling into waterway	**15**	3a. Watercraft should remain tied to secure anchoring point during loading and unloading activities. When boarding and exiting, do not attempt to carry other tools or equipment, always maintain on hand on the vessel.	8
	2b. Pinch points between docks and the sides of the boat	6	2b. Be aware of hand position when boarding and exiting vessel	3
On-Site Edits:				
3. Working from watercraft – Environmental Concerns	3a. Exposure or drowning from falling into waterway	**10**	3a. Wear proper PPE (e.g., eye protection, leather gloves, long pants, shirt with sleeves, steel-toe shoes, booties, life vest/preserver). Use the buddy system at all times. • At least two individuals or employees are required and both shall be equipped with a life vest and other appropriate PPE dictated by the atmosphere and other hazards. • If one individual must lean outside of the boat confines to perform a task, a lifeline must be attached to the individual. • If the individual falls out of the boat, the lifeline will permit the individual from floating away from the immediate work area and permit a less hazardous rescue. **Note:** If the passenger of the boat should fall into the waterway, the boat operator should never attempt a rescue by leaving the boat. • Unless the boat is anchored, the operator of the boat shall remain at the steering controls at all times.	8
	3b. Inclement weather	**10**	3b. Know what conditions that exist that prevent boating including small craft weather advisory, ice flows or ice packs on waterway ,thunderstorms, high wind, excessive boat traffic, etc. **STOP WORK** and exit the water if these conditions exist or can be anticipated.	6
	3c. Hypothermia	**10**	3c. Discuss symptoms of hypothermia before deployment. Have a means of warming (hot liquids, hand warmers, etc., and a set of dry clothing, etc. available on the vessel. Change into dry clothing if you become wet at cold temperatures.	

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Work Over Water	01-01-18-01

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions To Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
			When the water temperature is between 40 and 50 degrees Fahrenheit, field personnel working on the river or canal shall wear a float coat (top half of a Mustang Suit) or a one-piece survival suit. When the water temperature is less than 40 degrees Fahrenheit, field personnel shall wear either a float coat with bib-overalls (a full two-piece Mustang Suit), or a one-piece survival suit.	5
	3d. Heat stress/heat stress	6	3d. Provide adequate drinking water and electrolytes. Have a heat stress control plan (including shelters, work rotation, methods of cooling). Review prevention, symptoms and treatment guidance before deployment.	4
	3e. Sunburn	8	3e. Wear sunscreen and hat, prevent as much solar exposure as possible.	5
On-Site Edits:				
4. Working from watercraft – Physical Hazards	4a. Vessel unstable, vessel collapse, or overweight	**12**	4a. Select correct vessel for the work & do not carry weight in excess of vessel capacity. Allow for fuel and weight of samples, etc., to be brought on board.	4
	4b. Slips/trips/falls on vessel	**10**	4b. Avoid standing up in vessel. If necessary, have one hand holding onto the boat. Keep Practice good housekeeping to keep the ground around the sampling location clear of obstructions, equipment and other tripping hazards. Whenever there exists the possibility of falling into water, personnel must be attired in a USCG approved Type III or Type V work vest. The vest must be properly sized for the individual and must be secured at all times.	4
	4c. Striking submerged underwater hazards or going aground on mud flats or shallow bottoms	8	4c. Be aware of tidal levels and proximity to shallow water. Be aware of underwater debris near site and shoreline.	4
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Work Over Water	01-01-18-01

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
5. Working from watercraft – Biological Hazards	5a. Poisonous plants, ticks, mosquitoes and other insects	6	5a. Assess work area for poisonous plants and communicate observations to avoid them. All field clothing and equipment should be thoroughly cleaned, removed and/or segregated from clean clothing, equipment and supplies to avoid transfer of hazardous plants oils and inspects. If contact with poisonous plants or ticks are unavoidable, use controls including the use of disposable (Tyvek) coveralls, insect repellent (23.8% DEET or similar), light colored clothing, barrier creams, and frequent tick checks. All employees should bath immediately following fieldwork and use soaps/ cleansers designed to remove oils associated with poison oak, and conduct a full body tick check using a mirror.	4
On-Site Edits:				
6.	5a.		5a.	
On-Site Edits:				
7.	6a.		6a.	
On-Site Edits:				

Task Hazard Analysis

Task Name:	Work Over Water	01-01-18-01

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Work Over Water	01-01-18-01

All Employees:

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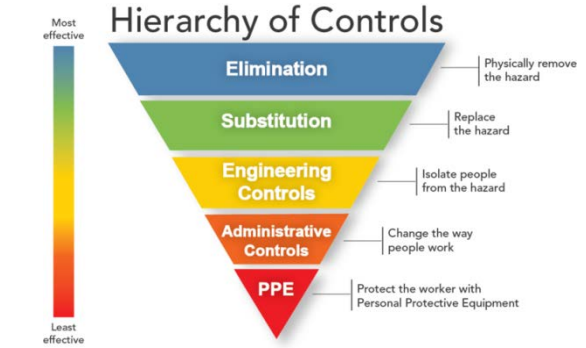

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Task Hazard Analysis

Task Name:	Work Over Water	01-01-18-01

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment – DCSA

AECOM Imagine it. Delivered.

Task Name:		**Control #:**	

Project Name:	Ashland Tank 75	**Client**:	Ashland LLC	**Date:**	3/17/2023
Permits Required? (list):		**Work Location:**	4625 River Road, Tonawanda, NY 14150		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: _____ ☐ Hearing Protection ☐ Other: _____
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

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1.	1a.		1a.	
On-Site Edits:				
2.	2a.		2a.	
On-Site Edits:				
3.	3a.		3a.	
On-Site Edits:				

Task Hazard Assessment – DCSA

AECOM Imagine it. Delivered.

Task Name:		**Control #:**	

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4.	4a.		4a.	
On-Site Edits:				
5.	5a.		5a.	
On-Site Edits:				
6.	6a.		6a.	
On-Site Edits:				
7.	7a.		7a.	
On-Site Edits:				

Additional Notes:

Task Hazard Assessment – DCSA

AECOM Imagine it. Delivered.

Task Name:		Control #:	

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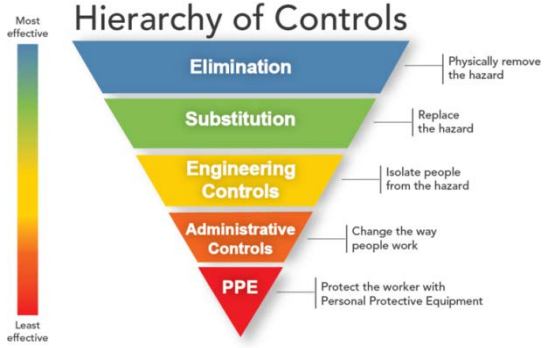

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AECOM

Americas

Daily Tailgate Meeting

S3AM-209-FM5

Instructions: Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics. **This meeting is a daily refresher, not a full orientation**. Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.

AECOM Supervisor Name:
Phone Number:

AECOM SH&E Rep. Name:
Phone Number:

Meeting Leader:

DCS Americas - This form may be replaced by the electronic Daily Tailgate Meeting Tool. Link - Ecosystem Daily Tailgate Meeting App Site

Date:	**Project Name/Location: Ashland Tank 75**	**Project Number: 60669081**

Today's Scope of Work:

Muster Point Location:	**First Aid Kit Location:**	**Fire Extinguisher Location:**	**Spill Kit Location:**

1. Required Topics

- ☐ Fitness for Duty requirements, all sign in / sign out
- ☐ Required training (incl. task specific) completed and current
- ☐ SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, preplanning hazard assessments / risk registers, controls, procedures, requirements, etc.)
- ☐ Task Hazard Assessments (THAs) are to be reviewed and completed for each task immediately prior to conducting
- ☐ STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA
- ☐ Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition
- ☐ Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location
- ☐ Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all
- ☐ Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified
- ☐ Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public
- ☐ Required checklists/records available, understood (describe):
- ☐ Lessons Learned / SH&E improvements (describe):

2. Discuss if Applicable to Today's Work

Check ☑ as reviewed or mark ■ as not applicable

☐	Biological/ Chemical / Electrical Hazards
☐	Ergonomics - Lifting, Body Position
☐	Lock Out/ Tag Out
☐	Short Service Employees - visual identifier and mentor/ oversight assignment
☐	Simultaneous/ Neighboring Operations
☐	Slip/ Trip/ Fall Hazards
☐	Specialized PPE Needs
☐	Traffic Control
☐	Waste Management/ Decontamination
☐	Weather Hazards / Heat Stress / Cold Stress
☐	Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.)
☐	Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach):
☐	Other Topics (describe/attach):
☐	Client specific requirements (describe):

3. Daily Check Out by Site Supervisor

Describe incidents, near misses, observations or Stop Work interventions from today:	Describe Lessons Learned/ Improvement Areas from today:

The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.

Site Supervisor Name	**Signature**	**Date** **Time** (at end of day / shift)

Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

4. Daily Check for COVID-19

Question	Yes	No
Is social distancing being practiced?		
Are hand sanitary/wipes available for project team?		
Are tail gate safety meetings held outdoors?		
Are remote/call in job meetings held?		
Is PPE (i.e. gloves, masks, eye protection) being used?		
Are field cleaning/disinfection practices being implemented?		
Are workers/visitors excluded based on close contact with individuals diagnosed with COVID-19, recent travel to restricted areas or countries, symptomatic (fever, chills, cough/shortness of breath)?		
Does any worker have a temperature of >100.4° F, persistent cough or shortness of breath? If so, describe actions taken:_____		

All employees:

- **STOP WORK if concerned / uncertain about safety / hazard or additional precaution is not recorded on the THA.**
- **Be alert and communicate any changes in personnel or conditions at the worksite to the supervisor.**
- **Reassess task, hazards, & mitigations on an ongoing basis; amend the THA if needed.**

SITE WORKERS (including AECOM Contractors and Subcontractors): Your signature below means that you understand:

* The requirement to participate in creating, reviewing, & updating hazard assessments (THA) applicable to your task(s).
* The hazards & control measures associated with each task you are about to perform.
* The permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
* That no tasks or work is to be performed without a hazard assessment.
* Your authority & obligation to "Stop Work" intervene, speak up/ listen up.

Your initials (right columns) certify that you arrived & departed fit for duty, & have reported all incidents/near misses; meaning:

* You are physically and mentally fit for duty and have inspected your required PPE to ensure satisfactory condition.
* You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
* You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or impairment/fatigue issue to the AECOM Supervisor.
* You signed out as fit / uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit

(Attach additional Site Worker sign-in/out sheets if needed) Identify number of attached sheets: _____

SITE VISITOR / SITE REPRESENTATIVE

Name	Company Name	Arrival Time	Departure Time	Signature

Discuss as Applicable and Modify THA as Needed

Check ☑ if reviewed or mark N/A

- ☐ *Biological / Chemical / Electrical Hazards*
- ☐ *Decontamination Procedures*
- ☐ *Ergonomics – Lifting, Body Position*
- ☐ *Lock Out / Tag Out*
- ☐ *Short Service Employees – visual identifier and mentor / oversight assignment*
- ☐ *Simultaneous / Neighboring Operations*
- ☐ *Slip / Trip / Fall Hazards*
- ☐ *Specialized PPE Needs*
- ☐ *Traffic Control*
- ☐ *Waste Management / Decontamination*
- ☐ *Weather Hazards / Heat Stress / Cold Stress*
- ☐ *Work Permit Requirements:* Click here to Identify OR type N/A
- ☐ *Other:* Click here to Describe OR type N/A

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & Safety Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & Safety Director

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Using the Matrix:

1. Identify basic steps of the task and associated hazards.
2. Calculate the initial risk rating.
3. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating.
4. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

AECOM

Attachment D

Applicable AECOM SHE Procedures

(provided in hard copy)

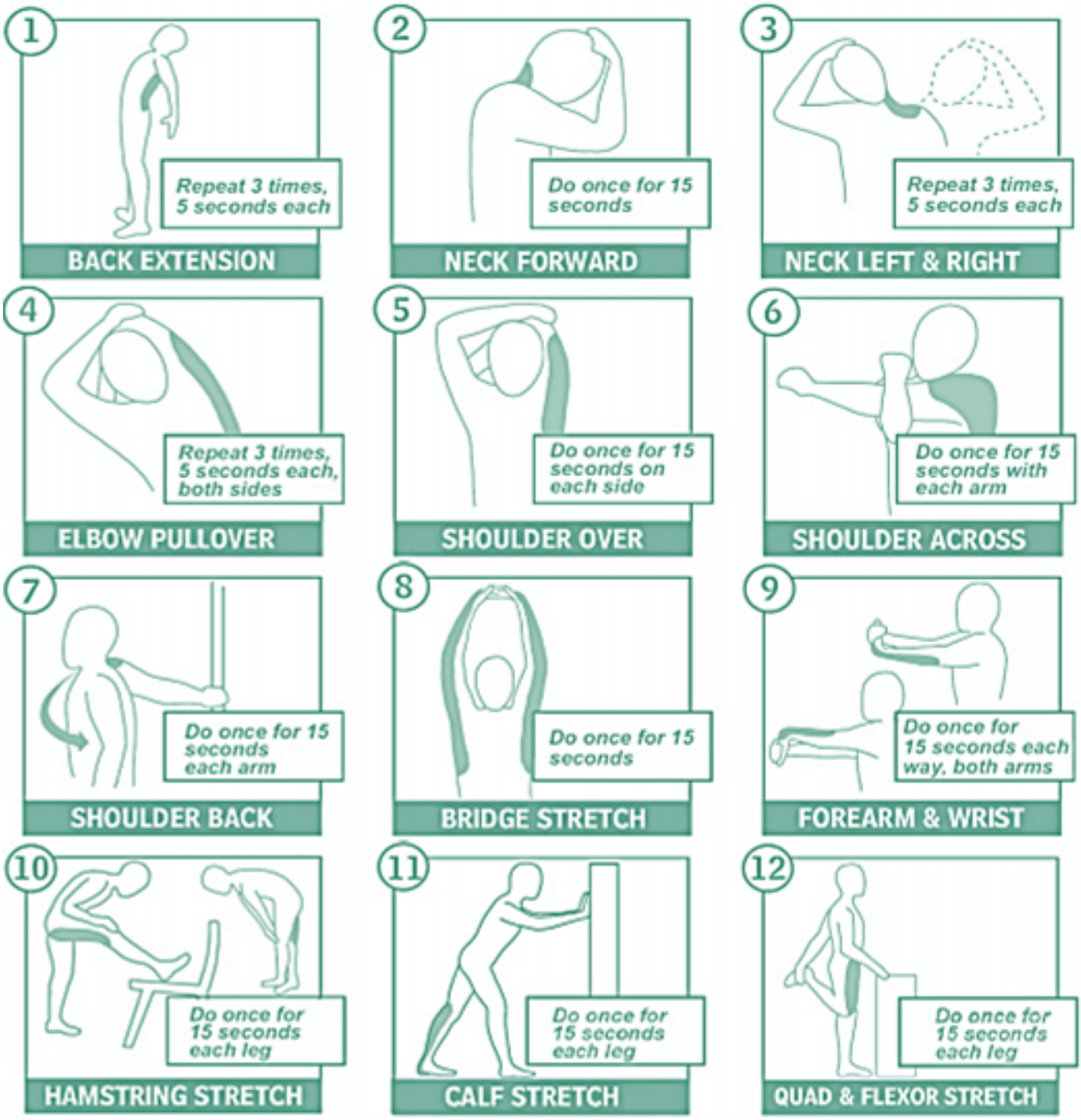
AECOM

Attachment E

Stretch/Flex Poster

Attachment E: Stretch/Flex Poster

Examples of Stretches



AECOM

Attachment F

Site Safety Orientation

Attachment F: Site Safety Orientation

AECOM will conduct a site safety briefing for a person's initial visit to the site. The briefing will be conducted:

- Prior to the start of work;
- For any new AECOM or subconsultant personnel;
- For Site Visitors; and
- At each mobilization, or whenever there is a change in task or significant change in task location.

All personnel working on the project who have received the site briefing (including the SWP review) will sign the Personal Acknowledgement located in **Section 18**. Visitors may receive a shortened version to address the hazards specific to their visit.

The following topics, at minimum, will be discussed during the site safety briefing:

- Contents of this SWP;
- The Emergency Response Plan (Table 7-1);
- Contractor SHE Management expectations;
- Injury management, including notification and hospital and occupational clinic locations;
- The AECOM 4-Sight program;
- Stop Work authority;
- The THAs (**Attachment C**) for the activities that will be performed on a given job;
- Types of hazards at the site and means for minimizing exposure to them;
- Instructions for new operations to be conducted, and safe work practices;
- PPE that must be used;
- Lone worker check-in procedures;
- Emergency evacuation routes, muster points, and tornado/storm shelters; and
- Location and use of emergency equipment.
- **These briefings must be documented and maintained in the project files.**

AECOM

Attachment G

Safety Data Sheets

Attachment G: Safety Data Sheets

SAFETY DATA SHEET

Revision Date 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Cadmium**

Cat No. : **C3-500**

CAS No 7440-43-9
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids	Category 2
Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 2
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	
Combustible dust	Yes

Label Elements

Signal Word

Danger

Hazard Statements
Flammable solid
May form combustible dust concentrations in air
Fatal if inhaled
Harmful if swallowed
Harmful in contact with skin
May cause respiratory irritation
Suspected of causing genetic defects
May cause cancer
Suspected of damaging fertility. Suspected of damaging the unborn child
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Skin
IF ON SKIN: Wash with plenty of soap and water
Wash contaminated clothing before reuse
Call a POISON CENTER or doctor/physician if you feel unwell
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING. Cancer and Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Cadmium	7440-43-9	100

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion Do NOT induce vomiting. Call a physician or poison control center immediately.

Most important symptoms and effects None reasonably foreseeable. . Kidney disorders: May cause harm to the unborn child: Blood disorders

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available

Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Fine dust dispersed in air may ignite. Dust can form an explosive mixture with air. Pyrophoric properties of solids and liquids. Do not allow run-off from fire-fighting to enter drains or water courses.

Hazardous Combustion Products
Toxic fumes.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	1	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment as required. Avoid dust

formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere. Incompatible Materials. Strong oxidizing agents. Strong acids. Sulfur oxides.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cadmium	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³	Ceiling: 0.3 mg/m³ Ceiling: 0.6 mg/m³ (Vacated) STEL: 0.3 ppm TWA: 0.1 mg/m³ TWA: 0.2 mg/m³ TWA: 5 µg/m³	IDLH: 9 mg/m³	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures When using do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes or clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. Physical and chemical properties

Physical State Solid

Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	321 °C / 609.8 °F
Boiling Point/Range	765 °C / 1409 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	8.64 @ 25°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cd
Molecular Weight	112.40

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under recommended storage conditions. Moisture sensitive. Air sensitive.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. Exposure to air or moisture over prolonged periods.

Incompatible Materials Strong oxidizing agents, Strong acids, Sulfur oxides

Hazardous Decomposition Products Toxic fumes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cadmium	LD50 = 2330 mg/kg (Rat)	Not listed	LC50 = 25 mg/m³ (Rat) 30 min

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Cadmium	7440-43-9	Group 1	Known	A2	X	A2

IARC (International Agency for Research on Cancer)	*IARC (International Agency for Research on Cancer)* *Group 1 - Carcinogenic to Humans* *Group 2A - Probably Carcinogenic to Humans* *Group 2B - Possibly Carcinogenic to Humans*
NTP: (National Toxicity Program)	*NTP: (National Toxicity Program)* *Known - Known Carcinogen* *Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*
ACGIH: (American Conference of Governmental Industrial Hygienists)	*A1 - Known Human Carcinogen* *A2 - Suspected Human Carcinogen* *A3 - Animal Carcinogen* *ACGIH: (American Conference of Governmental Industrial Hygienists)*

Mutagenic Effects Possible risk of irreversible effects

Reproductive Effects Possible risk of impaired fertility. May cause harm to the unborn child.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure Kidney Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Kidney disorders: May cause harm to the unborn child: Blood disorders

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cadmium	Not listed	LC50: 0.0004 - 0.003 mg/L, 96h (Pimephales promelas) LC50: = 0.016 mg/L, 96h (Oryzias latipes) LC50: = 21.1 mg/L, 96h flow-through (Lepomis macrochirus) LC50: = 0.24 mg/L, 96h static (Cyprinus carpio) LC50: = 4.26 mg/L, 96h semi-static (Cyprinus carpio) LC50: = 0.002 mg/L, 96h	Not listed	EC50: = 0.0244 mg/L, 48h Static (Daphnia magna)

		(Cyprinus carpio) LC50: = 0.006 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 0.003 mg/L, 96h flow-through (Oncorhynchus mykiss)		

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Technical Name	Cadmium
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

TDG

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IATA

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IMDG/IMO

UN-No	UN2930
Proper Shipping Name	Toxic solid, flammable, organic, n.o.s.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Cadmium	7440-43-9	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Cadmium	7440-43-9	X	-	231-152-8	X	X		X	X	KE-04397

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Cadmium	7440-43-9	100	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Cadmium	-	-	X	X

Clean Air Act

OSHA - Occupational Safety and Health Administration: Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Cadmium	5 µg/m³ TWA 2.5 µg/m³ Action Level	-

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Cadmium	10 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Cadmium	7440-43-9	Carcinogen Developmental Male Reproductive	0.05 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Cadmium	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Cadmium	-	Use restricted. See item 72. (see link for restriction details) Use restricted. See item 23. (see link for restriction details) Use restricted. See item 28. (see link for restriction details) Use restricted. See item 75. (see link for restriction details)	SVHC Candidate list - 231-152-8 - Carcinogenic, Article 57a;Specific target organ toxicity after repeated exposure, Article 57(f) - human health

After the sunset date the use of this substance requires either an authorization or can only be used for exempted uses, e.g. use in scientific research and development which includes routine analytics or use as intermediate.

https://echa.europa.eu/authorisation-list
https://echa.europa.eu/substances-restricted-under-reach
https://echa.europa.eu/candidate-list-table

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Cadmium	7440-43-9	Listed	Not applicable	Not applicable	0.01% (Max. Conc.)

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Cadmium	7440-43-9	Not applicable	Not applicable	Not applicable	Annex I - Y26

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Date Issued : 3/30/2012
MSDS No : M-1000-155

Iron metal pieces

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Iron metal pieces
GENERAL USE: Physical vapor deposition of thin films

MANUFACTURER

Kurt J Lesker Company
United States
1925 Route 51
Jefferson Hills, PA 15025
Customer Service: 412-387-9200
E-Mail: msds@lesker.com
Kurt J Lesker Company LTD
United Kingdom
15-16 Burgess Road
Hastings, East Sussex, TN35 4NR
England
Customer Service: +44 (0) 1424 458100

24 HR. EMERGENCY TELEPHONE NUMBERS

24-Hour Emergency Response provided by
3E Global Incident Response Hotline

When calling, refer to Kurt J Lesker Company
Global Response Access Code: 333594

North America [USA, Canada, Mexico]: 1-866-519-4752
Mainland China: (+86) 4001 2001 74
Europe: {int'l call prefix}-1-760-476-3961
Asia Pacific: {int'l call prefix}-1-760-476-3960
Middle East & Africa: {int'l call prefix}-1-760-476-3959

2. HAZARDS IDENTIFICATION

GHS CLASSIFICATIONS

Health:

This substance or mixture is not hazardous and is not classified under GHS.

EMERGENCY OVERVIEW

PHYSICAL APPEARANCE: Grey metal

IMMEDIATE CONCERNS: Negligible fire or explosion hazard in bulk form. Powdered material may form explosive dust-air mixtures.

POTENTIAL HEALTH EFFECTS

EYES: Contact may cause eye irritation.

SKIN: May cause skin irritation.

INGESTION: Low ingestion hazard in normal use.

INHALATION: May cause respiratory irritation.

REPRODUCTIVE TOXICITY

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

CARCINOGENICITY: Not listed as a human carcinogen

MUTAGENICITY: Not Available

MEDICAL CONDITIONS AGGRAVATED: None expected.

ROUTES OF ENTRY: Inhalation, ingestion, eye contact, or skin contact.

SENSITIZATION: None expected.

PHYSICAL HAZARDS: This substance is not considered hazardous in the form supplied. Dusts at sufficient concentrations can form explosive mixtures with air.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	Wt.%	CAS
Iron	100	7439-89-6

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water. Get medical attention, if irritation persists.

SKIN: Wash with soap and water. Get medical attention if irritation develops or persists.

INGESTION: Rinse mouth. Get medical advice/attention.

INHALATION: No specific treatment is necessary since this material is not likely to be hazardous by inhalation. If exposed to excessive levels of dusts or fumes, remove to fresh air and get medical attention if cough or other symptoms develop.

SIGNS AND SYMPTOMS OF OVEREXPOSURE

ACUTE TOXICITY: Poses little or no immediate hazard.

CHRONIC EFFECTS: Not Available

5. FIRE FIGHTING MEASURES

FLAMMABLE CLASS: Noncombustible except as a powder.

EXTINGUISHING MEDIA: Use a Class D dry powder extinguisher, dolomite, dry sand, graphite, or soda ash.

EXPLOSION HAZARDS: Dusts at sufficient concentrations can form explosive mixtures with air.

FIRE FIGHTING PROCEDURES: As in any fire, wear self-contained breathing apparatus pressure-demand, (MSHA/NIOSH approved or equivalent) and full protective gear.

HAZARDOUS DECOMPOSITION PRODUCTS: Toxic metal fumes

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Clean up spills immediately, observing precautions in Protective Equipment section.

LARGE SPILL: Collect spilled material in appropriate container. Spill may be reportable . Consult section 15 for Reportable Quantities.

ENVIRONMENTAL PRECAUTIONS

WATER SPILL: This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water.

GENERAL PROCEDURES: Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Eliminate all ignition sources if safe to do so. Avoid formation of dust. Provide appropriate exhaust ventilation where dust is formed. Avoid breathing (dust, vapor, mist, gas). Practice good chemical hygiene during and after use. Avoid release to the environment.

7. HANDLING AND STORAGE

GENERAL PROCEDURES: To avoid risks to human health and the environment, comply with the instructions for use.

HANDLING: Avoid formation of dust. Provide appropriate exhaust ventilation where dust is formed.

STORAGE: Keep container closed when not in use. Store in a cool dry place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses.

SKIN: Wear protective gloves.

RESPIRATORY: Not normally needed. If ventilation is inadequate and this material is handled at elevated temperatures or dusts/fumes/mists are generated a NIOSH/MSHA approved air purifying respirator with a manufacturers approved cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

WORK HYGIENIC PRACTICES: Practice good chemical hygiene during and after use.

COMMENTS: There are no established workplace exposure limits for components of this product.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Solid

ODOR: None

COLOR: Grey

pH: NA = Not Applicable

PERCENT VOLATILE: NA = Not Applicable

FLASH POINT AND METHOD: NA = Not Applicable

FLAMMABLE LIMITS: NA = Not Applicable

AUTOIGNITION TEMPERATURE: NA = Not Applicable

VAPOR PRESSURE: NA = Not Applicable

VAPOR DENSITY: NA = Not Applicable

BOILING POINT: 2862°C

MELTING POINT: 1538°C

SOLUBILITY IN WATER: Insoluble

DENSITY: 7.874 at 25°C

MOLECULAR WEIGHT: 55.845

10. STABILITY AND REACTIVITY

STABLE: Yes

HAZARDOUS POLYMERIZATION: No

HAZARDOUS DECOMPOSITION PRODUCTS: Toxic metal fumes

INCOMPATIBLE MATERIALS: Strong acids, Oxidizing materials, Halogens, Ammonium Nitrate.

11. TOXICOLOGICAL INFORMATION

ACUTE

DERMAL LD_{50}: Not Available

SKIN ABSORPTION: Not Available

ORAL LD_{50}: 30000 mg/kg (oral, rat)

INHALATION LC_{50}: Not Available

NOTES: Estimated toxic dose for humans is 20 mg/kg.

CARCINOGENICITY

IARC: Not listed

NTP: Not listed

OSHA: Not listed

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

MUTAGENICITY: Not Available

12. ECOLOGICAL INFORMATION

BIOACCUMULATION/ACCUMULATION: 14 day Bioconcentration Factor (BCF) =1000 (Penaeus aztecus)

AQUATIC TOXICITY (ACUTE)

96-HOUR LC_{50}: .56 mg/L (Cyprinus carpio)

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of according to applicable federal, state, provincial, and local regulations.

PRODUCT DISPOSAL: Material may be recyclable.

EMPTY CONTAINER: Follow all MSDS/label precautions even after container is emptied because it may retain product residues.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

PROPER SHIPPING NAME: NA = Not Applicable

ROAD AND RAIL (ADR/RID)

PROPER SHIPPING NAME: Not Regulated

AIR (ICAO/IATA)

SHIPPING NAME: NA = Not Applicable

VESSEL (IMO/IMDG)

SHIPPING NAME: NA = Not Applicable

CANADA TRANSPORT OF DANGEROUS GOODS

SHIPPING NAME: NA = Not Applicable

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

311/312 HAZARD CATEGORIES: None

TSCA (TOXIC SUBSTANCE CONTROL ACT)

TSCA STATUS: All components of this product are included in inventory, exempt, or notified

REGULATIONS

STATE REGULATIONS:

The following components appear in one or more of the following state hazardous substances lists

Component	CAS	CA	MA	MN	NJ	PA	RI
Iron	7439-89-6	No	No	No	Yes	Yes	No

CALIFORNIA PROPOSITION 65: This product is not known to contain any components for which the State of California has found to cause cancer, birth defects or other reproductive harm.

CANADA

WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM): Not Regulated

DOMESTIC SUBSTANCE LIST (INVENTORY): All components of this product are included in inventory, exempt, or notified

16. OTHER INFORMATION

APPROVED BY: EHS DEPT

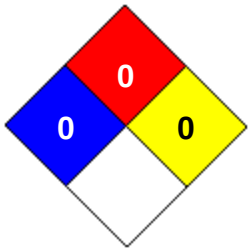
PREPARED BY: E Bolton

INFORMATION CONTACT: msds@lesker.com

HMIS RATING

HEALTH	0
FLAMMABILITY	0
PHYSICAL HAZARD	0
PERSONAL PROTECTION	B

NFPA CODES



MANUFACTURER DISCLAIMER:

Kurt J. Lesker Company ("KJLC") believes the information contained in this Material Safety Data Sheet is accurate as of the "Date of Last Revision" specified. The information relates only to typical properties of the product. Do not use the information for product

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Lead

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 12/15/2014 Revision date: 12/15/2014 Version: 1.1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Substance

CAS No : 7439-92-1

Formula : Pb

Synonyms : C.I. 77575, in massive state / elemental lead, in massive state / glover, in massive state

BIG no : 10073

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Solder
Battery: component
Construction
Electrodes

1.3. Details of the supplier of the safety data sheet

GSC International, Inc.
1747 N. Deffer Drive
Nixa,
MO 65714
United States of America

Tel: 417-374-7431
Fax: 417-374-7442
Email: info@gscinternationalinc.com

1.4. Emergency telephone number

Country	Organization/Company	Address	Emergency number
MEXICO	Servicio de Informacion Toxicologica Sintox	Tintoreto #32 Edif. a Desp. Col. Nochebuena Mixcoac México, D.F.	1 800 009 2800 +52 55 5611 2634 /+52 55 5598 9095
UNITED STATES OF AMERICA	American Association of Poison Control Centers		1-800-222-1222

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Acute Tox. 4 (Oral)	H302
Acute Tox. 4 (Inhalation)	H332
Carc. 1B	H350
Repr. 1A	H360
STOT RE 2	H373
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS07 GHS08 GHS09

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H302+H332 - Harmful if swallowed or if inhaled
H350 - May cause cancer
H360 - May damage fertility or the unborn child
H373 - May cause damage to organs through prolonged or repeated exposure

H400 - Very toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US) : P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust, fume
P264 - Wash hands thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P308+P313 - If exposed or concerned: Get medical advice/attention
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container to a licensed hazardous-waste disposal contractor or collection site except for empty clean containers which can be disposed of as non-hazardous waste

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS-US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Name	Product identifier	%	Classification (GHS-US)
Lead (Main constituent)	(CAS No) 7439-92-1	> 99,9	Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation), H332 Carc. 1B, H350 Repr. 1A, H360 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

4.1. Description of first aid measures

First-aid measures general : If you feel unwell, seek medical advice. IF exposed or concerned: Get medical advice/attention. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Not applicable. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after skin contact : Not applicable. Wash skin with plenty of water.

First-aid measures after eye contact : Not applicable. Rinse eyes with water as a precaution.

First-aid measures after ingestion : Not applicable. Rinse mouth. Call a poison center/doctor/physician if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : No effects known.

Symptoms/injuries after skin contact : No effects known.

Symptoms/injuries after eye contact : No effects known.

Symptoms/injuries after ingestion : No effects known.

Chronic symptoms : No effects known.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Adapt extinguishing media to the environment.

Unsuitable extinguishing media : No unsuitable extinguishing media known.

5.2. Special hazards arising from the substance or mixture

Fire hazard : DIRECT FIRE HAZARD. Non combustible.

Explosion hazard	:	DIRECT EXPLOSION HAZARD. No data available on direct explosion hazard. INDIRECT EXPLOSION HAZARD. No data available on indirect explosion hazard.
Reactivity	:	On burning: formation of metallic fumes. Oxidizes on exposure to air.

5.3. Advice for firefighters

Precautionary measures fire	:	Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to heat: have neighborhood close doors and windows.
Firefighting instructions	:	Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus. Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Protective clothing. See "Material-Handling" to select protective clothing.
Emergency procedures	:	Mark the danger area. No naked flames.

6.1.2. For emergency responders

Protective equipment	:	Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment. Prevent soil and water pollution. Prevent spreading in sewers. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment	:	Not applicable. Collect spillage.
Methods for cleaning up	:	Recover mechanically the product. Pick-up the material. Take collected spill to manufacturer/competent authority. Notify authorities if product enters sewers or public waters.
Other information	:	Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Meet the legal requirements. Do not discharge the waste into the drain. Handle unclean empty containers as full ones. Observe strict hygiene. Measure the concentration in the atmosphere. Carry out operations in the open/under local exhaust/ventilation or with respiratory protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust, fume. Use only outdoors or in a well-ventilated area. Take all necessary technical measures to avoid or minimize the release of the product on the workplace. Limit quantities of product at the minimum necessary for handling and limit the number of exposed workers. Provide local exhaust or general room ventilation. Wear personal protective equipment. Floors, walls and other surfaces in the hazard area must be cleaned regularly.
Hygiene measures	:	Separate working clothes from town clothes. Launder separately. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Does not require any specific or particular technical measures. Comply with applicable regulations.
Storage conditions	:	Store locked up. Store in a well-ventilated place. Keep cool.
Incompatible materials	:	Strong acids, strong bases and oxidation agents.
Heat-ignition	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: oxidizing agents. Strong acids. Strong bases.
Storage area	:	Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: closing. correctly labeled. meet the legal requirements. Secure fragile packaging in solid containers.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Lead (7439-92-1)		
ACGIH	ACGIH TWA (mg/m³)	0,05 mg/m³
ACGIH	Remark (ACGIH)	CNS & PNS impair
OSHA	Not applicable	

8.2. Exposure controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Ensure good ventilation of the work station.

Personal protective equipment : Protective goggles. Gloves.

Materials for protective clothing : GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: butyl rubber. PVC. GIVE LESS RESISTANCE: No data available. GIVE POOR RESISTANCE: No data available.

Hand protection : protective gloves.

Eye protection : Safety glasses.

Skin and body protection : Not required for normal conditions of use.

Respiratory protection : Wear respiratory protection.

Environmental exposure controls : Avoid release to the environment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid

Appearance : Metal.

Molecular mass : 207,20 g/mol

Color : White to blue-grey

Odor : Odorless

Odor threshold : No data available

pH : No data available

Relative evaporation rate (butyl acetate=1) : No data available

Melting point : 327 °C

Freezing point : No data available

Boiling point : 1740 °C

Flash point : Not applicable

Auto-ignition temperature : No data available

Decomposition temperature : No data available

Flammability (solid, gas) : No data available

Vapor pressure : < 0,1 hPa

Relative vapor density at 20 °C : No data available

Relative density : 11,3

Specific gravity / density : 11340 kg/m³

Solubility : insoluble in water. Substance sinks in water. Soluble in nitric acid. Insoluble in organic solvents. Water: < 0,1 g/100ml

Log Pow : 0,73 (Estimated value)

Log Kow : No data available

Viscosity, kinematic	:	Not applicable
Viscosity, dynamic	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Explosive limits	:	No data available

9.2. Other information

VOC content : Not applicable (inorganic)

SECTION 10: Stability and reactivity

10.1. Reactivity

On burning: formation of metallic fumes. Oxidizes on exposure to air.

10.2. Chemical stability

Unstable on exposure to air.

10.3. Possibility of hazardous reactions

No additional information available

10.4. Conditions to avoid

No additional information available

10.5. Incompatible materials

Acids. Bases.

10.6. Hazardous decomposition products

Thermal decomposition generates : fume.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed. Inhalation: Harmful if inhaled.

Lead (\f)7439-92-1	
LD50 oral rat	> 2000 mg/kg body weight (Rat; Weight of evidence)
LD50 dermal rat	> 2000 mg/kg body weight (Rat; Experimental value; OECD 402: Acute Dermal Toxicity)
ATE US (oral)	500,000 mg/kg body weight
ATE US (gases)	4500,000 ppmV/4h
ATE US (vapors)	11,000 mg/l/4h
ATE US (dust, mist)	1,500 mg/l/4h
Additional information	Lead massive metal is not considered to be acutely toxic. It is not easily inhaled or ingested, and if it is accidentally ingested normally passes through the gastrointestinal system without significant absorption into the body. Lead is not easily absorbed through the skin.

Skin corrosion/irritation : Not classified
(Based on available data, the classification criteria are not met)

Serious eye damage/irritation : Not classified
(Based on available data, the classification criteria are not met)

Respiratory or skin sensitization : Not classified
(Based on available data, the classification criteria are not met)

Germ cell mutagenicity : Not classified
(Based on available data, the classification criteria are not met)

Carcinogenicity : May cause cancer.

Lead (7439-92-1)	
Additional information	There is some evidence that inorganic lead compounds may have a carcinogenic effect, and they have been classified by IARC as probably carcinogenic to humans. However, it is considered that this classification does not apply to lead in articles, given the very low bioavailability of metallic lead. Carcinogenicity studies of lead metal powder have been negative. Epidemiology studies of workers exposed to inorganic lead compounds have found a limited association with stomach cancer. IARC has concluded that lead metal is possibly carcinogenic to humans (Group aB).
IARC group	2B - Possibly carcinogenic to humans
National Toxicology Program (NTP) Status	3 - Reasonably anticipated to be Human Carcinogen

Reproductive toxicity : May damage fertility or the unborn child.

Specific target organ toxicity (single exposure) : Not classified

(Based on available data, the classification criteria are not met)

Specific target organ toxicity (repeated exposure) : May cause damage to organs through prolonged or repeated exposure.

Lead (7439-92-1)	
Additional information	Lead is a cumulative poison and may be absorbed into the body through ingestion or inhalation. Although inhalation and ingestion of lead in massive form are unlikely, poor hygiene practises may result in hand to mouth transfer which maybe significant over a prolonged period of time. Inorganic lead compounds have been documented in observational human studies to produce toxicity in multiple organ systems and body function including the haemotopoetic (blood) system, kidney function, reproductive function and the central nervous system.

Aspiration hazard : Not classified

(Based on available data, the classification criteria are not met)

Symptoms/injuries after inhalation : No effects known.

Symptoms/injuries after skin contact : No effects known.

Symptoms/injuries after eye contact : No effects known.

Symptoms/injuries after ingestion : No effects known.

Chronic symptoms : No effects known.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Dangerous for the environment. Very toxic to aquatic life with long lasting effects.

Ecology - air : Not dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of fluorinated greenhouse gases (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.2/II.

Ecology - water : No water pollutant (surface water). Maximum concentration in drinking water: 0.010 mg/l (lead) (Directive 98/83/EC). Highly toxic to aquatic organisms.

Lead (7439-92-1)	
LC50 fish 1	2,8 (0,44 - 542) mg/l (96h) Coughlan, D.J., S.P. Gloss, and J. Kubota 1986. Acute and Sub-Chronic Toxicity of Lead to the Early Life Stages of Small mouth Bass (Micropterus dolomieui). Water Air Soil Pollut. 28(3/4):265-275
EC50 Daphnia 1	4,46 (0,53 - 5,1) mg/l (48h) Govindarajan, S., C.P. Valsaraj, R. Mohan, V. Hariprasad, and R. Ramasubramanian 1993. Toxicity of Heavy Metals in Aquaculture Organisms: Penaeus indicus, Perna viridis, Artemia salina and Skeletonema costatum. Pollut.Res. 12(3):187-189

12.2. Persistence and degradability

Lead (7439-92-1)	
Persistence and degradability	Biodegradability: Not applicable. No (test)data available on mobility of the substance.
ThOD	Not applicable (inorganic)

12.3. Bioaccumulative potential

Lead (7439-92-1)	
Log Pow	0,73 (Estimated value)
Bioaccumulative potential	Low bioaccumulation potential (Log Kow < 4).

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on ozone layer :

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Reuse or recycle following decontamination. Remove to an authorized dump (Class I). Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001).

Additional information : LWCA (the Netherlands): KGA category 05. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

In accordance with DOT

Transport document description : UN3077 Environmentally hazardous substances, solid, n.o.s. Lead(7439-92-1), 9, III

UN-No.(DOT) : UN3077

Proper Shipping Name (DOT) : Environmentally hazardous substances, solid, n.o.s.
Lead(7439-92-1)

Department of Transportation (DOT) Hazard Classes : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140

Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)

DOT Symbols : G - Identifies PSN requiring a technical name

Packing group (DOT) : III - Minor Danger

DOT Special Provisions (49 CFR 172.102)	:	8 - A hazardous substance that is not a hazardous waste may be shipped under the shipping description "Other regulated substances, liquid or solid, n.o.s.", as appropriate. In addition, for solid materials, special provision B54 applies. 146 - This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in 171.8 of this subchapter, or any hazard class as defined in Part 173 of this subchapter, if it is designated as environmentally hazardous by the Competent Authority of the country of origin, transit or destination. 335 - Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as "Environmentally hazardous substances, solid, n.o.s," UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leak-proof when used as bulk packaging. A112 - Notwithstanding the quantity limits shown in Column (9A) and (9B) for this entry, the following IBCs are authorized for transportation aboard passenger and cargo-only aircraft. Each IBC may not exceed a maximum net quantity of 1,000 kg: a. Metal: 11A, 11B, 11N, 21A, 21B and 21N b. Rigid plastics: 11H1, 11H2, 21H1 and 21H2 c. Composite with plastic inner receptacle: 11HZ1, 11HZ2, 21HZ1 and 21HZ2 d. Fiberboard: 11G e. Wooden: 11C, 11D and 11F (with inner liners) f. Flexible: 13H2, 13H3, 13H4, 13H5, 13L2, 13L3, 13L4, 13M1 and 13M2 (flexible IBCs must be sift-proof and water resistant or must be fitted with a sift-proof and water resistant liner). B54 - Open-top, sift-proof rail cars are also authorized. IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2). IP3 - Flexible IBCs must be sift-proof and water-resistant or must be fitted with a sift-proof and water-resistant liner. N20 - A 5M1 multi-wall paper bag is authorized if transported in a closed transport vehicle. T1 - 1.5 178.274(d)(2) Normal..... 178.275(d)(2) TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	155
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	213
DOT Packaging Bulk (49 CFR 173.xxx)	:	240
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	No limit
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	No limit
DOT Vessel Stowage Location	:	A - The material may be stowed ''on deck'' or ''under deck'' on a cargo vessel and on a passenger vessel.

Additional information

Other information : No supplementary information available.

ADR

No additional information available

Transport by sea

UN-No. (IMDG)	:	3077
Proper Shipping Name (IMDG)	:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Class (IMDG)	:	9 - Miscellaneous dangerous compounds
Packing group (IMDG)	:	III - substances presenting low danger

Air transport

UN-No.(IATA)	:	3077
Proper Shipping Name (IATA)	:	Environmentally hazardous substance, solid, n.o.s.
Class (IATA)	:	9 - Miscellaneous Dangerous Goods
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Lead (7439-92-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Listed on United States SARA Section 313 Not listed on the United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	10 lb

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Repr. 1A	H360Df
Acute Tox. 4 (Inhalation)	H332
Acute Tox. 4 (Oral)	H302
STOT RE 2	H373
Aquatic Acute 1	H400
Aquatic Chronic 1	H410

Full text of H-phrases: see section 16

Classification according to Directive 67/548/EEC [DSD] or 1999/45/EC [DPD]

Repr.Cat.1; R61
Repr.Cat.3; R62
Xn; R20/22
R33
N; R50/53

Full text of R-phrases: see section 16

15.2.2. National regulations

Lead (7439-92-1)
Listed on IARC (International Agency for Research on Cancer) Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

No additional information available

SECTION 16: Other information

Revision date : 12/15/2014

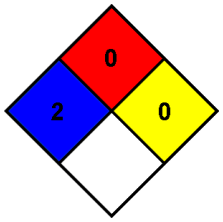
Full text of H-phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 1	Hazardous to the aquatic environment - Acute Hazard Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment - Chronic Hazard Category 1
Carc. 1B	Carcinogenicity Category 1B
Repr. 1A	Reproductive toxicity Category 1A
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H302	Harmful if swallowed
H332	Harmful if inhaled
H350	May cause cancer
H360	May damage fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects

NFPA health hazard : 2 - Intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical attention is given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : * Chronic Hazard - Chronic (long-term) health effects may result from repeated overexposure

Flammability : 0 Minimal Hazard

Physical : 0 Minimal Hazard

Personal Protection : B

SDS US (GHS HazCom 2012)

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

SAFETY DATA SHEET

Creation Date 24-Nov-2010 **Revision Date** 25-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Manganese, powder, -325 mesh**

Cat No. : **AC317440000; AC317440010; AC317442500**

CAS No 7439-96-5
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable solids	Category 2
Serious Eye Damage/Eye Irritation	Category 2

Label Elements

Signal Word
Warning

Hazard Statements
Flammable solid
Causes serious eye irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting equipment
Wear protective gloves/protective clothing/eye protection/face protection
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Manganese	7439-96-5	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention.

Inhalation Remove from exposure, lie down. Remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

Ingestion Clean mouth with water. Get medical attention.

Most important symptoms and effects No information available.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Dry chemical.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available
Explosion Limits

Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Combustible material.

Hazardous Combustion Products
None known.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	2	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment as required.
Environmental Precautions	See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling	Avoid contact with skin and eyes. Do not breathe dust. Use spark-proof tools and explosion-proof equipment. Use only non-sparking tools.
Storage.	Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat, sparks and flame. Keep under nitrogen. Incompatible Materials. Acids. Bases. Halogens.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Manganese	TWA: 0.02 mg/m³ TWA: 0.1 mg/m³	(Vacated) TWA: 1 mg/m³ Ceiling: 5 mg/m³ (Vacated) STEL: 3 mg/m³ (Vacated) Ceiling: 5 mg/m³	IDLH: 500 mg/m³ TWA: 1 mg/m³ STEL: 3 mg/m³	TWA: 0.2 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures	Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Dark brown
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	1260 °C / 2300 °F
Boiling Point/Range	1900 °C / 3452 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Mn
Molecular Weight	54.94

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Moisture sensitive.

Conditions to Avoid Incompatible products. Exposure to moisture.

Incompatible Materials Acids, Bases, Halogens

Hazardous Decomposition Products None under normal use conditions

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Manganese	LD50 = 9 g/kg (Rat)	Not listed	LC50 > 5.14 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Manganese	7439-96-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Manganese	Not listed	LC50: > 3.6 mg/L, 96h semi-static (Oncorhynchus mykiss)	Not listed	Not listed

Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT
UN-No UN3089
Proper Shipping Name Metal powder, flammable, n.o.s.
Technical Name Manganese
Hazard Class 4.1
Packing Group III

TDG
UN-No UN3089
Proper Shipping Name Metal powder, flammable, n.o.s.
Hazard Class 4.1
Packing Group III

IATA

UN-No	UN3089
Proper Shipping Name	Metal powder, flammable, n.o.s.
Hazard Class	4.1
Packing Group	III

IMDG/IMO

UN-No	UN3089
Proper Shipping Name	Metal powder, flammable, n.o.s.
Hazard Class	4.1
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Manganese	7439-96-5	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Manganese	7439-96-5	X	-	231-105-1	X	X		X	X	KE-22999

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Manganese	7439-96-5	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island

Manganese	X	X	X	X	X

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Manganese	7439-96-5	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Manganese	7439-96-5	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 24-Nov-2010
Revision Date 25-Dec-2021
Print Date 25-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 27-Jan-2010 **Revision Date** 24-Dec-2021 **Revision Number** 8

1. Identification

Product Name **Methylene chloride**

Cat No. : **D37-1; D37-4; D37-20; D37-200; D37-200LC; D37-500; D37FB-19; D37FB-50; D37FB-115; D37FB-200; D37POP-19; D37POPB-50; D37POPB-200; D37RB-19; D37RB-50; D37RB-115; D37RB-200; D37RS-19; D37RS-28; D37RS-50; D37RS-115; D37RS-200; D37SK-4; D37SK-4LC; D37SS-28; D37SS-50; D37SS-115; D37SS-200; D37SS-1350; D37RS1000ASME; NC1485726; D37RE200ASME; NC1568702; NC1641358; XXMECLDOW2000; XXMECLDOW200LI; NC1870181; D37ETSS1350; XXD37ET200LI; NC1948847; D37SS-19; NC2047457**

CAS No 75-09-2
Synonyms Dichloromethane; DCM

Recommended Use Laboratory chemicals.
Uses advised against . This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 1B

Specific target organ toxicity (single exposure) Target Organs - Central nervous system (CNS).	Category 3
Specific target organ toxicity - (repeated exposure) Target Organs - Liver, Kidney, Blood.	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)

Other hazards
Contains a known or suspected endocrine disruptor.
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Methylene chloride	75-09-2	>99.5

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Ingestion Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects . Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Causes central nervous system depression: Continued or high exposures by inhalation will cause anaesthetic effects. This may result in a loss of consciousness and could prove fatal: Causes formation of carbon monoxide in the blood. Carbon monoxide may cause adverse effects on the cardiovascular system and the central nervous system

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray, carbon dioxide (CO2), dry chemical, alcohol-resistant foam.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature 556 °C / 1032.8 °F

Explosion Limits
Upper 23 vol %
Lower 13 vol %
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO). Carbon dioxide (CO_2). Phosgene. Hydrogen chloride gas.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	1	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment as required. Ensure adequate ventilation.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Vapors are heavier than air and may spread along floors. Handle product only in closed system or provide appropriate exhaust ventilation. Reacts with aluminum and its alloys.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store in aluminum containers. Incompatible Materials. Strong oxidizing agents. Strong acids. Amines.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Methylene chloride	TWA: 50 ppm	(Vacated) TWA: 500 ppm (Vacated) STEL: 2000 ppm (Vacated) Ceiling: 1000 ppm TWA: 25 ppm STEL: 125 ppm	IDLH: 2300 ppm	TWA: 50 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-97 °C / -142.6 °F

Boiling Point/Range	39 °C / 102.2 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	23 vol %
Lower	13 vol %
Vapor Pressure	350 mbar @ 20°C
Vapor Density	2.93 (Air = 1.0)
Specific Gravity	1.33
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	556 °C / 1032.8 °F
Decomposition Temperature	No information available
Viscosity	0.42 mPas @ 25°C
Molecular Formula	C H2 Cl2
Molecular Weight	84.93

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions. Decomposes on exposure to light.

Conditions to Avoid Excess heat. Protect from direct sunlight.

Incompatible Materials Strong oxidizing agents, Strong acids, Amines

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), Phosgene, Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions Forms a detonable mixture with nitric acid.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methylene chloride	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rat)	53 mg/L (Rat) 6 h 76000 mg/m³ (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Methylene chloride	75-09-2	Group 2A	Reasonably Anticipated	A3	X	A3

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)

	Known - Known Carcinogen *Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen*
ACGIH: (American Conference of Governmental Industrial Hygienists)	*A1 - Known Human Carcinogen* *A2 - Suspected Human Carcinogen* *A3 - Animal Carcinogen*
	ACGIH: (American Conference of Governmental Industrial Hygienists)
Mexico - Occupational Exposure Limits - Carcinogens	*Mexico - Occupational Exposure Limits - Carcinogens* *A1 - Confirmed Human Carcinogen* *A2 - Suspected Human Carcinogen* *A3 - Confirmed Animal Carcinogen* *A4 - Not Classifiable as a Human Carcinogen* *A5 - Not Suspected as a Human Carcinogen*

Mutagenic Effects Mutagenic effects have occured in microorganisms.

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Liver Kidney Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Causes central nervous system depression: Continued or high exposures by inhalation will cause anaesthetic effects. This may result in a loss of consciousness and could prove fatal: Causes formation of carbon monoxide in the blood. Carbon monoxide may cause adverse effects on the cardiovascular system and the central nervous system

Endocrine Disruptor Information No information available

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity

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Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Methylene chloride	EC50:>660 mg/L/96h	Pimephales promelas: LC50:193 mg/L/96h	EC50: 1 mg/L/24 h EC50: 2.88 mg/L/15 min	EC50: 140 mg/L/48h

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Methylene chloride	1.25

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Methylene chloride - 75-09-2	U080	-

14. Transport information

DOT

UN-No	UN1593
Proper Shipping Name	DICHLOROMETHANE
Hazard Class	6.1
Packing Group	III

TDG

UN-No	UN1593
Proper Shipping Name	DICHLOROMETHANE
Hazard Class	6.1
Packing Group	III

IATA

UN-No	UN1593
Proper Shipping Name	Dichloromethane
Hazard Class	6.1
Packing Group	III

IMDG/IMO

UN-No	UN1593
Proper Shipping Name	Dichloromethane
Hazard Class	6.1
Packing Group	III

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Methylene chloride	75-09-2	X	ACTIVE	R

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

Section 6(a) of the Toxic Substances Control Act (TSCA) This chemical/product is not and cannot be distributed in commerce (as defined in TSCA section 3(5)) or processed (as defined in TSCA section 3(13)) for consumer paint or coating removal.

TSCA 12(b) - Notices of Export Not applicable

Component	CAS No	**TSCA 12(b)** - Notices of Export
Methylene chloride	75-09-2	Section 6

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Methylene chloride	75-09-2	X	-	200-838-9	X	X	X	X	X	KE-23893

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313

Component	CAS No	Weight %	SARA 313 - Threshold Values %
Methylene chloride	75-09-2	>99.5	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Methylene chloride	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Methylene chloride	X		-

OSHA - Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Methylene chloride	125 ppm STEL 12.5 ppm Action Level 25 ppm TWA	-

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Methylene chloride	1000 lb 1 lb	-

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Methylene chloride	75-09-2	Carcinogen	200 µg/day 50 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Methylene chloride	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Methylene chloride	-	Use restricted. See item 59. (see link for restriction details) Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Methylene chloride	75-09-2	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Methylene chloride	75-09-2	Not applicable	Not applicable	Not applicable	Annex I - Y45

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 27-Jan-2010
Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Safety Data Sheet
acc. to OSHA HCS

Printing date 03/24/2019 Version Number 2 Reviewed on 03/24/2019

*

1 Identification

· **Product identifier**

· **Trade name: Pentachlorophenol**

· **Part number:** PST-780, PST-780-25MG
· **CAS Number:**
87-86-5
· **EC number:**
201-778-6
· **Index number:**
604-002-00-8
· **Application of the substance / the mixture** Reagents and Standards for Analytical Chemical Laboratory Use

· **Details of the supplier of the safety data sheet**
· **Manufacturer/Supplier:**
Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95051 USA

· **Information department:**
Telephone: 800-227-9770
e-mail: pdl-msds_author@agilent.com
· **Emergency telephone number:** CHEMTREC®: 1-800-424-9300

2 Hazard(s) identification

· **Classification of the substance or mixture**


GHS06 Skull and crossbones

Acute Tox. 3 H301 Toxic if swallowed.
Acute Tox. 3 H311 Toxic in contact with skin.
Acute Tox. 2 H330 Fatal if inhaled.


GHS08 Health hazard

Carc. 2 H351 Suspected of causing cancer.


GHS07

Skin Irrit. 2 H315 Causes skin irritation.
Eye Irrit. 2A H319 Causes serious eye irritation.
STOT SE 3 H335 May cause respiratory irritation.

· **Label elements**
· **GHS label elements** The substance is classified and labeled according to the Globally Harmonized System (GHS).

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Safety Data Sheet
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Trade name: Pentachlorophenol

(Contd. of page 1)

· **Hazard pictograms**

GHS06 GHS07 GHS08

· **Signal word** Danger

· **Hazard-determining components of labeling:**
pentachlorophenol

· **Hazard statements**
Toxic if swallowed or in contact with skin.
Fatal if inhaled.
Causes skin irritation.
Causes serious eye irritation.
Suspected of causing cancer.
May cause respiratory irritation.

· **Precautionary statements**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust/fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.
[In case of inadequate ventilation] wear respiratory protection.
If swallowed: Immediately call a poison center/doctor.
Rinse mouth.
If on skin: Wash with plenty of water.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.
Continue rinsing.
IF exposed or concerned: Get medical advice/attention.
Call a poison center/doctor if you feel unwell.
Specific treatment is urgent (see on this label).
Take off immediately all contaminated clothing and wash it before reuse.
If skin irritation occurs: Get medical advice/attention.
If eye irritation persists: Get medical advice/attention.
Store in a well-ventilated place. Keep container tightly closed.
Store locked up.
Dispose of contents/container in accordance with local/regional/national/international regulations.

· **Classification system:**

· **NFPA ratings (scale 0 - 4)**

Health = 3
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 3
Fire = 0
Reactivity = 0

(Contd. on page 3)

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Trade name: Pentachlorophenol

(Contd. of page 2)

· **Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

3 Composition/information on ingredients

· **Chemical characterization: Substances**
· **CAS No. Description**
87-86-5 pentachlorophenol
· **Identification number(s)**
· **EC number:** 201-778-6
· **Index number:** 604-002-00-8

4 First-aid measures

· **Description of first aid measures**
· **General information:**
Immediately remove any clothing soiled by the product.
Remove breathing apparatus only after contaminated clothing have been completely removed.
In case of irregular breathing or respiratory arrest provide artificial respiration.
· **After inhalation:**
Supply fresh air or oxygen; call for doctor.
In case of unconsciousness place patient stably in side position for transportation.
· **After skin contact:** Immediately wash with water and soap and rinse thoroughly.
· **After eye contact:**
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:** Do not induce vomiting; immediately call for medical help.
· **Information for doctor:**
· **Most important symptoms and effects, both acute and delayed** No further relevant information available.
· **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Fire-fighting measures

· **Extinguishing media**
· **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
· **Special hazards arising from the substance or mixture**
During heating or in case of fire poisonous gases are produced.
· **Advice for firefighters**
· **Protective equipment:** Mouth respiratory protective device.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures** Mount respiratory protective device.
· **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **Methods and material for containment and cleaning up:**
Dispose contaminated material as waste according to item 13.

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Ensure adequate ventilation.

· **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

· **Protective Action Criteria for Chemicals**

· **PAC-1:**
1 mg/m³

· **PAC-2:**
15 mg/m³

· **PAC-3:**
150 mg/m³

7 Handling and storage

· **Handling:**
· **Precautions for safe handling**
Thorough dedusting.
Ensure good ventilation/exhaustion at the workplace.
Open and handle receptacle with care.
· **Information about protection against explosions and fires:** Keep respiratory protective device available.

· **Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Keep receptacle tightly sealed.
· **Specific end use(s)** No further relevant information available.

*
8 Exposure controls/personal protection

· **Additional information about design of technical systems:** No further data; see item 7.

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**	
87-86-5 pentachlorophenol	
PEL	Long-term value: 0.5 mg/m³ Skin
REL	Long-term value: 0.5 mg/m³ Skin
TLV	Short-term value: 1* mg/m³ Long-term value: 0.5* mg/m³ Skin; BEI;*inhalable fraction+vapor

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acc. to OSHA HCS

Trade name: Pentachlorophenol

(Contd. of page 4)

· **Ingredients with biological limit values:**

87-86-5 pentachlorophenol

BEI	2 mg/g creatinine Medium: urine Time: prior to last shift of workweek Parameter: Total pentachlorophenol (background) 5 mg/L Medium: plasma Time: end of shift Parameter: Free pentachlorophenol (background)

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Avoid contact with the eyes and skin.
· **Breathing equipment:**
When used as intended with Agilent instruments, the use of the product under normal laboratory conditions and with standard practices does not result in significant airborne exposures and therefore respiratory protection is not needed.
Under an emergency condition where a respirator is deemed necessary, use a NIOSH or equivalent approved device/equipment with appropriate organic or acid gas cartridge.
· **Protection of hands:**
Although not recommended for constant contact with the chemicals or for clean-up, nitrile gloves 11-13 mil thickness are recommended for normal use. The breakthrough time is 1 hr. For cleaning a spill where there is direct contact of the chemical, butyl rubber gloves are recommended 12-15 mil thickness with breakthrough times exceeding 4 hrs. Supplier recommendations should be followed.
· **Material of gloves**
For normal use: nitrile rubber, 11-13 mil thickness
For direct contact with the chemical: butyl rubber, 12-15 mil thickness
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· **Penetration time of glove material**
For normal use: nitrile rubber: 1 hour
For direct contact with the chemical: butyl rubber: >4 hours
· **Eye protection:**

Tightly sealed goggles

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acc. to OSHA HCS

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9 Physical and chemical properties

· **Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Solid
Color:	Not determined.
· **Odor:**	Characteristic
· **Odor threshold:**	Not determined.
· **pH-value:**	Not applicable.
· **Change in condition**	
Melting point/Melting range:	189 °C (372.2 °F)
Boiling point/Boiling range:	309-310 °C (588.2-590 °F)
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Product is not flammable.
· **Decomposition temperature:**	Not determined.
· **Auto igniting:**	Not determined.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapor pressure at 20 °C (68 °F):**	0.00008 hPa (0 mm Hg)
· **Density at 20 °C (68 °F):**	1.978 g/cm³ (16.50641 lbs/gal)
· **Relative density**	Not determined.
· **Vapor density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with**	
Water at 20 °C (68 °F):	0.02 g/l
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
VOC content:	0.00 % 0.0 g/l / 0.00 lb/gal
Solids content:	100.0 %
· **Other information**	No further relevant information available.

10 Stability and reactivity

· **Reactivity** No further relevant information available.
· **Chemical stability**
· **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
· **Possibility of hazardous reactions** No dangerous reactions known.
· **Conditions to avoid** No further relevant information available.

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Trade name: Pentachlorophenol

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· **Incompatible materials:** No further relevant information available.
· **Hazardous decomposition products:** No dangerous decomposition products known.

11 Toxicological information

· **Information on toxicological effects**
· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:**		
ATE (Acute Toxicity Estimate)		
Oral	LD50	27 mg/kg (rat)
Dermal	LD50	96 mg/kg (rat)
Inhalative	LC50/4 h	355 mg/L (rat)

87-86-5 pentachlorophenol		
Oral	LD50	27 mg/kg (rat)
Dermal	LD50	96 mg/kg (rat)
Inhalative	LC50/4 h	355 mg/L (rat)

· **Primary irritant effect:**
· **on the skin:** Irritant to skin and mucous membranes.
· **on the eye:** Irritating effect.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**

· **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**
2B

· **NTP (National Toxicology Program)**
R

· **OSHA-Ca (Occupational Safety & Health Administration)**
Substance is not listed.

12 Ecological information

· **Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **Persistence and degradability** No further relevant information available.
· **Behavior in environmental systems:**
· **Bioaccumulative potential** No further relevant information available.
· **Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 3 (Assessment by list): extremely hazardous for water
Do not allow product to reach ground water, water course or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

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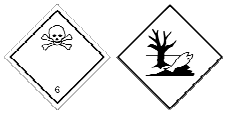
· **Other adverse effects** No further relevant information available.

13 Disposal considerations

· **Waste treatment methods**
· **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.

· **Uncleaned packagings:**
· **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· **UN-Number**	
· **DOT, IMDG, IATA**	UN2020
· **UN proper shipping name**	
· **DOT**	Chlorophenols, solid
· **IMDG**	CHLOROPHENOLS, SOLID, MARINE POLLUTANT
· **IATA**	CHLOROPHENOLS, SOLID
· **Transport hazard class(es)**	
· **DOT, IATA**	
· **Class**	6-1
· **Label**	6.1
· **IMDG**	
· **Class**	6-1
· **Label**	6.1
· **Packing group**	
· **DOT, IMDG, IATA**	II
· **Environmental hazards:**	
· **Marine pollutant:**	Symbol (fish and tree)
· **Special precautions for user**	Warning: Toxic substances
· **Danger code (Kemler):**	60
· **EMS Number:**	6.1-04
· **Stowage Category**	A
· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.

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Trade name: Pentachlorophenol

(Contd. of page 8)

· **Transport/Additional information:**

· **DOT**

· **Hazardous substance:**	10 lbs, 4.54 kg
· **UN "Model Regulation":**	UN 3155 PENTACHLOROPHENOL, 6.1, II, ENVIRONMENTALLY HAZARDOUS

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **Sara**

· **Section 355 (extremely hazardous substances):**

Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**

Substance is listed.

· **TSCA (Toxic Substances Control Act):**

Substance is listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**

Substance is listed.

· **Chemicals known to cause reproductive toxicity for females:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**

Substance is not listed.

· **Chemicals known to cause developmental toxicity:**

Substance is not listed.

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

L

· **TLV (Threshold Limit Value established by ACGIH)**

A3

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is not listed.

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

*
16 Other information

The information contained in this document is based on Agilent's state of knowledge at the time of preparation. No warranty as to its accurateness, completeness or suitability for a particular purpose is expressed or implied.

· **Department issuing SDS:** Document Control / Regulatory
· **Contact:** regulatory@ultrasci.com
· **Date of preparation / last revision** 03/24/2019 / 1

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Safety Data Sheet
acc. to OSHA HCS

Printing date 03/24/2019 Version Number 2 Reviewed on 03/24/2019

Trade name: Pentachlorophenol

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· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
PBT: Persistent, Bioaccumulative and Toxic
vPvB: very Persistent and very Bioaccumulative
NIOSH: National Institute for Occupational Safety
OSHA: Occupational Safety & Health
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
BEI: Biological Exposure Limit
Acute Tox. 3: Acute toxicity – Category 3
Acute Tox. 2: Acute toxicity – Category 2
Skin Irrit. 2: Skin corrosion/irritation – Category 2
Eye Irrit. 2A: Serious eye damage/eye irritation – Category 2A
Carc. 2: Carcinogenicity – Category 2
STOT SE 3: Specific target organ toxicity (single exposure) – Category 3
· *** Data compared to the previous version altered.**

SAFETY DATA SHEET

Version 6.6
Revision Date 04/18/2021
Print Date 07/30/2022

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Phenol

Product Number : P5566
Brand : Sigma-Aldrich
Index-No. : 604-001-00-2
CAS-No. : 108-95-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Germ cell mutagenicity (Category 2), H341
Specific target organ toxicity - repeated exposure (Category 2), Nervous system, Kidney, Liver, Skin, H373
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word — Danger

Hazard statement(s)

H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled.
H314	Causes severe skin burns and eye damage.
H341	Suspected of causing genetic defects.
H373	May cause damage to organs (Nervous system, Kidney, Liver, Skin) through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Vesicant., Rapidly absorbed through skin.

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Hydroxybenzene
Formula	:	C_6H_6O
Molecular weight	:	94.11 g/mol
CAS-No.	:	108-95-2

EC-No. : 203-632-7
Index-No. : 604-001-00-2

Component	Classification	Concentration
Phenol		
	Acute Tox. 3; Skin Corr. 1B; Eye Dam. 1; Muta. 2; STOT RE 2; Aquatic Acute 2; Aquatic Chronic 2; H301, H331, H311, H314, H318, H341, H373, H401, H411 Concentration limits: >= 3 %: Skin Corr. 1B, H314; 1 - < 3 %: Skin Irrit. 2, H315; 1 - < 3 %: Eye Irrit. 2, H319;	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
After contact with skin: rinse out with polyethylene glycol 400 or a mixture of polyethylene glycol 300/ethanol 2:1 and wash with plenty of water. If neither is available wash with plenty of water. Immediately take off contaminated clothing. Call a physician immediately.

In case of eye contact
After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed
If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible. Do not attempt to neutralise.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Foam Carbon dioxide (CO2) Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Combustible.
Vapors are heavier than air and may spread along floors.
Forms explosive mixtures with air on intense heating.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Avoid generation and inhalation of dusts in all circumstances. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage stability
Recommended storage temperature
2 - 8 °C

Handle and store under inert gas. Light sensitive.
Storage class (TRGS 510): 6.1A: Combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Phenol	108-95-2	TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	5 ppm 19 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		C	15.6 ppm 60 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential for dermal absorption		
		TWA	5 ppm 19 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		PEL	5 ppm 19 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Phenol	108-95-2	Phenol	250mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Body Protection

Flame retardant antistatic protective clothing.

Respiratory protection

required when dusts/vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odor	stinging
c)	Odor Threshold	0.005 ppm
d)	pH	6.0
e)	Melting	Melting point/range: 38 - 43 °C (100 - 109 °F)

	point/freezing point	
f)	Initial boiling point and boiling range	181.8 °C 359.2 °F at 1,013 hPa
g)	Flash point	79.0 °C (174.2 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 9.5 %(V) Lower explosion limit: 1.3 %(V)
k)	Vapor pressure	0.53 hPa at 20.0 °C (68.0 °F)
l)	Vapor density	3.2 at 20 °C(68 °F) - (Air = 1.0)
m)	Relative density	No data available
n)	Water solubility	87 g/l at 25 °C (77 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 1.47 at 30 °C (86 °F) - (ECHA), Bioaccumulation is not expected.
p)	Autoignition temperature	715 °C (1319 °F) at 1,013 hPa
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	38.2 mN/m at 50.0 °C (122.0 °F)
Relative vapor density	3.2 at 20 °C (68 °F) - (Air = 1.0)

SECTION 10: Stability and reactivity

10.1 Reactivity

Forms explosive mixtures with air on intense heating.
A range from approx. 15 Kelvin below the flash point is to be rated as critical.
The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .
Contains the following stabilizer(s):
Hypophosphorous acid (0.15 %)

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid
Strong heating.

10.5 Incompatible materials
rubber, various plastics, various alloys, various metals, Strong oxidizing agents

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - 100.1 mg/kg
(Calculation method)

No data available

Acute toxicity estimate Inhalation - 4 h - 0.51 mg/l
(Calculation method)
Inhalation: No data available

Acute toxicity estimate Dermal - 660 mg/kg
(Calculation method)
LD50 Dermal - Rat - female - 660 mg/kg
(OECD Test Guideline 402)
No data available

Skin corrosion/irritation
Skin - In vitro study
Result: Causes burns.
(OECD Test Guideline 431)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Corrosive
(OECD Test Guideline 405)
Causes serious eye damage. Risk of blindness!

Respiratory or skin sensitization
Sensitisation test: - Guinea pig
Result: negative
Remarks:
(IUCLID)

Germ cell mutagenicity
Suspected of causing genetic defects.

Test Type: Mutagenicity (mammal cell test): chromosome aberration.
Test system: Chinese hamster ovary cells
Metabolic activation: Metabolic activation
Method: OECD Test Guideline 473
Result: positive

Test Type: Mutagenicity (mammal cell test): micronucleus.
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 487
Result: positive

Carcinogenicity
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure. - Nervous system, Kidney, Liver, Skin

Aspiration hazard
No data available

11.2 Additional Information
Not available

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Circulatory collapse, tachypnea, paralysis, Convulsions, Coma., necrosis of mouth and G.I. Tract, Jaundice, respiratory failure, cardiac arrest
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Onchorhynchus clarki - 8.9 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Ceriodaphnia dubia (water flea) - 3.1 mg/l - 48 h (US-EPA)
Toxicity to algae	static test EC50 - Pseudokirchneriella subcapitata (algae) - 61.1 mg/l - 96 h (US-EPA)
Toxicity to bacteria	static test IC50 - microorganisms - 21 mg/l - 24 h Remarks: (ECHA)

12.2 Persistence and degradability

Biodegradability: aerobic - Exposure time 100 h
Result: 62 % - Readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation: Danio rerio (zebra fish) - 5 h
at 25 °C - 2 mg/l(Phenol)

Bioconcentration factor (BCF): 17.5
(OECD Test Guideline 305)

Remarks: Does not bioaccumulate.

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1671 Class: 6.1 Packing group: II
Proper shipping name: Phenol, solid
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1671 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: PHENOL, SOLID
Marine pollutant : yes

IATA
UN number: 1671 Class: 6.1 Packing group: II
Proper shipping name: Phenol, solid

SECTION 15: Regulatory information

SARA 302 Components

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact mlsbranding@sial.com.

Version: 6.6 Revision Date: 04/18/2021 Print Date: 07/30/2022

SAFETY DATA SHEET

Revision Date 24-Dec-2021 **Revision Number** 4

1. Identification

Product Name **Sodium Metal**

Cat No. : **S135-1LB; S206-1LB**

Synonyms Natrium.

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company
Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Substances/mixtures which, in contact with water, emit flammable gases	Category 1
Skin Corrosion/Irritation	Category 1 B
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
In contact with water releases flammable gases which may ignite spontaneously
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from any possible contact with water, because of violent reaction and possible flash fire
Handle under inert gas. Protect from moisture
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Brush off loose particles from skin. Immerse in cool water/wrap with wet bandages
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in a dry place. Store in a closed container
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Reacts violently with water

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Sodium	7440-23-5	100

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required. Keep eye wide open while rinsing.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Call a physician immediately.

Inhalation Remove to fresh air. If not breathing, give artificial respiration. Call a physician or poison control center immediately. Do not use mouth-to-mouth method if victim ingested or inhaled

	the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
Ingestion	Immediate medical attention is required. Do NOT induce vomiting. Drink plenty of water. Never give anything by mouth to an unconscious person.
Most important symptoms and effects	Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO_2, dry chemical, dry sand, alcohol-resistant foam. approved class D extinguishers.
Unsuitable Extinguishing Media	Water may be ineffective
Flash Point	Not applicable
Method -	No information available
Autoignition Temperature	115 °C / 239 °F
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
The product causes burns of eyes, skin and mucous membranes. Reacts violently with water.

Hazardous Combustion Products
Hydrogen.
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	2	W

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Evacuate personnel to safe areas. Avoid contact with skin, eyes or clothing. No special precautions required.
Environmental Precautions	Should not be released into the environment. Do not allow material to contaminate ground water system. See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Sweep up and shovel into suitable containers for disposal. Avoid dust formation. Do not expose spill to water. Pick up and transfer to properly labelled containers.

7. Handling and storage

Handling	Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe dust. Do not ingest. If swallowed then seek immediate medical assistance. Do not allow contact with water.
Storage.	Corrosives area. Keep away from water or moist air. Keep in a dry place. Keep away from acids. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Engineering Measures None under normal use conditions. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No special protective equipment required.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Solid
Appearance	Light grey
Odor	Odorless
Odor Threshold	No information available
pH	
Melting Point/Range	98 °C / 208.4 °F
Boiling Point/Range	883 °C / 1621.4 °F
Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mmHg @ 440 °C
Vapor Density	Not applicable
Specific Gravity	0.9684 @ 20°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	115 °C / 239 °F
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Na
Molecular Weight	22.99

10. Stability and reactivity

Reactive Hazard Yes

Stability Stable under normal conditions.

Conditions to Avoid Exposure to moist air or water. Exposure to moisture.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Hydrogen

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing. Reacts violently with water.

11. Toxicological information

Acute Toxicity

Product Information
Component Information
Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Sodium	7440-23-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

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Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1428
Proper Shipping Name	SODIUM
Hazard Class	4.3
Packing Group	I

TDG Forbidden

IATA

UN-No	UN1428
Proper Shipping Name	SODIUM
Hazard Class	4.3
Packing Group	I

IMDG/IMO

UN-No	UN1428
Proper Shipping Name	SODIUM
Hazard Class	4.3
Packing Group	I

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Sodium	7440-23-5	X	ACTIVE	-

Legend:
TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Sodium	7440-23-5	X	-	231-132-9	X	X	X	X	X	KE-31338

KECL - NIER number or KE number (http://ncis.nier.go.kr/en/main.do)

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Sodium	X	10 lb	-	-

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Sodium	10 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Sodium	X	X	X	-	X

U.S. Department of Transportation
Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Sodium	-	Use restricted. See item 75. (see link for restriction details)	-

https://echa.europa.eu/substances-restricted-under-reach

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Sodium	7440-23-5	Listed	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Sodium	7440-23-5	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 24-Dec-2021
Print Date 24-Dec-2021
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950
US GHS

Synonyms: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquid - Category 2
Skin Corrosion/Irritation - Category 2
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1B
Toxic to Reproduction - Category 1A
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Specific Target Organ Toxicity (Repeat Exposure) - Category 1 (liver, kidneys, bladder, blood, bone marrow, nervous system)
Aspiration Hazard - Category 1
Hazardous to the Aquatic Environment – Acute Hazard - Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Highly flammable liquid and vapour.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
Causes damage to organs (liver, kidneys, bladder, blood, bone marrow, nervous system) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe mist/vapours/spray.
Use only outdoors or in well-ventilated area.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

Response

In case of fire: Use water spray, fog, dry chemical fire extinguishers or hand held fire extinguisher.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash before reuse. If skin irritation occurs, get medical advice/attention.
IF exposed or concerned: Get medical advice/attention.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.
Get medical advice/attention if you feel unwell.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting.

Storage

Store in a well-ventilated place.
Keep cool. Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
86290-81-5	Gasoline, motor fuel	100
108-88-3	Toluene	1-25
106-97-8	Butane	<10
1330-20-7	Xylenes (o-, m-, p- isomers)	1-15
95-63-6	Benzene, 1,2,4-trimethyl-	<6
64-17-5	Ethyl alcohol	0-10
100-41-4	Ethylbenzene	<3
71-43-2	Benzene	0.1-4.9

110-54-3	Hexane	0.5-4

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

USE ONLY AS A MOTOR FUEL.
DO NOT SIPHON BY MOUTH

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Gasoline, motor fuel (86290-81-5)

ACGIH: 300 ppm TWA
500 ppm STEL

Toluene (108-88-3)

ACGIH: 20 ppm TWA
OSHA: 200 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL
NIOSH: 100 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL

Butane (106-97-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)
OSHA: 800 ppm TWA; 1900 mg/m3 TWA
NIOSH: 800 ppm TWA; 1900 mg/m3 TWA

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: 100 ppm TWA
150 ppm STEL
OSHA: 100 ppm TWA; 435 mg/m3 TWA
150 ppm STEL; 655 mg/m3 STEL

Benzene, 1,2,4-trimethyl- (95-63-6)

NIOSH: 25 ppm TWA; 125 mg/m3 TWA

Ethyl alcohol (64-17-5)

ACGIH: 1000 ppm STEL
OSHA: 1000 ppm TWA; 1900 mg/m3 TWA
NIOSH: 1000 ppm TWA; 1900 mg/m3 TWA

Ethylbenzene (100-41-4)

ACGIH: 20 ppm TWA
OSHA: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL
NIOSH: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL

Benzene (71-43-2)

ACGIH: 0.5 ppm TWA
2.5 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: 0.1 ppm TWA
1 ppm STEL

Hexane (110-54-3)

ACGIH: 50 ppm TWA
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 500 ppm TWA; 1800 mg/m3 TWA
NIOSH: 50 ppm TWA; 180 mg/m3 TWA

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Translucent, straw-colored or light yellow	**Odor:**	Strong, characteristic aromatic hydrocarbon odor. Sweet-ether like
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)	**Vapor Density:**	AP 3-4
Boiling Point:	85-437 °F (39-200 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible to Slight	**Specific Gravity:**	0.70-0.78
Evaporation Rate:	10-11	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	-45 °F (-43 °C)	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.6%	**Lower Flammability Limit (LFL):**	1.4%
Burning Rate:	ND	**Auto Ignition:**	>530°F (>280°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Gasoline, motor fuel (86290-81-5)

Inhalation LC50 Rat >5.2 mg/L 4 h; Oral LD50 Rat 14000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

Toluene (108-88-3)

Inhalation LC50 Rat 12.5 mg/L 4 h; Inhalation LC50 Rat >26700 ppm 1 h; Oral LD50 Rat 636 mg/kg; Dermal LD50 Rabbit 8390 mg/kg; Dermal LD50 Rat 12124 mg/kg

Butane (106-97-8)

Inhalation LC50 Rat 658 mg/L 4 h

Xylenes (o-, m-, p- isomers) (1330-20-7)
Inhalation LC50 Rat 5000 ppm 4 h; Inhalation LC50 Rat 47635 mg/L 4 h; Oral LD50 Rat 4300 mg/kg; Dermal LD50 Rabbit >1700 mg/kg

Benzene, 1,2,4-trimethyl- (95-63-6)
Inhalation LC50 Rat 18 g/m3 4 h; Oral LD50 Rat 3400 mg/kg; Dermal LD50 Rabbit >3160 mg/kg

Ethyl alcohol (64-17-5)
Oral LD50 Rat 7060 mg/kg; Inhalation LC50 Rat 124.7 mg/L 4 h

Ethylbenzene (100-41-4)
Inhalation LC50 Rat 17.2 mg/L 4 h; Oral LD50 Rat 3500 mg/kg; Dermal LD50 Rabbit 15354 mg/kg

Benzene (71-43-2)
Inhalation LC50 Rat 13050-14380 ppm 4 h; Oral LD50 Rat 1800 mg/kg

Hexane (110-54-3)
Inhalation LC50 Rat 48000 ppm 4 h; Oral LD50 Rat 25 g/kg; Dermal LD50 Rabbit 3000 mg/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Moderate irritant. Contact with liquid or vapor may cause irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product may cause genetic defects.

Carcinogenicity

A: General Product Information

May cause cancer.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

B: Component Carcinogenicity

Gasoline, motor fuel (86290-81-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

Toluene (108-88-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Ethyl alcohol (64-17-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 100E [in preparation] (in alcoholic beverages); Monograph 96 [2010] (in alcoholic beverages) (Group 1 (carcinogenic to humans))

Ethylbenzene (100-41-4)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 77 [2000] (Group 2B (possibly carcinogenic to humans))

Benzene (71-43-2)

ACGIH: A1 - Confirmed Human Carcinogen
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: potential occupational carcinogen
NTP: Known Human Carcinogen (Select Carcinogen)
IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is suspected of damaging fertility or the unborn child.

Specified Target Organ General Toxicity: Single Exposure

This product may cause drowsiness or dizziness.

Specified Target Organ General Toxicity: Repeated Exposure

This product causes damage to organs through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Very toxic to aquatic life with long lasting effects. Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Gasoline, motor fuel (86290-81-5)

Test & Species		Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]	
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]	
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L	
24 Hr EC50 Daphnia magna	170 mg/L	

Toluene (108-88-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	15.22-19.05 mg/L [flow-through]	1 day old
96 Hr LC50 Pimephales promelas	12.6 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.89-7.81 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	14.1-17.16 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.8 mg/L [semi-static]	
96 Hr LC50 Lepomis macrochirus	11.0-15.0 mg/L [static]	
96 Hr LC50 Oryzias latipes	54 mg/L [static]	
96 Hr LC50 Poecilia reticulata	28.2 mg/L [semi-static]	
96 Hr LC50 Poecilia reticulata	50.87-70.34 mg/L [static]	
96 Hr EC50 Pseudokirchneriella subcapitata	>433 mg/L	
72 Hr EC50 Pseudokirchneriella subcapitata	12.5 mg/L [static]	
48 Hr EC50 Daphnia magna	5.46 - 9.83 mg/L [Static]	
48 Hr EC50 Daphnia magna	11.5 mg/L	

Xylenes (o-, m-, p- isomers) (1330-20-7)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	13.4 mg/L [flow-through]	

96 Hr LC50 Oncorhynchus mykiss	2.661-4.093 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	13.5-17.3 mg/L
96 Hr LC50 Lepomis macrochirus	13.1-16.5 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	19 mg/L
96 Hr LC50 Lepomis macrochirus	7.711-9.591 mg/L [static]
96 Hr LC50 Pimephales promelas	23.53-29.97 mg/L [static]
96 Hr LC50 Cyprinus carpio	780 mg/L [semi-static]
96 Hr LC50 Cyprinus carpio	>780 mg/L
96 Hr LC50 Poecilia reticulata	30.26-40.75 mg/L [static]
48 Hr EC50 water flea	3.82 mg/L
48 Hr LC50 Gammarus lacustris	0.6 mg/L

Benzene, 1,2,4-trimethyl- (95-63-6)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	7.19-8.28 mg/L [flow-through]
48 Hr EC50 Daphnia magna	6.14 mg/L

Ethyl alcohol (64-17-5)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	12.0 - 16.0 mL/L [static]
96 Hr LC50 Pimephales promelas	>100 mg/L [static]
96 Hr LC50 Pimephales promelas	13400 - 15100 mg/L [flow-through]
48 Hr LC50 Daphnia magna	9268 - 14221 mg/L
24 Hr EC50 Daphnia magna	10800 mg/L
48 Hr EC50 Daphnia magna	2 mg/L [Static]

Ethylbenzene (100-41-4)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	11.0-18.0 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	4.2 mg/L [semi-static]
96 Hr LC50 Pimephales promelas	7.55-11 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	32 mg/L [static]
96 Hr LC50 Pimephales promelas	9.1-15.6 mg/L [static]
96 Hr LC50 Poecilia reticulata	9.6 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	4.6 mg/L
96 Hr EC50 Pseudokirchneriella subcapitata	>438 mg/L
72 Hr EC50 Pseudokirchneriella subcapitata	2.6 - 11.3 mg/L [static]

96 Hr EC50 Pseudokirchneriella subcapitata	1.7 - 7.6 mg/L [static]
48 Hr EC50 Daphnia magna	1.8 - 2.4 mg/L

Benzene (71-43-2)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [Static]
48 Hr EC50 Daphnia magna	10 mg/L

Hexane (110-54-3)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	2.1-2.98 mg/L [flow-through]
24 Hr EC50 Daphnia magna	>1000 mg/L

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

DOT Information

Shipping Name: Gasoline
UN #: 1203 **Hazard Class:** 3 **Packing Group:** II
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

A: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Toluene (108-88-3)
SARA 313: 1.0 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Xylenes (o-, m-, p- isomers) (1330-20-7)
SARA 313: 1.0 % de minimis concentration
CERCLA: 100 lb final RQ; 45.4 kg final RQ

Benzene, 1,2,4-trimethyl- (95-63-6)
SARA 313: 1.0 % de minimis concentration

Ethylbenzene (100-41-4)
SARA 313: 0.1 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Benzene (71-43-2)
SARA 313: 0.1 % de minimis concentration
CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

Hexane (110-54-3)

SARA 313: 1.0 % de minimis concentration
CERCLA: 5000 lb final RQ; 2270 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Gasoline, motor fuel	86290-81-5	No	No	No	No	Yes	No
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	No
Butane	106-97-8	Yes	Yes	Yes	Yes	Yes	No
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	Yes	Yes	Yes	Yes	No
Benzene, 1,2,4-trimethyl-	95-63-6	No	Yes	Yes	Yes	Yes	No
Ethyl alcohol	64-17-5	Yes	Yes	Yes	Yes	Yes	No
Ethylbenzene	100-41-4	Yes	Yes	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	No
Hexane	110-54-3	No	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.
WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Toluene	108-88-3	1 %
Butane	106-97-8	1 %
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 %
Ethyl alcohol	64-17-5	0.1 %
Ethylbenzene	100-41-4	0.1 %
Benzene	71-43-2	0.1 %
Hexane	110-54-3	1 %

Additional Regulatory Information

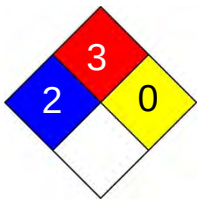
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Gasoline, motor fuel	86290-81-5	No	DSL	EINECS
Toluene	108-88-3	Yes	DSL	EINECS
Butane	106-97-8	Yes	DSL	EINECS
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	DSL	EINECS
Benzene, 1,2,4-trimethyl-	95-63-6	Yes	DSL	EINECS
Ethyl alcohol	64-17-5	Yes	DSL	EINECS
Ethylbenzene	100-41-4	Yes	DSL	EINECS
Benzene	71-43-2	Yes	DSL	EINECS
Hexane	110-54-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	2
Fire	3
Reactivity	0



HMIS® Hazard Rating

Health	2	Moderate
Fire	3	Serious
Physical	0	Minimal
		*Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	ALCONOX®
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

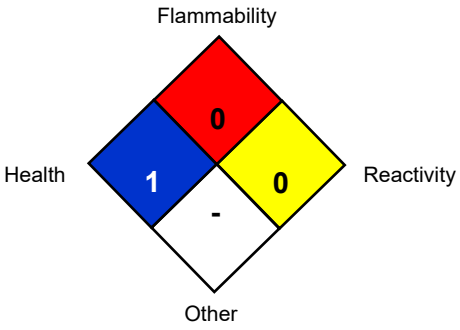
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Safety Data Sheet: **Simple Green® All-Purpose Cleaner** ★

Version No. 13000-14B Issue Date: September 13, 2014 Supersedes Date: January 7, 2014 *OSHA HCS-2012 / GHS*

Section 1: IDENTIFICATION

Product Name: Simple Green® All-Purpose Cleaner
Additional Names:

Manufacturer's Part Number: **Please refer to Section 16*

Recommended Use: Cleaner & Degreaser for water tolerant surfaces.
Restrictions on Use: Do not use on non-rinsable surfaces.

Company: Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA

Telephone: 800-228-0709 ● 562-795-6000 *Mon – Fri, 8am – 5pm PST*
Fax: 562-592-3830
Email: info@simplegreen.com

Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

This product is not classified as hazardous under 2012 OSHA Hazard Communication Standards (29 CFR 1910.1200).

OSHA HCS 2012
Label Elements
Signal Word: None **Hazard Symbol(s)/Pictogram(s):** None required

Hazard Statements: None
Precautionary Statements: None
Hazards Not Otherwise Classified (HNOC): None
Other Information: None Known

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Percent Range
Water	7732-18-5	> 84.8%*
Ethoxylated Alcohol	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Tetrasodium *N,N*-bis(carboxymethyl)-L-glutamate	51981-21-6	< 1%*
Sodium Carbonate	497-19-8	< 1%*
Citric Acid	77-92-9	< 1%*
Isothiazolinone mixture	55965-84-9	< 0.2%*
Fragrance	Proprietary Mixture	< 1%*
Colorant	Proprietary Mixture	< 1%*

**specific percentages of composition are being withheld as a trade secret*

Section 4: FIRST-AID MEASURES

Inhalation: Not expected to cause respiratory irritation. If adverse effect occurs, move to fresh air.
Skin Contact: Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.
Eye Contact: Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.
Ingestion: May cause upset stomach. Drink plenty of water to dilute. See section 11.

Most Important Symptoms/Effects, Acute and Delayed: None known.

Indication of Immediate Medical Attention and Special Treatment Needed, if necessary: Treat symptomatically

Section 5: FIRE-FIGHTING MEASURES

Suitable & Unsuitable Extinguishing Media: Use Dry chemical, CO2, water spray or "alcohol" foam. Avoid high volume jet water.
Specific Hazards Arising from Chemical: In event of fire, fire created carbon oxides may be formed.
Special Protective Actions for Fire-Fighters: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

This product is non-flammable. See Section 9 for Physical Properties.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: *For non-emergency and emergency personnel:* See section 8 – personal protection. Avoid eye contact. Safety goggles suggested.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Methods and Materials for Containment and Clean Up: Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling: Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

Conditions for Safe Storage including Incompatibilities: Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values: No components listed with TWA or STEL values under OSHA or ACGIH.

Appropriate Engineering Controls: Showers, eyewash stations, ventilation systems

Individual Protection Measures / Personal Protective Equipment (PPE)
Eye Contact: Use protective glasses or safety goggles if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.
Skin Contact: Use protective gloves (any material) when used for prolonged periods or dermally sensitive.
General Hygiene Considerations: Wash thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Green Liquid
Odor: Added sassafras odor
Odor Threshold: Not determined
pH ASTM D-1293**:** 8.5 – 9.5
Freezing Point ASTM D-1177**:** 0-3.33°C (32-38°F)
Boiling Point & Range ASTM D-1120**:** 101°C (213.8°F)
Flash Point ASTM D-93**:** > 212°F
Evaporation Rate ASTM D-1901**:** ½ Butyl Acetate @ 25°C
Flammability (solid, gas): Not applicable
Upper/Lower Flammability or Explosive Limits: Not applicable
Vapor Pressure ASTM D-323**:** 0.60 PSI @77°F, 2.05 PSI @100°F
Vapor Density: Not determined

Partition Coefficient: n-octanol/water: Not determined
Autoignition Temperature: Non-flammable
Decomposition Temperature: 109°F
Viscosity: Like water
Specific Gravity ASTM D-891**:** 1.01 – 1.03
VOCs: ***Water & fragrance exemption in calculation*

SCAQMD 304-91 / EPA 24:	0 g/L	0 lb/gal	0%
CARB Method 310**:	2.5 g/L	0.021 lb/gal	0.25%
SCAQMD Method 313:	Not tested		

VOC Composite Partial Pressure: Not determined
Relative Density ASTM D-4017**:** 8.34 – 8.42 lb/gal
Solubility: 100% in water

Section 10: STABILITY AND REACTIVITY

Reactivity: Non-reactive.
Chemical Stability: Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).
Possibility of Hazardous Reactions: None known.
Conditions to Avoid: Excessive heat or cold.
Incompatible Materials: Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
Hazardous Decomposition Products: Normal products of combustion - CO, CO2.

Section 11: TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:
Inhalation - Overexposure may cause headache.
Skin Contact - Not expected to cause irritation, repeated contact may cause dry skin.
Eye Contact - Not expected to cause irritation.
Ingestion - May cause upset stomach.

Symptoms related to the physical, chemical and toxicological characteristics: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from short term exposure: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from long term exposure: headache, dry skin, or skin irritation may occur.
Interactive effects: Not known.

Numerical Measures of Toxicity

Acute Toxicity:
Oral LD_{50} (rat) > 5 g/kg body weight
Dermal LD_{50} (rabbit) > 5 g/kg body weight
Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals

Skin Corrosion/Irritation: Non-irritant per Dermal Irritection® assay modeling. No animal testing performed.
Eye Damage/Irritation: Minimal irritant per Ocular Irritection® assay modeling. No animal testing performed.
Germ Cell Mutagenicity: Mixture does not classify under this category.
Carcinogenicity: Mixture does not classify under this category.
Reproductive Toxicity: Mixture does not classify under this category.
STOT-Single Exposure: Mixture does not classify under this category.
STOT-Repeated Exposure: Mixture does not classify under this category.
Aspiration Hazard: Mixture does not classify under this category.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Aquatic: Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC_{50} & IC_{50} ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Terrestrial: Not tested on finished formulation.

Persistence and Degradability: Readily Biodegradable per OCED 301D, Closed Bottle Test
Bioaccumulative Potential: No data available.
Mobility in Soil: No data available.
Other Adverse Effects: No data available.

Section 13: DISPOSAL CONSIDERATIONS

Unused or Used Liquid: May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

Empty Containers: May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.N. Number: Not applicable
U.N. Proper Shipping Name: Cleaning Compound, Liquid NOI
Transport Hazard Class(es): Not applicable
NMFC Number: 48580-3
Packing Group: Not applicable
Class: 55
Environmental Hazards: Marine Pollutant - NO
Transport in Bulk (according to Annex II of MARPOL 73/78 and IBC Code): Unknown.
Special precautions which user needs to be aware of/comply with, in connection with transport or conveyance either within or outside their premises: None known.

U.S. (DOT) / Canadian TDG: Not Regulated for shipping.
ICAO/ IATA: Not classified as Hazardous
IMO / IDMG: Not classified as Hazardous
ADR/RID: Not classified as Hazardous

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA and DSL Inventory.

SARA Title III: Sections 311/312 Hazard Categories – Not applicable.
Sections 313 Superfunds Amendments and Reauthorizations Act of 1986 – Not applicable.
Sections 302 – Not applicable.

Clean Air Act (CAA): Not applicable
Clean Water Act (CWA): Not applicable

State Right To Know Lists: No ingredients listed
California Proposition 65: No ingredients listed
Texas ESL:

Ethoxylated Alcohol	68439-46-3	60 µg/m³ long term	600 µg/m³ short term
Sodium Citrate	68-04-2	5 µg/m³ long term	50 µg/m³ short term
Sodium Carbonate	497-19-8	5 µg/m³ long term	50 µg/m³ short term
Citric Acid	77-92-9	10 µg/m³ long term	100 µg/m³ short term

Section 16: OTHER INFORMATION

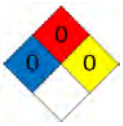
Size	UPC	Size	UPC
2 oz. Pump	043318130366	1 Gallon w/ Dilution Bottle	043318000669
2 oz. Pump	043318131035	1 Gallon	043318000799
4 oz. Pump	043318130014	1 Gallon w/ Dilution Bottle	043318001383
16 oz. Trigger	043318130021	1 Gallon w/ Dilution Bottle	043318002021
22 oz. Trigger	043318130229	1 Gallon	043318130052
24 oz. Trigger, 12 per case	043318000034	1 Gallon w/ Dilution Bottle, 112 per case	043318480140
24 oz. Trigger	043318000300	1 Gallon w/ Dilution Bottle, 4 per case	043318480416
24 oz. Trigger	043318130137	1 Gallon w/ Dilution Bottle, 24 per case	043318480492
32 oz. Trigger	043318000652	1 Gallon w/ laundry	043318002052
32 oz. Trigger	043318130335	1 Gallon w/ towel	043318001222
67.6 oz	043318000393	140 oz.	043318001390
67.6 oz.	043318130144	140 oz., 168 per case	043318561405
1 Gallon w/ Dilution Bottle	043318000539	140 oz. w/ Dilution Bottle	043318001468
1 Gallon w/ Dilution Bottle	043318000645		

USA items listed only. Not all items listed. USA items may not be valid for international sale.

Section 16: OTHER INFORMATION - continued

NFPA:

Health – None
Flammability – Non-flammable
Stability – Stable
Special - None



Acronyms

NTP	National Toxicology Program	IARC	International Agency for Research on Cancer
OSHA	Occupational Safety and Health Administration	CPSC	Consumer Product Safety Commission
TSCA	Toxic Substances Control Act	DSL	Domestic Substances List

Prepared / Revised By: Sunshine Makers, Inc., Regulatory Department.
This SDS has been revised in the following sections: Revised SDS layout

DISCLAIMER: The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

Hydrogen Chloride

Section 1. Identification

GHS product identifier : Hydrogen Chloride

Chemical name : Hydrogen chloride

Other means of identification :

Product use : Synthetic/Analytical chemistry.

Synonym :

SDS # : 001028

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Compressed gas
ACUTE TOXICITY (inhalation) - Category 3
SKIN CORROSION/IRRITATION - Category 1
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Contains gas under pressure; may explode if heated.
Toxic if inhaled.
Causes severe skin burns and eye damage.
Causes serious eye damage.
May cause respiratory irritation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid breathing gas. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Hydrogen chloride

Other means of identification :

CAS number/other identifiers

CAS number : 7647-01-0

Product code : 001028

Ingredient name	%	CAS number
hydrogen chloride	100	7647-01-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Section 4. First aid measures

Eye contact : Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic if inhaled. May cause respiratory irritation.

Skin contact : Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
halogenated compounds

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Section 6. Accidental release measures

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
hydrogen chloride	**ACGIH TLV (United States, 3/2015).** C: 2 ppm **NIOSH REL (United States, 10/2013).** CEIL: 7 mg/m³ CEIL: 5 ppm **OSHA PEL (United States, 2/2013).** CEIL: 7 mg/m³ CEIL: 5 ppm **OSHA PEL 1989 (United States, 3/1989).** CEIL: 7 mg/m³ CEIL: 5 ppm

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Section 8. Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless. Yellowish.

Molecular weight : 36.46 g/mole

Molecular formula : Cl-H

Boiling/condensation point : -85°C (-121°F)

Melting/freezing point : -114°C (-173.2°F)

Critical temperature : 51.45°C (124.6°F)

Odor : Pungent.

Odor threshold : Not available.

pH : Not available.

Flash point : [Product does not sustain combustion.]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Section 9. Physical and chemical properties

Vapor pressure : 613 (psig)

Vapor density : 1.3 (Air = 1)

Specific Volume (ft ^{3}/lb) : 10.5263

Gas Density (lb/ft ^{3}) : 0.095

Relative density : Not applicable.

Solubility : Soluble in the following materials: cold water.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.25

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
hydrogen chloride	LC50 Inhalation Gas. LC50 Inhalation Gas.	Rat Rat	3124 ppm 1562 ppm	1 hours 4 hours

IDLH : 50 ppm

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
hydrogen chloride	Eyes - Mild irritant Skin - Mild irritant	Rabbit Human	- -	0.5 minutes 5 milligrams 24 hours 4 Percent	- -

Sensitization

Not available.

Mutagenicity

Not available.

Section 11. Toxicological information

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
hydrogen chloride	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
hydrogen chloride	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic if inhaled. May cause respiratory irritation.

Skin contact : Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
hydrogen chloride	Acute LC50 240000 µg/l Marine water Acute LC50 282 ppm Fresh water	Crustaceans - Carcinus maenas - Adult Fish - Gambusia affinis - Adult	48 hours 96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
hydrogen chloride	0.25	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

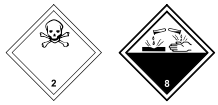
Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1050	UN1050	UN1050	UN1050	UN1050
UN proper shipping name	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS
Transport hazard class(es)	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	Inhalation hazard zone C **Reportable quantity** 5000 lbs / 2270 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: Forbidden. **Special provisions** 3	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.40-2.42 (Class 8). **Explosive Limit and Limited Quantity Index** 0 **ERAP Index** 25 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 38	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 0 Forbidden

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Water Act (CWA) 311: Hydrogen chloride

Clean Air Act (CAA) 112 regulated toxic substances: Hydrogen chloride

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Section 15. Regulatory information

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
hydrogen chloride	100	Yes.	500	-	5000	-

SARA 304 RQ : 5000 lbs / 2270 kg

SARA 311/312

Classification : Sudden release of pressure
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
hydrogen chloride	100	No.	Yes.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Hydrogen chloride	7647-01-0	100
Supplier notification	Hydrogen chloride	7647-01-0	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Section 15. Regulatory information

Canada

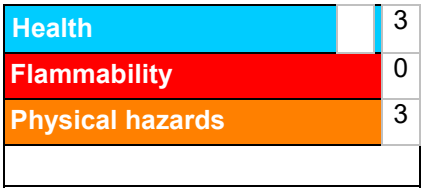
WHMIS (Canada) : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Press. Gas Comp. Gas, H280	According to package
Acute Tox. 3, H331	On basis of test data
Skin Corr. 1, H314	Expert judgment
Eye Dam. 1, H318	Expert judgment
STOT SE 3, H335	Expert judgment

History

Date of printing : 6/24/2016

Date of issue/Date of revision : 6/24/2016

Section 16. Other information

Date of previous issue : No previous validation

Version : 0.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Hydrochloric Acid, 31 – 36%

Product Name: Hydrochloric Acid, 31 – 36.7%

Identified Uses: acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

Company Information:
ASHTA Chemicals Inc.
P.O. Box 858
Ashtabula Ohio 44005
Phone: (440) 997-5221
Fax: (440) 998-0286
24-hour Emergency Phone: CHEMTREC: (800) 424-9300

SECTION 2: HAZARDS IDENTIFICATION

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

GHS label elements, including precautionary statements:

Signal Word: **Danger**

Pictogram(s):

Hazard Statements	
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

Precautionary Statements	
P234	Keep only in original container.
P261	Avoid breathing dust/ fume/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.

P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container with a resistant inner liner.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms:

CHEMICAL NAME:	Hydrochloric acid
TRADE NAME:	Hydrochloric acid, 31 – 36%
SYNONYMS:	Muriatic acid, Chlorohydric acid, Hydrogen Chloride
C.A.S:	7647-01-0
EC:	231-595-7
WHMIS:	D2A, E
CHEMICAL FORMULA:	HCl (in aqueous solution)
CHEMICAL FAMILY:	Inorganic Acid

SECTION 4 FIRST AID MEASURES

Description of first aid measures:
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

In case of skin contact
Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point (Method):	Non-combustible.
Extinguishing Media:	Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.
Auto Ignition Temp:	Non-combustible.
Special Fire Fighting Procedures:	Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials.
Unusual Fire/Explosion Hazards:	Releases flammable hydrogen gas when reacting with metals.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Environmental Precautions:
Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

Containment and Cleaning:
Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill:	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.
Large Spill:	Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

SECTION 7: HANDLING AND STORAGE

Precautions to be taken for handling and storage:
Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well ventilated area. Keep out of sun.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Principal Component: Hydrochloric Acid
Occupational Exposure Limits:
Regulatory Limits:

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrochloric Acid Mixture	---	---	5 ppm 7.59 mg/m^3

ACGIH TLV = 5 ppm (7.59 mg/m^3) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

Exposure Controls:

Eye Protection: Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection: Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended: Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended: Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

Appearance	Colorless to light yellow liquid
Odor	Pungent (irritating/strong)
Odor Threshold	0.3ppm (can cause olfactory fatigue)
pH	<1 (in aqueous solution)
Melting point/freezing point	-30°C (-22°F)
Initial boiling point	>100°C (>212°F)
Flash point	Not applicable
Auto-ignition Temp	Not applicable
Evaporation rate	No data available

Decomposition temperature	No data available
Flammability (solid, gas)	Not combustible
Upper/lower flammability or explosive limits	Not combustible
Water solubility	100%
Molecular Weight	36.46
Relative Density (Specific Gravity)	1.16 (32% HCl solution) 1.19 (36.5% HCl solution)
Bulk Density	8.75 lbs/gal (32% HCl solution) 9.83 lbs/gal (36.5% HCl solution)
Vapor Density (air = 1)	1.267 at 20 °C
Vapor Pressure	84 mm Hg @ 20°C
Partition Coefficient: n-octanol/water	No data available

SECTION 10: STABILITY AND REACTIVITY

Stability: Hydrochloric acid is stable under normal conditions and pressures.

Conditions to avoid: Incompatible materials, metals, excess heat, bases.

Incompatibility: Bases, amines, metals, permanganates, (e.g. potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.

Hazardous decomposition products: Hydrogen chloride, chlorine, hydrogen gas.

Polymerization: Hazardous polymerization WILL NOT occur.

SECTION 11: TOXICOGICAL INFORMATION

Information on likely routes of exposure:

Inhalation: Vapors and mist will irritate throat and respiratory system and cause coughing.

Skin contact: Causes skin burns.

Eye contact: Causes eye burns.

Ingestion: Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Symptoms related to the physical, chemical and toxicological characteristics:

Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

Information on toxicological effects:

Acute toxicity: Harmful if swallowed.

Skin corrosion/irritation: Causes severe skin burns and eye damage.

Serious eye damage/eye Irritation: Causes serious eye damage.

Respiratory sensitization: Not available.

Skin sensitization:	No data available.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure:	No data available.
Aspiration hazard:	Not available.
Chronic effects:	Prolonged inhalation may be harmful.

Components Species Test Results:
Hydrochloric acid (CAS# 7647-01-0)

Rat - Inhalation LC_{50}:	3124 ppm, (1 hour)
Rabbit - Dermal LD_{50}:	5010 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:	Because of the low pH of this product, it would be expected produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity:	This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity:	Fish LC_{50} Mosquito fish: 282 mg/l, 96 hours Fish LC_{50} Bluegill: 3.6 mg/l, 48 hours
Persistence and degradability:	Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment..
Bioaccumulative Potential:	No data available.
Mobility in soil:	Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other adverse effects:	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation

SECTION 13: DISPOSAL CONSIDERATIONS

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material , if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.

SECTION 14: TRANSPORT INFORMATION

Shipping:

Usual Shipping Containers:	Tank cars, bulk tankers.
Usual Shelf Life:	Indefinite (life of containers).
Storage/Transport Temperatures:	Ambient.

Suitable Storage:

Materials/Coatings:	Teflon, Tygon, Rubber, PVC and polypropylene materials.

D.O.T. Information:

Labeling:	Corrosive
D.O.T. Identification Number	UN 1789
D.O.T. Shipping Name:	Hydrochloric Acid
Hazard Class:	8
Packing Group:	II
Hazard Guide:	157
Placard:	UN 1789

SECTION 15 REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:
Hydrochloric Acid CAS#: 7647-01-0

SARA 311/312 Hazards
Acute health hazard, reactive hazard.

Massachusetts Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
Pennsylvania Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
New Jersey Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

OSHA PSM/RMP Threshold for Accidental Release:
CAS# 7647-01-0 is regulated under OSHA PSM ***only*** if anhydrous HCl.
CAS# 7647-01-0 is regulated under EPA RMP ***only*** if $\geq$ 37% HCl.

Toxic Substances Control Act (TSCA):
Hydrochloric Acid CAS#: 7647-01-0

Comprehensive Environmental Response Compensation Liability Act: (CERCLA)
Hydrochloric Acid CAS#: 7647-01-0

SECTION 16 OTHER INFORMATION

NFPA Rating:
Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. Makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations, and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A regulations apply to the above.

Version 1.0	For the new GHS SDS Standard	Revision Date: 12/31/2014
Version 1.1	Graphics updated	Revision Date: 3/9/2015
Version 1.2	Title updated	Revision Date: 6/2/2015
Version 1.3	Section 9 changes	Revision Date: 7/30/2015
Version 1.4	Section 1, 15 changes	Revision Date: 4/15/2016

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 12-Mar-2009 **Revision Date** 28-Nov-2016 **Revision Number** 5

1. Identification

Product Name **Nitric acid (65 - 70%)**

Cat No. : **A198C-212, A200-212, A200-212LC, A200-500, A200-500LC, A200-612GAL, A200C-212, A200S-212, A200S-212LC, A200S-500, A200SI-212, A467-1, A467-2, A467-250, A467-500, A483-212; S719721**

Synonyms Azotic acid; Engraver's acid; Aqua fortis

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

4. First-aid measures

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.

Inhalation If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Remove from exposure, lie down. Call a physician immediately.

Ingestion Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.

Most important symptoms/effects Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO_2, dry chemical, dry sand, alcohol-resistant foam.

Unsuitable Extinguishing Media No information available

Flash Point Not applicable
Method - No information available

Autoignition Temperature No information available

Explosion Limits
Upper No data available
Lower No data available

Oxidizing Properties Oxidizer

Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products
Nitrogen oxides (NOx) Thermal decomposition can lead to release of irritating gases and vapors
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	OX

6. Accidental release measures

Personal Precautions Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.

Environmental Precautions Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from clothing and other combustible materials.

Storage Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m³ TWA: 2 ppm TWA: 5 mg/m³	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm STEL: 4 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles. Face-shield.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear Colorless, Light yellow
Odor	Strong Acrid
Odor Threshold	No information available
pH	< 1.0 (0.1M)
Melting Point/Range	-41 °C / -41.8 °F
Boiling Point/Range	Not applicable
Flash Point	Not applicable

Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available
Specific Gravity	1.40
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	HNO3
Molecular Weight	63.02

10. Stability and reactivity

Reactive Hazard Yes

Stability Oxidizer: Contact with combustible/organic material may cause fire.

Conditions to Avoid Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.

Incompatible Materials Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents

Hazardous Decomposition Products Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed

Persistence and Degradability Miscible with water Persistence is unlikely based on information available.
Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Nitric acid	-2.3

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

TDG

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IATA

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IMDG/IMO

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	65 - 70	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitric acid	X	X	X	X	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
C Oxidizing materials
E Corrosive material
D2B Toxic materials

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 12-Mar-2009
Revision Date 28-Nov-2016
Print Date 28-Nov-2016
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene

SDS # : 001031

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene

Product code : 001031

CAS number/other identifiers

CAS number : 115-11-7

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Use only non-sparking tools. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	**ACGIH TLV (United States, 3/2017).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Compressed gas.]

Color : Colorless.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Melting point : -140.7°C (-221.3°F)

Boiling point : -6.9°C (19.6°F)

Critical temperature : 144.75°C (292.6°F)

Flash point : Closed cup: -76.1°C (-105°F)

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.6845

Gas Density (lb/ft ^{3}) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.26 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Molecular weight : 56.12 g/mole

Aerosol product

Heat of combustion : -45029034 J/kg

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Section 11. Toxicological information

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Isobutylene	2.34	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Section 12. Ecological information

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : **Limited quantity** Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.
Special provisions 19, T50

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
ERAP Index 3000
Passenger Carrying Ship Index Forbidden
Passenger Carrying Road or Rail Index Forbidden
Special provisions 29

IATA : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Air Act (CAA) 112 regulated flammable substances: Isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Section 15. Regulatory information

Taiwan : This material is listed or exempted.

Thailand : Not determined.

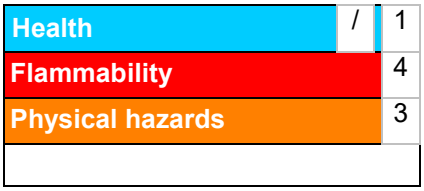
Turkey : Not determined.

United States : This material is listed or exempted.

Viet Nam : Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas	Expert judgment Expert judgment

History

Date of printing : 5/10/2018

Date of issue/Date of revision : 5/10/2018

Date of previous issue : 7/11/2016

Version : 0.02

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973

Section 16. Other information

as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

AECOM

Attachment H

Work Plan/Client SH&E Requirements

Attachment H: Work Plan/Client SH&E Requirements

There is no Work Plan / Client SH&E Requirements for this plan.

AECOM

Attachment I

Project Emergency Response Plan

Attachment I: Project Emergency Response Plan

Please complete the Project Emergency Response Plan, which can be found at the following location:

- https://myecosystem.aecom.com/ppf/forms/Forms/S3NA_010_FM2_A%20Short%20Visit%20ERP.dotm

Ashland Tank 75 Site

Short Visit Emergency Response Plan

When required to operate under a client's Emergency Response Plan, this plan will be used in conjunction with the client plan. This is to ensure emergency response and notification processes meet the requirements of both the client and AECOM.

This plan is effective as of

August 5, 2022

ERP PHONE LIST		
4625 River Road, Tonawanda, NY		
Ambulance		911
Fire Sheridan Park Fire District		911
Hospital Kenmore Mercy Hospital, 2950 Elmwood Avenue, Kenmore, NY 14217		716-873-1111
Police Town of Tonawanda Police Department		911
Clinic WellNow Urgent Care, 1751 Sheridan Drive, Tonawanda, NY 14223		716-879-5300
Emergency Response Coordinator	C.E.R.T.	716-879-6685
AECOM Project Manager	Colin Wasteneys	716-225-4396
AECOM SS/SSO	John Boyd	716-449-1717
AECOM Area SH&E Manager	Pete Wray	302-660-9178
Ashland Project Manager	Shannon Lloyd	614-315-7401
NYSDEC Project Manager	Ben McPherson	716-851-7220
Ashland Hotline		1-800-ASHLAND
24hr Incident Reporting Line		1-800-348-5046

EMERGENCY RESPONSE

Firefighting, medical treatment, rescue, or other emergency response activities should only be performed by properly equipped and trained emergency responders. AECOM recognizes that some of its personnel may have received training in first aid, cardiopulmonary resuscitation (CPR) and AED use, and may choose to perform these duties on injured personnel.

Method(s) of Alarm:
Use car horn as alarm

Evacuation

1. If a situation requires an evacuation or emergency muster/assembly, the pre-determined alarm will be initiated.
2. All personnel (e.g., workers, contractors, visitors) of the area requiring evacuation or muster/assembly will immediately assemble at the designated Muster Point, Assembly Point or Shelter-in-Place as determined by the alarm or communication.
3. The Emergency Response Coordinator or designate will take action to account for all personnel, including visitors (i.e. head count, roll call).
4. The Emergency Response Coordinator or designate shall ensure the appropriate emergency response is activated.
5. Should it be determined that an individual is still within the hazard zone, establish whether a rescue can be safely attempted. Follow the 'Emergency Rescue Procedure' if properly trained and a rescue attempt will not put another individual in jeopardy.
6. Personnel shall await further instruction from the Emergency Response Coordinator or designate (e.g., all clear and re-entry or further evacuation).

Site Specific Additions

7. To be determined by Site Supervisor and Site Safety Officer
8.
9.

Medical Emergency

1. Stop the work activity.
2. Assess the cause of the injury to avoid injury to yourself (i.e. live wires, gases, hazardous materials).
3. Do not move the casualty unless they remain in danger.
4. First Aid Provider will designate an individual to call for medical assistance (e.g., 911, ambulance, site medic).
5. First Aid Provider will designate an individual to retrieve the first aid kit and blankets.
6. Request assistance from other First Aid Providers as necessary. Administer first aid:
    a. Assess responsiveness: ask permission.
    b. Send for medical help.
    c. Place casualty face up.
    d. Check Airway, Breathing and Circulation ABC's
    e. Control severe bleeding.
7. If CPR is deemed necessary:
    a. Begin chest compressions at a rate of at least 100 compressions per minute.
    b. CPR shall be continued until:
        i. until an AED is applied,
        ii. casualty begins to respond,
        iii. another first aid provider takes over,
        iv. medical help takes over, or
        v. physically unable to continue.

8. If the casualty begins to breathe on their own, place them in the recovery position, monitor and treat for shock as appropriate.
9. Individual in communication with the designated medical assistance shall attempt to answer any questions, stay on the line until information is verified and follow instruction.
10. Arrange for medical transport as needed. A designated individual should be positioned to direct medical transport to the casualty.
11. Personnel shall await further instruction from the Emergency Response Coordinator or designate (e.g., resume activity).

Fire

1. Alert others in the area of the fire.
2. Sound the alarm or ensure applicable notification system is initiated.
3. All personnel will vacate the building or site and proceed to the Muster Point. DO NOT use elevators.
4. If smoke and heat are strong stay low and close to the floor.
5. Emergency Response Coordinator or designate will confirm all personnel have exited.
6. If the fire can be contained, extinguish the fire with the correct type of extinguisher. Remember PASS:
    a. **P** – pull the pin.
    b. **A** – aim the hose at the base of the fire.
    c. **S** – squeeze the handle.
    d. **S** – sweep from side to side until the fire is out or the extinguisher is empty
7. If the fire cannot be contained or there is any concern of an extinguished fire reigniting, call the local fire department, call or notify site fire responders. Give directions to the location; stay on the line until information is verified.
8. The Emergency Response Coordinator or designate will take action to account for all personnel, including visitors (e.g., head count, roll call).
9. A designated individual should be positioned to direct the fire truck to the fire location.
10. Personnel shall await further instruction from the Emergency Response Coordinator or designate (e.., all clear and re-entry or further evacuation).

Spill / Leak / Release of Hazardous Materials (HAZMAT)

1. Identify the product and assess the risk of injury, fire or explosion.
2. If there is insufficient information on the product or inadequate PPE, move upwind if possible and leave the area immediately (initiate personnel evacuation if required).
3. Isolate the area and deny access to any unauthorized personnel.
4. Only if safe to do so, take measures to stop and control the spill / leak / release
5. Eliminate all ignition sources, if required (no smoking, flares, sparks / flames, engines running).
6. As applicable, designate an individual to notify the Emergency Response Coordinator or designate, or Foreman and SH&E representative.
7. Consult the product SDS for accidental release / handling procedures.
8. If it is not possible to stop / control the release, call or appropriate emergency services.
9. Tend to any injured personnel (follow Medical Emergency steps).
10. Personnel shall await further instruction from the Emergency Response Coordinator or designate (e.g., further evacuation or resume activity).

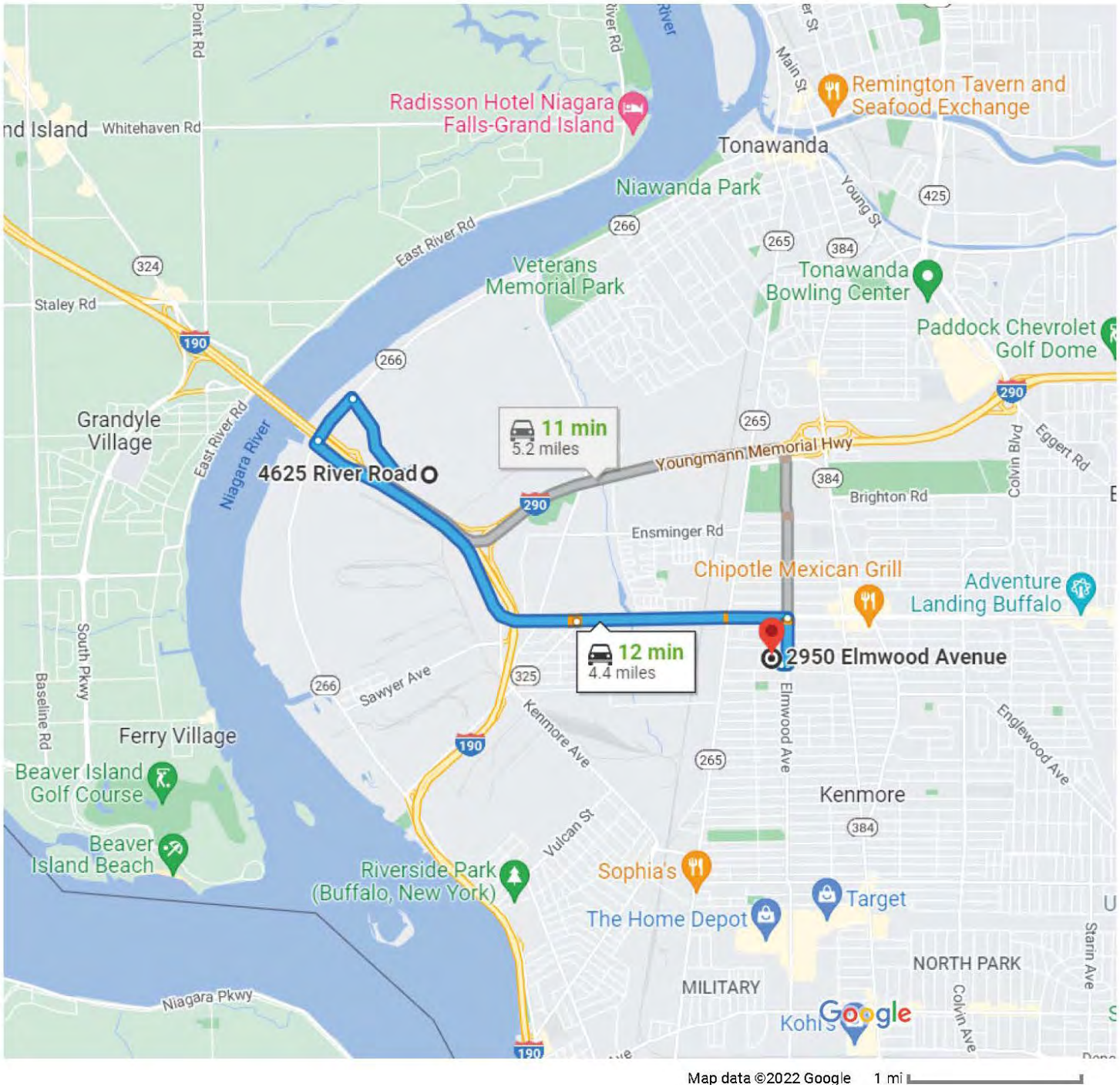
Site Control Map

Directions to Hospital

Google Maps

4625 River Rd, Tonawanda, NY 14150 to 2950 Elmwood Avenue, Kenmore, NY

Drive 4.4 miles, 12 min

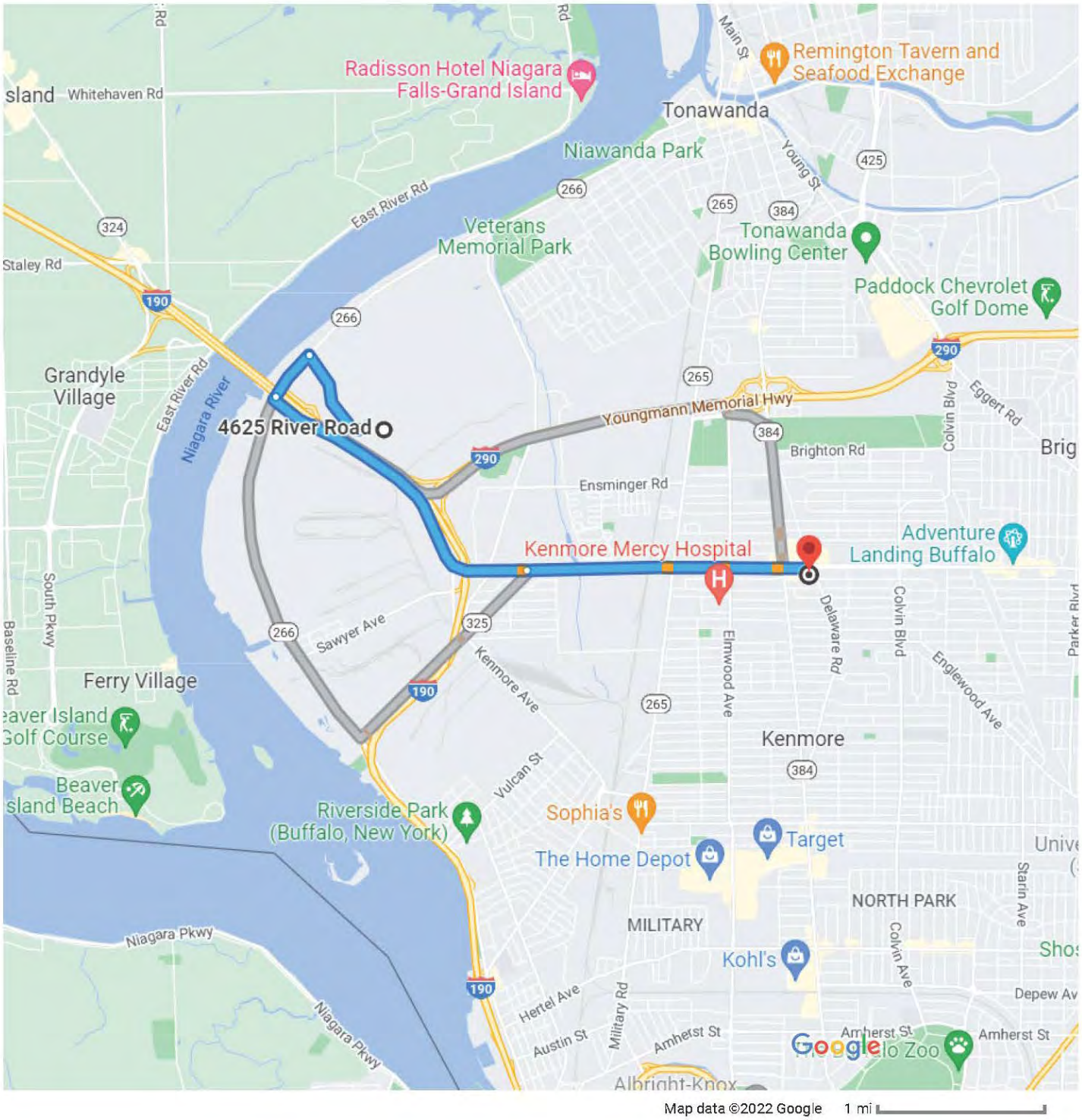


Directions to Urgent Care Center

Google Maps

4625 River Rd, Tonawanda, NY 14150 to 1751 Sheridan Dr, Buffalo, NY 14223

Drive 4.6 miles, 13 min



Emergency Response Procedure Action Checklist

DATE: _____

Procedure(s) Followed

Evacuation	☐	Gas Leak	☐
Medical Emergency	☐	Hurricane	☐
Fire	☐	Internal Violence or Intruder	☐
Spill, Leak, Release of Hazardous Material	☐	Lightning	☐
AED Use	☐	Pandemic Management	☐
Bear Charges and Attacks	☐	Power Outage	☐
Civil Disturbance	☐	Severe Winter Storm	☐
Earthquake	☐	Threats of Violence / Bomb Threats	☐
Electrical Live Line Contact	☐	Tornado	☐
Elevator Emergency	☐	Utility Shut-Off Before or During an Emergency	☐
Emergency Rescue	☐	Vehicle Incident	☐
Explosion	☐	Wildfire	☐
Floods/Heavy Rain	☐	Other Procedure: _____	☐

Communication

	Yes	No	N/A		Yes	No	N/A
Alarm initiated	☐	☐	☐	Local law enforcement agency (police) contacted	☐	☐	☐
Floor Marshall/Warden or Emergency Response Coordinator contacted	☐	☐	☐	Client contacted Name: _____	☐	☐	☐
Internal emergency responders contacted (i.e. First aid Provider, onsite medic, rescue crew)	☐	☐	☐	Regulatory Body contacted Name: _____	☐	☐	☐
External emergency services (i.e. fire department, ambulance) contacted	☐	☐	☐	Local Resilience Coordinator (LRC) contacted Name: _____	☐	☐	☐
Supervisor / Foreman contacted	☐	☐	☐	24 Hour Incident Reporting Line called	☐	☐	☐
Concurrent operations contacted	☐	☐	☐	Others contacted _____			

Only take measures that will not put another's safety in jeopardy

Response

	Yes	No	N/A		Yes	No	N/A
Emergency assessed for appropriate response	☐	☐	☐	Appropriate emergency equipment accessed	☐	☐	☐
Evacuation conducted	☐	☐	☐	Individual designated to provide direction to emergency location for emergency services	☐	☐	☐
Roll-Call conducted	☐	☐	☐	Spill/Leak/Release control measures initiated	☐	☐	☐
Emergency assessed for additional hazards	☐	☐	☐	Firefighting equipment utilized	☐	☐	☐
Rescue initiated if safety of others not compromised	☐	☐	☐	All ignition sources controlled	☐	☐	☐
First Aid provided	☐	☐	☐	Further evacuation conducted	☐	☐	☐
Emergency area contained, barricaded or controlled	☐	☐	☐	Utilities shut off	☐	☐	☐
Equipment, machinery or processes shut down if safe to do so	☐	☐	☐	External emergency services provided (i.e. firefighting, air ambulance)	☐	☐	☐
Other response:				Other response:			

Completed By: _____ Signature: _____

Reviewed By: _____ Signature: _____

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Attachment J

Project Hazardous Materials Communication Plan

Attachment J: Project Hazardous Materials Communication Plan

Materials to be brought or encountered onsite will have a Safety Data Sheet (SDS) maintained in an accessible location for workers to review. Applicable SDSs are presented in **Attachment G**. Materials to be brought or encountered onsite will include:

- Cadmium
- Lead
- Manganese
- Iron
- Sodium
- Phenol
- Methylene Chloride
- Pentachlorophenol
- Gasoline
- Alconox
- Simple Green
- Hydrogen Chloride
- Hydrochloric Acid
- Nitric Acid
- Isobutylene

As part of the Site Safety Officer (SSO) daily activities, an inventory of hazardous materials will be prepared with the quantities expected to be on site. The inventory will be updated if any additional materials are brought on site and as frequently as necessary to reflect accurate quantities. This chemical inventory list will be readily available for review (usually kept with the SDSs).

Unless each container has appropriate labeling, all chemical containers will be labeled with the following information:

- Product name and identity of the hazardous chemical(s).
- Appropriate hazard warnings.
- Name and address of the chemical manufacturer, importer, or other responsible party.

Labels on incoming containers of hazardous materials will not be removed or defaced. Labels are also required when a hazardous substance is transferred from a primary container to a secondary container. Labels on secondary containers must indicate the product name or the names of the hazardous substances contained therein as well as related physical and health hazards and their associated target organs. Labels may incorporate words, pictures, symbols, or combinations thereof to ensure the appropriate information is provided to the end user.

Examples of acceptable labeling systems include the National Fire Protection Association Diamond, the Hazardous Materials Identification System, the Chemical Hazard Identification and Training system, or similar.

Employee requirements for reviewing SDSs for specific safety and health protection procedures are presented below.

- AHAs will incorporate information contained in the SDSs.

- SDS information will be followed in the use and disposal of material and selection of hazard control and emergency response measures.
- The SSO will obtain an SDS for each chemical before it is used. SDSs will generally be received by the person ordering the product. SDSs for products frequently used should be kept on file because additional copies may not be included in repeat shipments.
- The SSO will review each SDS when it is received to evaluate whether the information is complete and to determine whether existing protective measures are adequate.
- The SSO will maintain a collection of all applicable and relevant SDSs in an area that is accessible to all employees at all times. An electronic database is an acceptable method of maintaining the SDSs.
- The SSO will replace SDSs when updated sheets are received and will communicate any significant changes to those who work with the chemical.
- SDSs are required for all hazardous materials brought on site by project personnel.

General household products to be used for their specific purpose, food, drugs, and cosmetics brought into the workplace for employee use and consumption are all exempt, as are supplies in the first-aid kit, such as isopropyl alcohol and antibacterial wipes.

Employees bringing hazardous materials on to a site or project must submit SDSs to the SSO. The SSO may restrict the use of certain hazardous materials on a site or project due to occupational health risk, hazardous physical properties of the material, or potential employee sensitivity to odor or irritating properties of the material.

Other personnel working in the same area shall be provided with the following information on chemicals used by or provided to AECOM personnel:

- Names of hazardous chemicals to which they may be exposed while on the jobsite.
- Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures, such as ventilation or isolation of the work. In some cases, as an administrative control measure, a task may be delayed to a time when a minimal number of employees are present in the area.
- Location of SDSs.

As discussed in Section 5.1 of the HASP, employees will be trained initially and periodically when use of hazardous or toxic agents is altered or modified to accommodate changing on-site work procedures. Training shall cover the following topics:

- Requirements and use of the hazard communications program on the project.
- The location of all hazardous or toxic agents at the project.
- Identification and recognition of hazardous or toxic agents on the project.
- Physical and health hazards of the hazardous or toxic agents pertinent to project activities.
- Protective measures employees can implement when working with project-specific hazardous or toxic agents.

Provide training to all employees who have the potential to be exposed to hazardous materials: a) at the time of the initial task assignment, b) whenever new chemicals are introduced into the workplace, and c) more frequently where required by site-specific conditions or client-specific requirements. This training will include the following:

- Applicable regulatory requirements.
- Location of the program, inventory, and SDS.
- Site-specific chemicals used and their hazards (chemical, physical, and health), including the general characteristics of the chemicals and signs and symptoms of exposure.
- How to detect the presence or release of chemicals including the location, types, and usage of any portable and fixed monitoring or detection equipment and their associated alarms, where applicable.

- Safe work practices (S3AM-001-PR1) and methods employees can take to protect themselves from chemical hazards (metals or explosives constituents in soil).
- How to read an SDS.
- Site- or project-specific information on hazard warnings and labels in use at the location, if applicable.
- Site-specific evacuation and rescue procedures in the event of chemical release, including the location of staging areas and personnel accounting procedures.

The following documentation will be maintained in the project file:

- Chemical inventory list;
- SDSs; and
- Training records.

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Attachment K

AECOM SH&E Policy

Attachment K: AECOM SH&E Policy

Safety, Health & Environment

Purpose

This policy establishes the framework to safeguard AECOM's employees and stakeholders through effective management of risk and commitment to a Culture of Caring.

Commitment

In recognition of the right to a safe and healthy working environment, AECOM is committed to maintaining the physical, psychological, and social well-being, of our employees, stakeholders, and global communities through appropriate risk management strategies.

To advance our Safety, Health & Environment (SH&E) program, we are committed to:

- Our goal of Zero work-related injuries to AECOM employees and stakeholders, incident prevention and protection of the environment while executing our work.
- Providing a highly effective SH&E management system based on our Life-Preserving Principles that empowers employees and drives continuous review and improvement opportunities.
- Effectively managing critical SH&E risk throughout the project lifecycle, through identification and development of suitable actions using the hierarchy of controls.
- Appropriately meeting client requirements and properly incorporating all applicable SH&E legal requirements and local, state, provincial and national regulations.
- Fostering an exceptional safety culture based on communication, collaboration, and consultation, where our people and stakeholders embrace ownership for the well-being of themselves and others.
- Advancing our goals of pollution prevention, resource conservation and environmental sustainability as set out in the Sustainable Legacies strategy.
- Setting aggressive SH&E performance goals and Core Value Metrics; working with employees and business partners to meet targets and promote continuous improvement opportunities.
- Establishing AECOM as the global provider of choice through safe execution of professional services throughout the project lifecycle.

Participation

Individual ownership of our Safety for Life program is required through participation of all parties in our Culture of Caring.

To that end, we expect our leaders, managers, supervisors, employees, and subcontractors to:

- Commit to the well-being of themselves and of all other stakeholders both on and off the job.
- Demonstrate this commitment through compliance with applicable rules and properly identifying, managing and eliminating hazards and reducing risk in the workplace.
- Engage in planning and training to enable competency and the proper and appropriately maintained equipment, materials, and personal protective equipment required to work safely and respond as necessary to emergencies.
- Take action to stop work if the work cannot be executed safely or if conditions or behaviors on the work activity are unsafe or unhealthy.
- Immediately report SH&E incidents, near-misses, unsafe conditions, and at-risk behaviors; participate in investigations and review findings with appropriate stakeholders to enable implementation of corrective and preventative actions.

Accountability

We expect continuous improvement in our journey toward a "zero" incident culture, where everyone participates and is committed to SH&E excellence.

To that end our leaders, managers, supervisors, employees, and subcontractors will be held accountable to their commitment and participation through:

- Recognition and reward of those who positively contribute to excellent SH&E performance.
- Inspections, investigations and reporting to assess SH&E management system application; elevation of high potential findings to senior and executive leadership to enable appropriate action.
- Appropriate action such as coaching or disciplinary measures when expectations are not met.

Review and Communication

This Policy and associated SH&E management system will be reviewed annually and will be made available to all persons under the control of the company.

September 3, 2021

Troy Rudd — **Date**

Chief Executive Officer

Attachment L

Competent Person Designation

Attachment L: Competent Person Designation

Activity / Area of Competency	Name of Person (Affiliation) Note: Subcontractor may provide this person
☐ Asbestos	
☐ Assured Equipment Grounding Conductor	
☐ Blasting & Explosives	
☐ Concrete & Masonry Construction	
☐ Confined Spaces	
☐ Control of Hazardous Energy (Lockout-Tagout)	
☐ Crane Assembly / Disassembly	
☐ Cranes & Derricks	
☐ Demolition	
☐ Electrical Wiring Design & Protections	
☐ Elevated Work Platforms & Aerial Lifts	
☐ Fall Protection	
☐ Hearing Protection	
☐ Heavy Equipment	
☐ Ionizing Radiation	
☐ Lead	
☐ Material Hoists & Personnel Hoists	
☐ Respiratory Protection	
☐ Rigging Equipment	
☐ Scaffolds	
☐ Stairways & Ladders	
☐ Steel Erection	
☐ Trench & Excavations	
☐ Underground Construction	
☐ Welding & Cutting	

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