AECOM

Site Characterization Work Plan

338 Broadway, Kingston, NY (Site No. 356059)

New York State Department of Environmental Conservation

Project number: 60781325

May 22, 2026

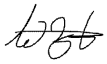
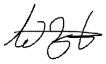
Certification

I, *Abdiel López Torres, P.G*, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Site Characterization Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10) and Green Remediation (DER-31).

Signature

Date

Quality information

Prepared by	Checked by	Verified by	Approved by
			
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Revision History

Revision	Revision date	Details	Authorized	Name	Position

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Executive Summary

AECOM USA, Inc. (AECOM) is pleased to submit this Site Characterization Work Plan (SCWP) for 338 Broadway (Site) as requested by the New York State Department of Environmental Conservation (NYSDEC) under Standby Contract No. D009803, Work Assignment (WA)-63. The Site is comprised of four parcels in the City of Kingston, Ulster County, New York located at 338 Broadway (Tax ID: 56.26-11-46), 17 Jansen Avenue (Tax ID: 56.26-11-45), 15 Jansen Avenue (Tax ID: 56.26-11-44), and 334 Broadway (Tax ID: 56.26-11-12). **Figure 1** presents the Site Location Map; **Figure 2** presents the Site Characterization Proposed Sampling Locations.

The data gathering effort outlined in this SCWP includes advancement of direct push borings, analysis of subsurface soil samples, installation of temporary overburden monitoring wells and the analysis of groundwater samples from the newly installed wells. This information will be necessary to further characterize subsurface impacts, and investigate the potential source and extent of detected Chlorinated Volatile Organic Compounds (CVOCs) as well as other Site contaminants not previously characterized or identified. Data collected will be compiled into a Comprehensive Site Characterization Investigation Report (SCR) At the request of NYSDEC, AECOM will review and evaluate the information generated by Aztech Environmental Technologies, Inc (Aztech) during prior investigations and determine whether this information can be incorporated into the SCR to be issued by AECOM. Upon determination that the Aztech data can be included, the SCR will include both Aztech and AECOM data.

The scope of work described in this SCWP includes the following field activities:

- Soil boring advancement;
- Subsurface soil sampling;
- Overburden temporary monitoring well installation;
- Water level measurement and non-aqueous phase liquid (NAPL) thickness measurement, if present; and,
- Groundwater sampling.

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1. Introduction

This work is being implemented under the NYSDEC under Standby Contract No. D009803, WA-63. The planned scope of work for this project includes soil boring advancement, the collection and analysis of subsurface soil samples, the installation of temporary overburden groundwater monitoring wells, measurement of groundwater levels and the collection and analysis of groundwater samples. The locations of the proposed soil borings and monitoring wells (shown in **Figure 2**) were chosen to fill data gaps from previous investigations performed at the Site by Aztech between 2020 and 2023 and to establish a clearer contaminant gradient in order to determine possible source areas of contamination.

1.1 Scope of Work Objectives

The scope of work chosen for this SCWP is to target data gap areas and provide data for the assessment of the lateral and vertical extents of soil and groundwater contamination within overburden soils, to re-evaluate the surface and subsurface characteristics of the Site, including topography, stratigraphy, hydrogeology and depth to groundwater, assess and evaluate potential migration pathways, and establish a clearer contaminant gradient to assist in identifying the sources(s) of contamination in environmental media within overburden, Data gap areas include previously inaccessible interior locations within 338 Broadway where historical drycleaning equipment was located, the parking area on the south side of the Site where borings were not extended to the confining layer, and to the north of Bob's Auto at 336 Broadway.

At the request of NYSDEC, AECOM will review and evaluate the information generated by Aztech during prior investigations and determine whether this information can be incorporated into the Comprehensive SCR to be issued by AECOM. Upon determination that the Aztech data can be included, the Comprehensive SCR will include both Aztech and AECOM data.

1.2 Site Description

The Site is comprised of four (4) parcels in the City of Kingston, Ulster County, New York located at 338 Broadway (Tax ID: 56.26-11-46), 17 Jansen Avenue (Tax ID: 56.26-11-45), 15 Jansen Avenue (Tax ID: 56.26-11-44), and 334 Broadway (Tax ID: 56.26-11-12). **Figure 1** presents the Site Location Map.

The entirety of the Site spans 1.72 acres across the four parcels; 338 Broadway (0.23-acre), 334 Broadway (0.11-acre), 15 Jansen Avenue (0.69-acre) and 17 Jansen Avenue (0.69-acre). The Site is located within an urban area and is surrounded in all directions by a mix of commercial, single-family residential and multi-family residential properties.

The 338 Broadway parcel consists of a single three-story building divided into multiple units. One of the two ground-floor units is currently occupied by a retail business, Anajpati Asian Grocery Store, while the other is unoccupied, and the upper floors contain occupied residential apartments. A detached garage structure is located at the rear of the property that connects to 334 Broadway. 334 Broadway is occupied by an inactive auto body shop, Bob's Automotive Repair, and includes a paved area at the front of the building. 15 Jansen Avenue contains an occupied two-story, single-family residence. 17 Jansen Avenue is vacant, contains no structures and is used as a parking area.

1.3 Site Use History

Based upon historical property information provided by NYSDEC and historical Sanborn Fire Insurance (Sanborn) maps from previous environmental reports, dry cleaning operations were conducted at 338 Broadway as early as 1950 and continued through circa 1971. The earliest information available about the on-site buildings and their historic use is from an 1887 Sanborn map, which depicts a building on-site

that shares a partially similar but non-identical footprint to the current Site building. The use is listed as a store and dwelling, and the use is updated to a saloon and dwelling in the following Sanborn map dated 1899. Subsequent Sanborn maps dated 1950 and 1957 depict a building labeled “dry cleaners” more closely resembling the current building footprint. The label “dry cleaners” is not present in the following Sanborn map dated 1972. The dry-cleaning business appears to have ceased operations at that time, with activities possibly resuming in 1986 based on the SC Addendum prepared by Environmental Assessment & Remediations (EAR) for NYSDEC in 2024. The date of the subsequent closure is not documented; however, municipal records indicate that between 1992 and 2014 the property was occupied intermittently by various commercial tenants, including a tattoo parlor, a clothing store and other retail businesses.

Sanborn maps depict the 334 Broadway property as glass shop from approximately 1972 to the final available Sanborn map dated 1987. Prior to 1972, the building at 334 Broadway is depicted as a residence.

The Sandborn maps depict the 15 and 17 Jansen Avenue properties as residences from the first depiction in 1887 to the final Sanborn map in 1987.

1.4 Previous Investigations

The SCWP submitted to NYSDEC by Aztech (2020) stated that no records of previous investigation work specific to 338 Broadway were available for review. However, prior off-Site subsurface investigations at 322 Broadway (occupied by a Burger King), by AECOM had documented the presence of CVOCs including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE) in groundwater samples. Aztech conducted a SC at the 338 Broadway and additional surrounding parcels to further assess the existence and extent of chlorinated solvent contamination identified at the 322 Broadway property.

- Initial Site Characterization - Aztech (2020 – 2022)

Aztech was contracted by NYSDEC in 2020 to perform a Site Characterization (SC) to inform a decision on the Site’s classification within the NYSDEC State Superfund Program. The Site is classified as a “P-Site,” indicating that the Site may have contamination present that makes it eligible for consideration for placement on the Registry of Inactive Hazardous Waste Disposal Sites.

Between September 2020 and April 2022, Aztech performed an initial SC of the Site. This work included a ground penetrating radar (GPR) survey, collection of four (4) surface soil samples, advancement of six (6) soil borings completed as groundwater monitoring wells (MW-1 through MW-6), gauging and low-flow groundwater sampling of the installed monitoring wells (October 2020); installation and sampling of twenty (20) soil vapor probes during two events, VP-1 through VP-10 (October–December 2020) and VP-11 through VP-20 (August–September 2021). In March 2021, a soil vapor intrusion investigation was also conducted inside the buildings at 322, 336, 338, 344, and 342 Broadway, and 15, 17, and 25 Jansen Avenue.

- Supplemental Site Characterization - Aztech (2023)

In May 2023, additional investigation activities were performed at the Site and additional properties to the west by Aztech to supplement the initial SC preformed between 2020 and 2021. Additional GPR scanning was performed within the area of investigation, an anomaly indicative of an underground storage tank was reported to have been observed within the interior of the property located at 336 Broadway (occupied

by Bob's Automotive). Eight (8) soil borings were advanced and completed as temporary groundwater monitoring wells. Four (4) borings, SB-7 through SB-10, were located within the building interior of 336 Broadway, and four (4) borings, SB-10 through SB-14, were installed in the exterior, at the rear of the property. The temporary monitoring wells were gauged and low-flow sampling was performed in May of 2023.

The initial SC identified varying concentrations and distributions of CVOCs PCE, TCE cis-1,2-DCE, methylene chloride, as well as perfluorooctane sulfonic acid (PFOS) across soil, groundwater, and soil vapor at the Site and additional properties to the west. Section 1.6 further discusses the findings of the investigation performed by Aztech.

- Site Characterization Addendum - EAR (2024)

In August of 2024, EAR submitted a Site Characterization Addendum to the NYSDEC for the report prepared by Aztech in November of 2023. Additional figures were created summarizing concentrations of detected VOCs, SVOCs, pesticides, PFAs and select metals. In addition, NYSDEC requested a record review of the properties immediately to the north and west of 338 Broadway to determine if there is potential PCE sources upgradient to 338 Broadway.

No final Site Characterization Report approved by NYSDEC was issued by Aztech.

At the request of NYSDEC, AECOM will review and evaluate the information generated by Aztech and determine whether this information can be incorporated in a comprehensive Site Characterization Report to be issued by AECOM. Upon determination that the Aztech data can be included, the comprehensive Site Characterization Report will include both Aztech and AECOM data.

1.5 Site Geology

The Site is located within the Hudson–Mohawk Lowlands of New York State, situated in the Hudson River Valley south-southeast of the Catskill Mountain foothills. The topography of the Site and the surrounding area is generally flat, with a gentle slope downward toward the Hudson River to the southeast. Review of the Surficial Geologic Map of New York, Lower Hudson Sheet published by the University of the State of New York, the State Education Department, dated 1989, indicates that the Site is underlain by glaciolacustrine sands and clays, and till of variable extent. The area to the southeast of the Site, in the direction of the Rondout Creek and Hudson River include recent floodplain deposits and bedrock that is exposed or present within 1 meter of the surface. Review of the Geologic Bedrock Map of New York, Lower Hudson Sheet published by the University of the State of New York, the State Education Department, dated 1970, indicates that the Site is underlain by the Onondaga limestone.

Subsurface soil conditions encountered during prior investigation of the Site have been reported in a draft SCR submitted by Aztech (Aztech SCR) to NYSDEC in November of 2023. The report states subsurface conditions typically consist of loose brown fine to medium sand with varying amounts of silt from just beneath the surface and ranging to approximately 10 to 14 feet below ground surface (bgs). The predominant sand and silt soils were found to overlay a confining layer of gray silt and clay. The silt and clay confining interval was generally firm and encountered below the observed water table. The silt and clay layer extended to the maximum investigation terminal depth 20 feet below ground surface (bgs). During the prior investigations, boring advancement did not exceed the confining layer of silt and clay. The average terminal depth of borings during Aztech's 2023 investigation was 16.6 feet bgs. Bedrock was reportedly not encountered during prior investigations at the Site.

1.6 Site Hydrogeology

During prior Site investigations, groundwater was reported to have been encountered within soil borings between 8 and 14 feet bgs (Aztech, 2023). Based upon the water levels collected during the October and December 2020 well gauging event, Aztech reports stated the groundwater flow direction at the Site was determined to be in a southeasterly direction with the average groundwater gradient within the measured well network ranging from 0.005-0.006 ft/ft between both gauging events. The Rondout Creek is located approximately 0.75 miles southeast of the Site and serves as an eastward flowing tributary to the Hudson River. The Hudson River itself lies approximately 1.5 miles to the east-southeast of the Site. The presumed groundwater flow direction in the vicinity of the Site is to the southeast and groundwater discharges into the Hudson River and/or its tributary.

1.7 Reported Site Conditions

Soil, groundwater, and soil vapor samples were collected from the Site and surrounding properties (334 Broadway, 342 Broadway and 25 Jansen) as part of the prior SC work performed by Aztech between 2020 and 2023 and documented in the Aztech SCR. Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), per and polyfluoroalkyl substances (PFAS), and pesticides. Soil vapor samples were analyzed for VOCs. Based upon investigations conducted to date, the primary contaminants of concern are listed as PCE, TCE, cis-1,2-DCE, methylene chloride, and PFOS in soil, groundwater, and soil vapor.

At this time, further characterization of the Site is required to support the ongoing investigation to assess the possible source and extent of contaminants. Through the investigative activities to be performed by AECOM, additional information will be obtained regarding existing groundwater and subsurface soil conditions at the Site, in targeted areas where conditions are currently unknown and warrant further investigation.

The scope of work chosen for this SCWP is to target data gap areas and provide data for comprehensive site characterization. Data gap areas include previously inaccessible interior locations within 338 Broadway where historical drycleaning equipment was located, the parking area on the south side of the Site where borings were not extended to the confining layer, and to the north of Bob's Auto at 336 Broadway, to establish a clearer contaminant gradient.

The following summaries of findings from previous investigations per environmental media are from the DER Environmental Remediation Database and are presented for context only. NYSDEC has indicated the online content may not be complete or fully accurate.

Soil

Pesticides 4,4' DDD, 4,4' DDE, and 4,4' DDT were detected in surface soil samples up to 2.3 parts per million (ppm), 0.41 ppm, 1.4 ppm, respectively. Each compound exceeds the respective NYSDEC 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objective (UUSCO) of 0.0033 ppm for each compound. Dieldrin was detected up to 0.11 ppm, exceeding the Residential Soil Cleanup Objective of 0.039 for the compound. Metals copper, lead, zinc, and mercury were reported at a concentration of 51.9 ppm, 365 ppm, 508 ppm, and 0.27 ppm, respectively, each exceeded their respective UUSCOs of 50 ppm, 63 ppm, 109 ppm and 0.18 ppm. PFOS was detected in surface soil samples up to 6.4 parts per billion (ppb), exceeding the UUSCO of 0.88 ppb.

The VOC PCE was detected up to 110 ppm in subsurface soil exceeding the Restricted Residential Soil Cleanup Objective (RRSCO) of 19 ppm. TCE was detected in subsurface soil samples up to 1.7 ppm, exceeding the UUSCO of 0.47 ppm. The metal nickel was detected up to 36.8 ppm, exceeding the

UUSCO of 30 ppm. No other exceedance of UUSCOs were reported in subsurface soil samples. There were no exceedances of Commercial Soil Cleanup Objectives identified during the SC performed by Aztech. Per NYSDEC, surface and sub surface soil contamination is limited to the Site and does not pose a threat to off-site receptors.

Groundwater

The VOCs PCE, TCE, and DCE were detected up to 21 ppb, 6.6 ppb, and 130 ppb, respectively, exceeding the Groundwater Quality Standard (GWQS) level of 5 ppb for each compound. PFOS was detected up to 24 nanograms per liter (ng/L), exceeding the GWQS of 2.7 ng/L. Perfluorooctanoic acid (PFOA) was reported as not detected on the DER Environmental Remediation Database, however, the Aztech SCR reported PFOA was detected up to 63 ng/L exceeding the GWQS of 6.7 ng/L. 1,4 dioxane was reported as not detected in groundwater samples. Per NYSDEC, groundwater impacts will likely cause off-site impacts and the source of contamination warrants further investigation.

Soil Gas

PCE was detected in soil gas samples up to 7,700 micrograms per meter cubed (ug/m^3) at the northern site boundary. TCE was detected up to 100 ug/m^3 at the same location.

Soil Vapor Intrusion

On April 19, 2022, eight structures including the Site were sampled for soil vapor intrusion (SVI) using co-located indoor air and sub slab soil vapor samples in accordance with the New York State Department of Health (NYSDOH) Soil Vapor Intrusion Guidance Document. PCE was detected with a maximum concentration of 280 ug/m^3 in indoor air and 3,800 ug/m^3 in sub-slab vapor. No other compounds were detected above their NYSDOH SVI guidance values. Based on sampling results, mitigation of soil vapor intrusion is recommended in two of the eight structures, and no further action is recommended in the remaining six.

Surface Water

No surface water is present within the boundaries of the Site.

2. Site Characterization Work Plan

2.1 Purpose

The purpose of the AECOM SC includes, but is not limited to, the following:

- Assess the lateral and vertical extents of soil and groundwater contamination within overburden soils in target data gap locations;
- Evaluate the surface and subsurface characteristics in target locations of the Site, including topography, stratigraphy, hydrogeology, and depth to groundwater.;
- Identify the source(s) of contamination in environmental media within overburden previously unaddressed, assess and evaluate the potential migration pathways of these sources, and identify actual or potential receptors of contaminants; and,

- Conduct a review of available data from previously performed Site investigations and integrate findings into a Comprehensive SCR to provide continuity and support the development of an updated understanding of current Site conditions.

The locations of the proposed soil borings and temporary monitoring wells are shown in **Figure 2** (locations may change based on physical access constraints and soil boring findings). NYSDEC will be notified prior to any recommended changes to the sampling locations. Necessary adjustments based on field conditions will be discussed with NYSDEC and NYSDOH.

This SCWP will be used in conjunction with the Site-specific *Health and Safety Plan* (HASP, see **Appendix A**), Site-specific *Field Activity Plan* (FAP, see **Appendix B**) and Site-specific *Quality Assurance Project Plan* (QAPP, see **Appendix C**) for Work Assignments under Standby Engineering Services Contract D009803. Refer to these plans, included in the Appendices of this SCWP for descriptions of routine field procedures, field forms, and quality assurance procedures.

2.2 Scope of Work

The scope of work for the field investigation consists of the following tasks:

- Task 1 – Underground Utility Clearance
- Task 2 – Advancement of Soil Borings and Surface/Subsurface Soil Sampling
- Task 3 – Installation of Temporary Monitoring Wells
- Task 4 – Water Level Measurement and NAPL Thickness Measurement (if present)
- Task 5 – Groundwater Sample Collection
- Task 6 – Site Survey
- Task 7 – Investigation Derived Waste (IDW) Handling

The field investigation tasks are further described below.

2.2.1 Task 1 – Underground Utility Clearance

Prior to intrusive work described in Task 2 (below), geophysical screening will be conducted by Enviroprobe, Inc. to identify the presence of underground utilities or any anomalies (e.g., underground storage tanks, etc.) within the interior and exterior work areas where direct-push borings will be advanced. This will be done using geophysical methods (i.e., ground penetrating radar and electromagnetic conductivity).

Prior to mobilization, the drilling subcontractor, Cascade Drilling, shall have the required utility clearance mark-outs necessary for commencing drilling activities at the Site.

In addition, at each proposed soil boring location, the drilling subcontractor will hand clear/soft dig down to 5-feet bgs. If necessary, air knifing or Vac-Tron® will be used to clear the first 5 feet.

The procedures for this task are described in Sections 2.3 through 2.5 of the Contract D009803-63 Site-specific FAP, included as **Appendix B**.

2.2.2 Task 2 – Advancement of Soil Borings and Subsurface Soil Sampling

Soil borings will be advanced by AECOM's drilling subcontractor, Cascade Drilling. Soil borings will be sampled at up to four (4) locations at the Site, SB-13, SB-14, SB-15 and SB-16, (Figure 2) using a direct

push technology (DPT) drill rig (e.g., Geoprobe®). DPT soil borings will be advanced to approximately 15 feet bgs, into the clay confining layer. Soil borings will be advanced and soil samples will be collected in areas where there is a data gap (due to sampling access constraints encountered during prior investigations at the Site or due to borings not being extended to the confining layer) and/or additional definition of contaminant distribution is warranted to help determine possible source areas.

Soil sampling will be conducted continuously to classify subsurface material. Three soil samples will be collected from each of the four soil boring locations; one from the shallow subsurface (0-2 ft. bgs), one from the top of saturated zone (approximately 8 ft. bgs) and one at the confining layer (approximately 14 ft. bgs), for a total of twelve soil samples. Soil samples will be visually described and classified, assessed for signs of contamination, and screened with a photoionization detector (PID) for the presence of organic vapors by a qualified AECOM geologist. Soil boring logs will present the pertaining soil classification in accordance with the Unified Soil Classification System (USCS) and display PID readings for each foot interval. Since the top five (5) feet of each soil boring will be hand-cleared, soil will be classified and documented as best as practicable.

The three soil samples collected from each soil boring will be submitted to a NYSDEC call-out laboratory (Pace Analytical) for analysis of Target Compound List (TCL) VOCs. The sample analytical program is summarized in Table 1.

Samples will be analyzed by Pace Analytical, which will be an ELAP certified lab. Proper QA/QC will be collected in accordance with the Site-specific QAPP (**Appendix C**) and the Sample Analytical Program, (Table 1). Category B deliverables are required for all soil and groundwater analytical data. Data validation and DUSRS will be completed by AECOM's in-house data validator.

The procedures for Task 2 are described in Sections 3.0 and 5.0 of the FAP (**Appendix B**). Soils will be logged following the procedures described in Section 8.0 of the FAP. Community air monitoring will be performed as described in Section 2.6 of the FAP.

2.2.3 Task 3 – Installation of Overburden Temporary Monitoring Wells

Four (4) overburden temporary monitoring wells will be installed at the Site (Figure 2) by AECOM's drilling subcontractor Cascade Drilling.

As described in Task 2, overburden soil will be visually described and classified, inspected for signs of contamination, and screened with a PID for the presence of organic vapors by an AECOM geologist. Soil cuttings and drilling water will be contained in Department of Transportation (DOT) approved 55-gallon drums. Monitoring wells, and soil borings will be surveyed for horizontal and vertical control.

The procedures for Task 3 are described in Section 4.3 of the FAP (**Appendix B**). Soils will be logged following the procedures described in Section 5.1 of the FAP.

The temporary overburden monitoring wells will be constructed with 10-feet of 1-inch ID #10 slot polyvinyl chloride (PVC) screen attached to a 1-inch inner diameter (ID), Schedule 40 PVC riser to the ground surface and a Schedule 40 PVC bottom plug. The well screen will straddle the water table. If bedrock is encountered below the water table, but prior to the target depth of 15 feet bgs, drilling will cease, and the well shall be screened at a depth that straddles the water table above the bedrock interface, as directed by the AECOM geologist.

2.2.4 Task 4 – Water Level Measurement

A comprehensive round of water levels will be measured from the temporary overburden monitoring wells by AECOM. If present, NAPL thickness will be measured. The procedures for water level and NAPL thickness measurement are described in Sections 4.1 and 4.2 of the FAP (**Appendix B**). No NAPL was documented in previous investigation by Aztech. Water level measurements will be limited to the newly installed temporary monitoring wells.

2.2.5 Task 5 – Groundwater Sample Collection

Groundwater samples will be collected from the newly installed temporary overburden monitoring wells by AECOM. Samples will be collected using low-flow sampling procedures and will be analyzed for TCL VOCs. The sample analytical program is summarized in Table 1.

Samples will be analyzed by an NYSDEC call-out laboratory (Pace Analytical), which will be an ELAP certified lab. Proper QA/QC will be collected in accordance with the Site-specific QAPP (**Appendix C**) and the Sample Analytical Program, (Table 1). Category B deliverables are required for all soil and groundwater analytical data. Data validation and DUSRS will be completed by AECOM's in-house data validator.

Proposed well locations can be found in Figure 2. Groundwater samples will be collected using the procedures described in Sections 4.4.1 and 4.4.2 of the FAP (**Appendix B**).

2.2.6 Task 6 – Site Survey

AECOM's site survey subcontractor, MJ Engineering and Land Surveying, Inc., will survey sampling locations and key site features at the Site. This will include monitoring well locations, soil borings, other relevant Site features such as anomalies identified during the geophysical screening, ground surface locations, and top of casing (TOC) elevations. Data from this survey will be used in generating the comprehensive SCR discussed below.

2.2.7 Task 7 – Investigation Derived Waste Handling

IDW generated during the field activities will be handled using the procedures described in Section 6.2 of the FAP (**Appendix B**).

One soil and one aqueous sample from IDW will be collected and submitted for laboratory analysis of waste characterization parameters as indicated on Table 1.

Following waste characterization, and upon NYSDEC approval, IDW will be transported off-Site under manifest by Island Pump and Tank, LLC for proper disposal.

2.3 Site Characterization Report Preparation

The comprehensive SCR will be submitted as a draft report within 90 days after fieldwork has been completed and data have been received and validated. Data will be validated in accordance with *Division of Environmental Remediation (DER)-10, Technical Guidance for Site Investigation and Remediation, Appendix 2B - Guidance for Data Deliverables and the Development of Data Usability Summary Reports* (NYSDEC, 2010).

A final version of the report will be submitted within two weeks after NYSDEC's comments on the draft report are received by AECOM.

The report for this task will include the following:

a. A description of field activities conducted by AECOM and its subcontractors on the Site;

b. A summary of previous investigations;

c. A site location map;

d. Figure(s) depicting the site layout soil borings, monitoring wells, and key site features;

e. Figures depicting sample locations and NYS standards, criteria, guidance (SCG) non-compliance values from the soil, and groundwater analytical data collected during site work;

f. A discussion of analytical results;

g. Tables and Figures depicting groundwater elevation and NAPL contours, and NAPL thickness (as applicable);

h. Data summary tables of detected compounds with NYS SCGs listed, and non-compliance values highlighted;

i. Field notes and/or daily activity logs;

j. Photographs taken at the site during field activities;

k. Soil boring logs;

l. Monitoring well construction logs;

m. Monitoring well purge logs with water quality measurements;

n. Manifests and/or bills of lading signed by the disposal facility documenting the proper disposal of IDW;

o. Survey field notes and site sketches;

p. DUSR (Data Usability Summary Reports) (including Form 1s) containing only data from the current field work by AECOM; and

q. A Site Characterization Assessment which integrates analytical data and Site information collected during AECOM's current SC activities, along with analytical data and Site information previously collected by Aztech from 2020-2023. Note that this task will require AECOM to rely on reports prepared by others and provided by NYSDEC, and AECOM is not responsible to independently verify the accuracy of the information provided.

This task includes EQuIS™ submittals to the NYSDEC for all analytical data collected during the investigation.

2.4 Green & Sustainable Remediation Initiative Efforts

Development of this SCWP was completed with the goal of implementing sustainable practices where possible in accordance with the goals of the DER-31 Green Remediation Policy (January 2011 and November 2023 Memorandum). A summary of green remediation best management practices by the EPA for site investigations can be found in **Appendix D** – Green Remediation Best Management Practices: Site Investigation.

Pursuant to the NYSDEC DER-31 Green and Sustainable Remediation (GSR) initiative, GSR principles and techniques shall be implemented to the extent feasible during site investigation, remedial and site management stages of projects under NYSDEC programs. The major GSR components are as follows:

- Considering the environmental impacts of investigative technologies over the long term;
- Reducing direct and indirect greenhouse gas and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increase in recycling, and increasing reuse of materials which would otherwise be considered a waste; and
- Incorporating GSR principles and techniques to the extent feasible in the future development at this site.

During implementation of this work plan, the following GSR efforts will be incorporated into field activities:

- Vehicle idling will be reduced wherever practicable.
- GPR will be used as a non-invasive method, in lieu of excavating, to clear for utilities as well as identify any potential previously unidentified underground structures. This field task is described above in Task 1.
- Using low-flow groundwater sampling technology to reduce IDW in the form of purge water gallons and disposable sampling equipment.
- IDW drums will be grouped and stored in a secure location throughout field activities and removed from the Site in a single event at the end of each field mobilization as applicable, rather than daily pickups.
- When applicable, visits to stores to purchase field supplies, etc., and trips to the laboratory to drop off sample coolers will be limited or combined to save energy, reduce emissions, reduce localized noise, vibration, and wear and tear on roads.

Additional information on GSR best practices is found in Section 2.8 of the FAP (**Appendix B).**

3. Anticipated Schedule

This WA will be performed according to the following anticipated time frames:

Activity	**Date**
NYSDEC approval of 2.11 Package	June 20, 2026
Task 2: Field Work/Field Investigation Start	July 20, 2026
Task 2: Field Work/Field Investigation End	August 20, 2026
Task 3: Comprehensive Site Characterization Report - Draft	December 14, 2026 or 90 days after all DUSRs received from Validator
Task 3: Comprehensive Site Characterization Report - Final	January 28, 2027 or two weeks after comments received from NYSDEC

Acronyms

AECOM	AECOM USA, Inc.
Aztech	Aztech Environmental Technologies
bgs	below ground surface
cis-1,2-DCE	cis-1,2-Dichloroethene
CVOC	Chlorinated Volatile Compound
DER	Division of Environmental Remediation
DOT	Department of Transportation
DPT	Direct Push Technology
DUSR	Data Usability Summary Reports
FAP	Generic Field Activity Plan
GPR	Ground Penetrating Radar
GSR	Green and Sustainable Remediation
GWQS	Groundwater Quality Standard
HASP	Health and Safety Plan
ID	Inner Diameter
IDW	Investigation Derived Waste
ug/m^3	micrograms per meter cubed
ng/L	nanograms per liter
NAPL	Non-Aqueous Phase Liquid
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethylene
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perflurooctane Sulfonic Acid
PID	Photoionization Detector
ppb	parts per billion
ppm	parts per million
PVC	Polyvinyl Chloride
RRSCO	Restricted Residential Soil Cleanup Objective
Site	338 Broadway
SC	Site Characterization
SCG	Standards, Criteria, or Guidance
SCO	Soil Cleanup Objectives
SCR	Site Characterization Report
SVI	Soil Vapor Intrusion

SVOC	Semi Volatile Organic Compounds
SCWP	Site Characterization Work Plan
TAL	Total Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TOC	Top of Casing
trans-1,2-DCE	trans-1,2-Dichloroethene
USCS	Unified Soil Classification System
UUSCO	Unrestricted Use Soil Cleanup Objective
VOC	Volatile Organic Compound
WA	Work Assignment

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USEPA, 2016. *Green Remediation Best Management Practices: Site Investigation and Environmental Monitoring.* Office of Land and Emergency Management EPA 542-F-16-002. September.

Figures

0 2000 4000

APPROXIMATE SCALE IN FEET
SCALE= 1:24000

BASEMAP SOURCES:

USGS 7.5-minute Series Topographic Map 2023
East Kingston, NY Quadrangle, Ulster Co. New York
USGS 7.5-minute Series Topographic Map 2023
West Kingston, NY Quadrangle, Ulster Co. New York

Title:	SITE LOCATION MAP
Location:	FORMER DRY CLEANER 338 BROADWAY KINGSTON, NEW YORK SITE ID: 356058
Client:	NYSDEC

AECOM

Drafter: CLS	Date: February 2026
Drg. Size: 8.5 x 11	Job No.: 60781325

FIGURE 1

D:\Kingston Walgreens\February 2026\Figure 1 Site Location NYSDEC SITE ID # 356058 February 2026.dwg User:carrie.szczeponski Feb 18, 2026 - 10:27am

LEGEND

- SITE BOUNDARY
- PROPOSED BORING LOCATIONS
- APPROXIMATE FOOTPRINT OF FORMER DRYCLEANING EQUIPMENT

NOTES

1. BORINGS MAY BE SUBJECT TO CHANGE BASED UPON FIELD CONDITIONS OR FINDINGS OF THE GEOPHYSICAL SURVEY.
2. ALL LOCATIONS AND SCALE ARE APPROXIMATE.

BASEMAP SOURCES:
ORTHOIMAGERY ACCESSED FROM GIS.NY.GOV ORTHOIMAGERY CLEARINGHOUSE. ORTHOIMAGERY DATED 2021.

0 30' 60'

1" = 30'

FORMER DRY CLEANER 338 BROADWAY NYSDEC SITE ID: 356058
334 BROADWAY, 338 BROADWAY, 15 JENSEN AVENUE AND 17 JENSEN AVENUE
Kingston, New York
Project No.: 60781325 Date: 2026-05-14

PROPOSED SOIL BORING LOCATIONS

AECOM

Figure: 2

Table

Table 1
AECOM Work Assignment (WA) D009803-63
338 Broadway
Site Characterization
Site No. 356058
SAMPLE ANALYTICAL PROGRAM

Analytical Methods	Samples	Quality Control Samples						Total Number of Samples
		Field Duplicate	Matrix Spike	Matrix Spike Duplicate	Equipment/ Rinse Blank	Field Blank	Trip Blank	
Soil Samples								
VOCs via 8260D	12	1	1	1	1	0	1	17
Groundwater Samples								
VOCs via 8260D	4	1	1	1	0	0	1	8
Waste Characterization (IDW)								
Full TCLP	2	0	0	0	0	0	0	2
Ignitability	2	0	0	0	0	0	0	2
Corrosivity	2	0	0	0	0	0	0	2
Reactivity	2	0	0	0	0	0	0	2

Appendix A– HASP

Project-Specific SH&E Plan

D009803-63
60781325
338 Broadway
Kingston, NY 12401
United States of America
Latitude 41.9261, Longitude -73.9927

S3AM-209-FM2
Revision 10
January 30, 2026

Delivering a better world

Quality information

Prepared by	Checked by (Area/Regional/Business Line SH&E Manager or Delegate)	Approved by (Project Manager, Project Director, or Business Line Lead)
Kaleb Hotaling	Caroline Lee	
Signature	Signature	Signature
Kaleb Hotaling	Caroline Lee, CSP	Abdiel Lopez Torres
Print Name	Print Name	Print Name

Expiration:	May 20, 2027	Valid for 1 year maximum or until the scope of work, subcontractor(s), methods and/or equipment change.

Revision History

Revision	Revision date	Details	Name	Position

Distribution List

# Hard Copies	PDF Required	Association / Company Name

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1. Safety, Health, and Environment (SH&E) Program

1.1 AECOM SH&E Policy

The SH&E Policy – AECOM Global (available on AECOM's Ecosystem intranet) establishes the framework to safeguard AECOM employees and stakeholders through effective management of risk and commitment to a Culture of Caring.

AECOM

Safety, Health & Environment

Purpose

This policy establishes the framework to safeguard AECOM 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 healthful working environment, AECOM is committed to maintaining the physical, psychological, and social well-being of our employees and stakeholders through appropriate risk management strategies.

To advance our Safety, Health & Environment (SH&E) program, AECOM is committed to:

- The ultimate objective of incident prevention for AECOM employees, stakeholders, and the environment.
- Implementation of our Safety for Life program, a comprehensive SH&E management system guided by our Life-Preserving Principles, to empower employees and drive continuous review and improvement.
- Effective management of SH&E risk throughout the project lifecycle, through identification of hazards, development of suitable actions using an established hierarchy of controls, and appropriate resourcing.
- Meet client requirements and comply with all applicable local, state, provincial and national SH&E legal requirements.
- Foster a safety culture where communication, collaboration, and consultation enable ownership for the well-being of self and others.
- Set appropriate SH&E performance goals and Core Value Metrics; work with employees and business partners to meet targets and promote continuous improvement opportunities.
- Establish AECOM as the global provider of choice through safe execution of professional services throughout the project lifecycle.

Participation

Individual engagement with the AECOM Safety for Life program is required through the participation of all parties in our Culture of Caring.

AECOM expects its leaders, managers, supervisors, employees, and subcontractors to:

- Support their own well-being as well as the well-being of all other stakeholders both on and off the job.
- Demonstrate individual commitment through compliance with applicable policies and processes, and properly identify, manage, and eliminate hazards to reduce risk in the workplace.
- Complete applicable planning and training to enable competency and proper and appropriately maintained equipment, materials, and personal protective equipment required to work safely and respond as necessary to emergencies.
- Take a moment to assess SH&E risk and take action to stop work if the work cannot be executed safely or if conditions or behaviors are unsafe or unhealthy.
- Immediately report SH&E incidents, near-misses, unsafe conditions, and at-risk behaviors; participate in investigation processes to enable learning and implementation of corrective and preventive actions.

Accountability

AECOM expects ownership of our Safety for Life program, where everyone participates, and leaders demonstrate and drive accountability to achieve SH&E excellence.

AECOM management, 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 culture and performance.
- Inspections, investigations and reporting to assess SH&E management system application and effectiveness; elevation of high potential findings to leadership to enable appropriate action.
- Suitable 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 working for or on behalf of AECOM.

August 29, 2025

Troy Rudd **Date**
Chief Executive Officer

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Safety, Health & Environment Policy (01-001-PL1)
Revision 12 August 29, 2025
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1.2 Safety for Life

Safety for Life is our comprehensive global SH&E program. Its key components, our Culture of Caring, our foundational Life-Preserving Principles, and a wealth of supporting resources and tools, combine to enable AECOM personnel to contribute to and apply our Safety for Life program both on and off the job.

1.3 Life-Preserving Principles

AECOM has adopted the Life-Preserving Principles – AECOM Global (available on AECOM's Ecosystem intranet) which guide our global SH&E program, Safety for Life. These nine principles advance our commitment to achieve our ultimate objective of incident prevention, and protection of the environment while executing our work.

1.4 Safety Tenets

The safety tenets listed below must be followed. If a violation of a safety tenet is observed, the associated work activity must be stopped immediately, and corrective action must be taken.

	Use Stop Work Authority immediately upon observation of Imminent Danger. Refer to Safety Tenets and Stopping Work – Americas.
	Keep the worksite free of hazards that could cause slips, trips, and falls. For work at height, refer to Work at Height – Americas.
	Obtain authorization before entering a confined space. Refer to Confined Spaces – Americas.
	Confirm that safety precautions are in place for ground intrusive work. Refer to Ground Disturbance – Americas.
	Take precautions to prevent falling into a body of water when working on, in, and near water. Refer to Work On, In, or Near Water – Americas.
	Do not work alone when performing tasks with High Potential (HiPo) Risks or when working remotely. Refer to SH&E Risk Assessment and Planning – Americas.
	Only work on or near a roadway with proper traffic safety controls in place. Refer to Highway and Road Work – Americas.

	Only foul a railroad track with appropriate approvals, proper training, and train protection. Refer to Railroads – Americas.
	Wear a seatbelt and never use mobile communication devices or other devices while driving. Refer to Driving – Americas.
	Assess risk for all work and changes to scope of work. Refer to SH&E Risk Assessment and Planning – Americas.
	Complete SH&E training required to perform identified tasks. Refer to SH&E Training – Americas.
	Conduct site-specific safety orientation for all first-time visits. Refer to SH&E Training – Americas.
	Use the required personal protective equipment (PPE). Refer to Safety Gear – Americas.
	Only use equipment that is maintained in a safe condition and appropriate to the work performed. Refer to Heavy Equipment and Machines – Americas and Hand and Power Tools – Americas.
	Report for work fit for duty. Refer to Fitness for Duty – Americas.

2. Project Contacts and Resources

2.1 Key Personnel

Level	Title	Name	Phone #
Project Level	**Project Manager (PM)**	Abdiel Lopez Torres	518-951-2393
	Site Supervisor (SS)	Julie Healy	631-965-0532
	Site Safety Lead (SSL):	Julie Healy	631-965-0532
	Client Contact	Kathleen Carey	518-485-5174
Region Level	**SH&E Manager**	Caroline Lee	445-345-3568
	Regional SH&E Director	Peter Gregory	(201) 602-3511

2.2 Site Safety Lead (SSL) Determination

AECOM SSL requirements apply if the answer is "yes" to both questions below.

1.	**Will an AECOM employee be tasked with directly supervising safety implementation on a program or project?**	☒ Yes ☐ No
2.	**Do the program or project activities include one or more high hazards (see Question 3 below)?**	☒ Yes ☐ No

Note: If you have questions about "high hazard" activities, please reach out to your SH&E Manager – the Ask SH&E link may be used.

3. Select one of the two options below:

☒ **Site Safety Lead is approved (through the SSL Platform), and the PM acknowledges the SSL is qualified and authorizes the SSL to monitor/supervise the following high hazards (check the boxes below that apply):**

☐ Confined Spaces	☐ Hazardous Energy/Control	☐ Underground Work
☒ Hazardous Substances/Respiratory Protection	☒ Heavy Equipment/Machines	☐ Working at Heights
☒ Ground Disturbance	☐ Highway and Road Work	☐ Work On, In, or Near Water
☒ Power Tools	☐ Railroad	☐ Radiological Hazards
☐ Non-Standard Driving (e.g., utility task vehicles, all-terrain vehicles, off-road vehicles, and pulling a trailer or other equipment)	☐ Other - **Specify**:	Click here to enter

☐ **An approved SSL is NOT required for the project scope of work.**

2.3 Short Service Employee (SSE) Log

1. **An Employee is designated as an SSE if they are undertaking work in the field and have less than 6 months experience working in the industry of the work to be performed. An employee is not considered an SSE, when they have more than 6 months field work experience in a similar industry and can demonstrate competency in AECOM's safety management system and processes.**

2. ☐ Project scope of work does **NOT** involve short service employees.

☒ Project scope of work **DOES** involve short service employees. SSE Information is provided below.

SSE Employee Name	Kaleb Hotaling	**Phone #**	518-225-0830	**Mentor's Name**	Abdiel Lopez Torres

2.4 Subcontractors and Third Parties

1. **Refer to Subcontractor Selection and Stewardship – Americas.**

2. ☐ Project scope of work does NOT involve AECOM subcontractors or third parties.

☒ Project scope of work DOES involve one or more AECOM subcontractors and/or third parties. Their information is provided below.

Company/ Affiliation	Relationship to AECOM	Primary Emergency Contact Name and Phone Number	Alternate Emergency Contact Name and Phone Number
Cascade Drilling	☒ AECOM Subcontractor (Managed) ☐ Sub of AECOM Sub (Managed) ☐ Client Direct-Hire Contractor (Unmanaged) ☐ Third Party (Unmanaged)	Zachary Fordley 518-330-9332	TBD
Enviroprobe Service, Inc.	☒ AECOM Subcontractor (Managed) ☐ Sub of AECOM Sub (Managed) ☐ Client Direct-Hire Contractor (Unmanaged) ☐ Third Party (Unmanaged)	Matthew McMillen 856-858-8584	TBD
MJ Engineering, Architecture, Landscape Architecture and Land Surveying, P.C.	☒ AECOM Subcontractor (Managed) ☐ Sub of AECOM Sub (Managed) ☐ Client Direct-Hire Contractor (Unmanaged) ☐ Third Party (Unmanaged)	Michael D. Panichelli 518-371-0799	TBD
Island Pump and Tank LLC	☒ AECOM Subcontractor (Managed) ☐ Sub of AECOM Sub (Managed) ☐ Client Direct-Hire Contractor (Unmanaged) ☐ Third Party (Unmanaged)	Matthew Schleferstein 631-462-2226	TBD

Notes:

a. An emergency contact is someone who is capable of initiating medical case management/incident response for their company.
b. An alternate emergency contact is recommended, but not required for client direct-hire contractors and third parties.
c. For a subcontractor of an AECOM subcontractor, one of the emergency contacts can be a representative from the AECOM subcontractor that hired them.

2.5 Lone Worker Management Plan

1. **AECOM discourages employees from working alone (i.e., where AECOM personnel are out of visual and audio range of others) when performing field tasks. If lone work is to be performed, a communications/check-in plan must be developed and implemented.**

2. ☒ The project scope of work does NOT involve the lone worker operations.

3. Site Description and Scope of Work

1. Site Location and Description	The Site, 338 Broadway, is located at 338 Broadway, Kingston, NY 12401. The Site consists of 4 parcels – 338 Broadway, 334 Broadway, 15 Jansen Ave, and 17 Jansen Ave. The Site is generally flat, with several structures. The building is split into multiple units, with the ground floor units currently occupied by commercial businesses, residential apartments on the upper floors, and a garage structure in the back. 334 Broadway is occupied by an auto body shop with a paved area in front. 15 Jansen Ave is a two-story single-family residential structure. 17 Jansen Ave is vacant and used as a parking area.
Site Background/ History	The site split between commercial (334 and 338 Broadway) and residential zoning (15 and 17 Jansen Ave). Properties to the north, south, east, and west of the site are a mix of commercial, single- family residential, and multi-family residential. Past use of the Site: 338 Broadway operated as a dry-cleaner as early as 1950 and operation continued through 1971. The dry-cleaning business likely closed at this time and later resumed in 1986. It is unknown when the dry-cleaning business closed, though city records indicate that the property was operating periodically between 1992 – 2014 as miscellaneous businesses, a tattoo parlor, and a clothing store. Past use of the other parcels is not currently available. Soil, groundwater, and soil vapor samples were collected from the site and surrounding properties as part of a site characterization. Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), per and polyfluoroalkyl substances (PFAS), and pesticides. Soil vapor samples were analyzed for VOCs. Based upon investigations conducted to date, the primary contaminants of concern are tetrachloroethene (PCE) and trichloroethene (TCE), cis 1,2 dichloroethene (DCE), methylene chloride, and perfluorooctane sulfonic acid (PFOS) in soil, groundwater, and soil vapor.
Client and/or Third-Party Operations at Site	☐ There are NO client and/or third-party operations anticipated at the Site during AECOM's field activities.
	☒ Client and/or third-party operations are anticipated at the Site during AECOM's field activities.
	An auto body shop is present at 338 and 334 Broadway properties, where drilling is anticipated to occur however, the auto body shop is no longer in operation. Other commercial businesses are present in the vicinity of the Site, where members of the public may visit during AECOM's field activities. A public sidewalk is present at the site where members of the public may pass by during AECOM's field activities. On-street parking is available to the public in the vicinity of the Site.
Scope of Work	AECOM was retained by New York State Department of Environmental Conservation to The objective of this work assignment is to complete a site characterization for 338 Broadway, Site No. 356058. The Site Characterization will assess the lateral and vertical extents of soil and groundwater contamination down 15 feet below ground surface (bgs); re-evaluate the surface and subsurface characteristics of the Site, including topography, stratigraphy, hydrogeology, and depth to groundwater; and identify the source(s) of contamination in environmental media, assess and evaluate the potential migration pathways, and identify actual or potential receptors of contaminants. The following primary and auxiliary / supporting activities will be required to complete the scope of work and accomplish project objectives and must be included in a Task Hazard Assessment (THA): • Soil boring advancement; • Subsurface soil sampling; • Overburden monitoring well installation; • Water level measurement and non-aqueous phase liquid (NAPL) thickness measurement, if present; and, • Groundwater sampling.

	Project Start Date	4/1/2026	**Field Work Start Date or Next Mobilization to Site**	6/1/2026	**Project Completion Date**	11/30/2026

4. Risk Assessment

☐	AECOM or AECOM-managed subcontractors are NOT self-performing or exposed to any of the activities below.
☒	AECOM or AECOM-managed subcontractors are self-performing or exposed to any of the activities/hazards below.

Drug & Alcohol Testing	Medical Surveillance	**Heat and Cold Stress**
Excessive Noise	**Biological Hazards**	**Ground Disturbance**
Heavy Equipment and Machines	Railroads	Underground Work
Highway and Road Work	**Hazardous Substances and Communication**	**Hand and Power Tools**
Confined Spaces	Working at Height	Work On, In, or Near Water
Respiratory Protection	Hot Work	Hazardous Energy Control
Radiological Hazards		

Non-standard driving activities, including undertaking trips more than 250 miles each way, driving in remote or hazardous areas, or operation of utility task vehicles (UTVs), all-terrain vehicles (ATVs), off-road vehicles, towing trailers or other equipment

4.1 Anticipated Activities, Situations, and Hazards

Select all applicable boxes that describe the activities, situations, or hazards expected to occur during the project's scope of work.
Note: Project Team = AECOM employees, AECOM managed contractors and their managed subcontractors (all tiers)

Fitness for Duty – Americas		
☒	**Does the project scope of work or the work location require workers to be enrolled in a medical surveillance program?**	**If not already enrolled and current, contact the Occupational Health Team at nurse@aecom.com and indicate any project-specific protocols.** Click here to enter

Hazardous Substance and Communication – Americas		
☐	**Does the project scope of work require chemical materials (i.e., hazardous materials/substance and/or Materials of Trade) to be brought onto the site to perform work?**	**Use Project Hazardous Materials Communication Plan – Americas**
☒	**Is potential exposure to chemical hazards reasonably anticipated to have the potential to result in inhalation, dermal contact, ingestion, or injection routes of exposure during the performance of one or more tasks?** **Chemical hazards can be from materials brought on the Site to perform work, constituents of concern found or suspected to be in environmental media under investigation, and/or simultaneous operations being performed at the Site by the property owner/third party.**	**For the U.S., use Project Hazardous Substance Exposure Control Plan – Americas**

☒	**Will activities being performed at hazardous waste sites (i.e. HAZWOPER) involve or potentially involve employee or equipment exposure to and/or physical contact with hazardous materials, hazardous substances, hazardous wastes and/or health hazards?**	**For the U.S., use Project Hazardous Substance Exposure Control Plan – Americas**

Heat and Cold Stress – Americas

☒	**Is there potential for heat stress to occur?**	**Source(s) of heat stress**
		High outdoor temperatures and exposure to direct sunlight.
		Engineering controls
		Sun shades or canopy use when working in direct sunlight outdoors, water available at Site for hydration, air conditioning in vehicles and in indoor environments.
		Administrative controls
		Work/rest schedules based on heat exposure, completing safety training which reviews heat illness prevention and scheduling exterior borings for the morning to avoid working outdoors at the hottest part of the day.
		Personal protective equipment
		Lightweight, breathable clothing, cooling PPE (cooling bandanas or towels), wide-brim hard hats or sunshades, and UV protective clothing/ sunscreen for exposed skin.
		If applicable, add Heat Stress Monitoring Log – Americas
		Add a heat stress monitoring plan if required by the state where the work will take place (e.g., Oregon, California, Washington, Nevada, or Maryland)
☐	**Is there potential for cold stress to occur?**	**Engineering controls**
		Click here to enter
		Administrative controls
		Click here to enter
		Personal protective equipment
		Click here to enter

Biological Hazards – Americas

☒	**Are there any known wildlife, domestic animals (including pets or livestock), biting or stinging insects, or hazardous plants present at the project site?**	**Complete the biological hazard control plan below.**
		Animals of concern (select all that apply)
		☐ Bears ☐ Carnivores ☐ Ungulates (hoofed mammal) ☐ Snakes ☐ Alligators
		☐ Other (specify): Click here to enter
		Insects of concern (select all that apply)
		☒ Ticks ☒ Spiders ☒ Stinging Insects (Bees/Mosquitos)
		☐ Other (specify): Click here to enter
		Plants of concern (select all that apply)
		☐ Poison ivy ☐ Poison oak ☐ Poison sumac ☐ Giant hogweed (giant cow parsnip) ☐ Wild parsnip ☐ Devils club ☐ Stinging nettle
		☐ Other (specify): Click here to enter

		Equipment to be used specific to animals, plants, and insects of concern (e.g. snake chaps, bear spray, etc.)
		Insect repellent spray containing DEET, closed-toe boots, first-aid kit (if an insect bite occurs).
		Identify the response procedure in case one is encountered
		Stop work and assess if insects of concern are impacting workers at the site, move away from the area without panicking or swatting at flying insects, notify others of the hazard and avoid contact with nests if encountered. Avoid reaching into hidden areas (brush, debris, and voids). If insects are swarming leave the area immediately and seek shelter in a vehicle or indoors. If ticks are found on clothing remove them immediately and check clothing for additional ticks present. If a tick is attached to skin use a tick removal tool to detach the tick without twisting or crushing the tick. In all cases of insect bites follow proper reporting procedures (i.e, notify manager or PM, and AECOM nurse and submit an incident report via Industry Safe.)
☐	**Is there potential for work in areas that may expose project team member(s) to human bodily fluids (e.g., sanitary sewers, sharps, etc.)?**	**Bloodborne Pathogen – Exposure Control Plan**
		Exposure Determination (source of exposure)
		Click here to enter
		Training
		Click here to enter
		Hepatitis B Vaccination offered
		Click here to enter
		Engineering Work Practice Controls
		Click here to enter
		PPE
		Click here to enter

Noise – Americas

☒	**Is there potential for work activities to expose project team member(s) to an average of 85 decibels (dBA) over an 8-hour period, or 94 decibels over a 1-hour period?** **Note: A sign and symptom of exceeding 85 dBA may be having to shout to be heard by someone 3 feet away, and/or experiencing ringing of your ears, respectively.**	**Hearing protection device (HPD) selected**	Ear plugs or hard-had mounted ear muffs.
		Areas of required HPD use	In vicinity of drill rig during drilling operations.
		Monitoring Procedures and Action Levels Noise Dosimeter Instrument Type	N/A - Hearing protection is to be worn during all drilling activities.
		Action Level	**Response Activity**
		<85 dBA	• **Continue work activities.**
		>85 dBA	• **Don hearing protection (plugs or muffs) with Minimum Noise Reduction Rating (NRR) of 27.**
			• **Contact the Site Safety Lead or Supervisor.**
		>95 dBA	• **Don dual hearing protection (muffs over plugs).**
			• **Contact the Site Safety Lead or Supervisor.**
		>100 dBA	• **Cease activities and contact the Site Safety Lead or Site Supervisor.**
			• **Implement additional control measures and obtain Project Manager approval before resuming work.**

Ground Disturbance – Americas		
☒	**Will performing/managing excavation, drilling, surface mining, and/or other ground disturbance operations be required?**	**Add Utilities and Subsurface Clearance Checklist – Americas**
☒	**Will working around or performing oversight of drilling operations be required?**	**Add Drill Site Safety Inspection Checklist – Americas**
☐	**Will a designated Competent Person for excavation and/or trenching operations be required?**	**Add Daily Excavation Checklist – Americas**
☐	**Is there a potential to encounter munitions and explosives of concern (MEC), which includes unexploded ordnance (UXO), discarded military munitions (DMM), and explosive compounds, on a project site?**	**Contact the Munitions Response Program (MRP) Technical Group**
Railroads – Americas		
☐	**Will project team member(s) be working on or near railroads?**	**Add Railroad THA – refer to THA Library Ecosystem page** **Railroad Agency** Click here to enter
Hazardous Energy Control – Americas		
☒	**Will project team member(s) be working near – but not directly on – live electrical equipment (not including power tools)?** **(Examples - Overhead lines and obstructions. extension cords/ temporary electric power, lights and task lights, circuit breakers, hydraulic, mechanical and pneumatic sources.)**	**Describe hazardous energy sources:** Overhead lines present on Site, but not in the vicinity of outdoor soil borings. Ground penetrating radar and additional electrical line location techniques will be performed prior to soft-digging/pre-clearing activities to locate any possible underground utilities including underground electric lines both on the interior and exterior of the building, in target areas for soil borings.
☐	**Will project team member(s) be required to implement Lockout/Tagout procedures?**	Lock and Tag Log – Americas **As applicable, add:** Lockout Tagout Permit – Americas Equipment-Specific LOTO Process Template – Americas
☐	**Will the project team member(s) operate or use a machine or equipment that presents hazardous energy sources?**	**Add machine- and/or equipment-specific THA.**
Heavy Equipment and Machines – Americas		
☒	**Will there be work on sites with exposure to heavy mobile equipment (skid steers, back hoes, excavators, etc.)?**	**Describe onsite heavy equipment:** Geoprobe 420M
☐	**Does any of the work involve directly managing employees and/or subcontractors operating heavy equipment and/or machines?**	**As applicable, add:** • Lift Classification Checklist – Americas • Critical Lift Plan – Americas • Personnel Platform Lifting – Americas • Pre-Operations Powered Industrial Truck Checklist • MEWP Pre-Operation Checklist – Americas • Under Bridge Inspection Unit Pre-Operation Checklist – Americas

Hand and Power Tools – Americas		
☒	**Will project team member(s) work with hand and/or power tools?**	**Add Tool-Specific THA and manufacturer's operating manual**

4.2 Task Hazard Assessment (THA)

1. THA forms must be prepared using Task Hazard Assessment – Americas or equivalent for each task to be performed as part of the scope of work as well as the hazards, associated risk, and appropriate controls for all other on-site activities and exposures. For DCS U.S. East and LATAM and DCS U.S. West, the THA Library Ecosystem page may also be used to find previously approved THAs, though these should be modified to be project and site-specific.

2. Each operation being performed by AECOM and each operation performed by an AECOM subcontractor working under the AECOM SH&E Plan is summarized below, and the relevant field forms, including THAs, are included in Appendix C Field Forms

Task Name	Permit(s) Required		Primary Task Performed By	
			AECOM	Subcontractor
General Hazards	☐ Yes	☒ No	☒	☒
Oversight of Drilling Activities	☐ Yes	☒ No	☒	☐
Monitoring Well Construction and Development	☐ Yes	☒ No	☒	☒
Monitoring Well Sampling	☐ Yes	☒ No	☒	☐
Drilling-Well Installation Soil Sampling	☐ Yes	☒ No	☒	☒
Monitoring Well Abandonment	☐ Yes	☒ No	☐	☒
Hand and Power Tools	☐ Yes	☒ No	☒	☒
Portable Generator Operation	☐ Yes	☒ No	☒	☐
Work Area Air Monitoring	☐ Yes	☒ No	☒	☐
Investigation Derived Waste Management	☐ Yes	☒ No	☒	☒

***Note:** **All AECOM subcontractors must have a THA for each assigned task. THA(s) for AECOM subcontractors working under the AECOM SH&E Plan must be included in Appendix C** Field Forms**.**

3. A review of THAs must take place during the Daily Safety Meeting (Section 4.3). When employees arrive on site, conditions may be different from what was 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 must NOT proceed.

4.3 Daily Safety Meeting

1. A Daily Safety Meeting must be held at the start of each shift to instruct employees, managed subcontractors and others, as necessary, on the anticipated scope, reasonably anticipated hazards and controls. Participants in simultaneous operations are encouraged to attend each other's safety meetings, or at the very least, the supervisors should discuss the coordination of activities and associated hazards of each other's tasks.

2. Daily Safety Meeting – Americas, or equivalent form, to document names of all attendees and meeting topics must be completed and retained in the project folder. Alternatively, use the appropriate QR code to download the app and/or go to the eDaily Safety Meeting App Ecosystem page for details, guides, training sessions and other information:

	iOS	Android

How will you conduct and document the daily safety meetings?			
☒ Daily Safety Meeting – Americas	☐ eDaily Safety Meeting App	☐ Other:	In Person

4.4 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. Answering 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?

4.5 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (refer to Safety Tenets and Stopping Work – Americas). All employees have the authority and responsibility to issue a Stop Work Order for work activities deemed to present an Imminent Danger or when the control of an SH&E risk is not clearly established or understood. Employees issuing a Stop Work Order must do so without any fear of retaliation or form of intimidation.

5. Project-Specific SH&E Training

All personnel at project sites must be qualified and experienced in the tasks they are assigned. SH&E Training - Americas establishes the general training requirements for AECOM employees.

Select all boxes that describe the training that is applicable to the site and/or scope of work.					
☒	Project Emergency Response Plan Review		☒	AECOM Field Safety (annual requirement)	
☒	Project SH&E Plan Review		☒	Defensive Driving	
☒	Site Safety Orientation		☒	AED/First Aid/CPR	
☐	Client- or Host Facility-Specific Training		☐	Client- or Host Facility-Specific Training	
	Specify:	Click here to enter		**Specify:**	Click here to enter

5.1 Risk-Based Training

☐	AECOM or AECOM-managed subcontractors are NOT self-performing or exposed to any of the activities below.
☒	AECOM or AECOM-managed subcontractors are self-performing or exposed to any of the activities below.

Drug & Alcohol Testing	Medical Surveillance	**Heat and Cold Stress**
Excessive Noise	**Biological Hazards**	**Ground Disturbance**
Heavy Equipment and Machines	Railroads	Underground Work
Highway and Road Work	Hazardous Substances and Communication	**Hand and Power Tools**
Confined Spaces	Working at Height	Work On, In, or Near Water
Respiratory Protection	Hot Work	Hazardous Energy Control
Radiological Hazards		
Non-standard driving activities, including undertaking trips more than 250 miles each way, driving in remote or hazardous areas, or operation of utility task vehicles (UTVs), all-terrain vehicles (ATVs), off-road vehicles, towing trailers or other equipment		

5.2 Competent Persons

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.

Competent Person Designation – Americas must be completed, as applicable, and included in Appendix B Pre-Task Forms.

6. Personal Protective Equipment (PPE)

PPE Must	
1.	Properly fit the Employee's body including gender-specific gear and sizing.
2.	Be selected, used, cared for, and stored in accordance with recognized standards (e.g., American National Standards Institute [ANSI]) and manufacturer's specifications/instructions.
3.	Provide effective protection.
4.	Not in itself create a hazard to the wearer.
5.	Be compatible so one item of PPE does not interfere with another.
6.	Be maintained in good working order and in a sanitary condition.
7.	Not be altered in any way.
8.	Be inspected prior to use.
9.	Be removed from service and replaced if worn out, expired, damaged, and/or defective.

Site Minimum PPE	
• Hard hat or helmet • Safety glasses with side shields • High visibility safety vest • Gloves (on person) – required to be worn if handling materials, equipment, etc.	• Shirt with sleeves that cover the shoulders • Long pants • Work boots with defined heel and over-ankle support • Hearing protection (on person)

Project-Specific PPE (Above Site Minimum)		
Applicable?	**Type of PPE Protection**	**Description of PPE**
☒	Head Protection (ANSI Z89.1 / CSA Z94.1)	Ear plugs or muffs as applicable
☐	Eye Protection (ANSI Z87.1/ CSA Z94.3)	Click here to enter
☐	Face Protection (ANSI Z87.1/ CSA Z94.3)	Click here to enter
☐	Hand Protection (ANSI/ISEA 105 / ISEA 138)	Click here to enter
☐	Body and Limb Protection	Click here to enter
☒	Foot Protection (ASTM F2413/CSA Z195)	Steel Toe/Composite Toe protection
☐	Fall Protection (ANSI A10.14 / ANSI Z359 / CSA Z259)	Click here to enter
☐	Water/Drowning Protection	Click here to enter
☐	Thermal (Cold/Hot) Protection	Click here to enter

7. Contractor Management

☐	**Performance of the project scope of work DOES NOT involve the use of AECOM subcontractors.**
☒	**Performance of the project scope of work DOES involve the use of one or more subcontractors. The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in Subcontractor Selection and Stewardship – Americas.**

7.1 Subcontractor Details

Subcontractor 1		
Name of Subcontractor	Cascade Drilling	
Assigned Task	**High Risk Task (Yes or No)**	**Contractor Site Supervisor Name and Number**
Pre-clearing drilling locations to 5 feet below ground surface using soft digging methods	Yes	Zachary Fordley 518-330-9332
Drilling 4 boreholes to 15 feet below ground surface and the installation/decommissioning of temporary monitoring wells.	Yes	Zachary Fordley 518-330-9332

Required Subcontractor Documents	
The Project Manager must verify that the following documents are in place for each subcontractor:	
Select one	☒ Subcontractor will work under AECOM's SH&E Plan and field personnel will sign the AECOM SH&E Plan Acknowledge Form

Select all that apply and have been verified

☒	Copy of signed contract
☐	Project-specific purchase order for subcontractor
☐	Copy of the subcontractor's business license and training certificates (task specific)
☐	Copy of task specific THAs/Job Hazard Analyses (JHAs) and inspection/tailgate forms
☐	Competent Person documentation

Prequalification Status		
Supplier Status		**Action(s)**
☒ Approved		None – skip to the next subcontractor.
☐ Conditionally Approved		Complete and submit a Subcontractor Variance Form – Americas with this plan for approval.
☐ Pending Approval		Subcontractor must not be used until approved or conditionally approved.

Subcontractor 2		
Name of Subcontractor	Enviroprobe Service, Inc.	
Assigned Task	**High-Risk Task (Yes or No)**	**Contractor Site Supervisor Name and Number**
Geophysical Survey	No	Matthew McMillen 856-858-8584

Required Subcontractor Documents	
The Project Manager must verify that the following documents are in place for each subcontractor:	
Select one	☒ Subcontractor will work under AECOM's SH&E Plan and field personnel will sign the AECOM SH&E Plan Acknowledge Form

Select all that apply and have been verified

☒	Copy of signed contract

Subcontractor 2	
☐	Project-specific purchase order for subcontractor
☐	Copy of the subcontractor's business license and training certificates (task specific)
☐	Copy of task specific THAs/Job Hazard Analyses (JHAs) and inspection/tailgate forms
☐	Competent Person documentation

Prequalification Status		
Supplier Status		**Action(s)**
☐ Approved		None – skip to the next subcontractor.
☒ Conditionally Approved		Complete and submit a Subcontractor Variance Form – Americas with this plan for approval.
☐ Pending Approval		Subcontractor must not be used until approved or conditionally approved.

Subcontractor 3		
Name of Subcontractor	MJ Engineering, Architecture, Landscape Architecture, and Land Surveying, P.C.	
Assigned Task	**High-Risk Task (Yes or No)**	**Contractor Site Supervisor Name and Number**
Land Survey	No	Michael D. Panichelli 518-371-0799

Required Subcontractor Documents	
The Project Manager must verify that the following documents are in place for each subcontractor:	
Select one	☒ Subcontractor will work under AECOM's SH&E Plan and field personnel will sign the AECOM SH&E Plan Acknowledge Form

Select all that apply and have been verified

☒	Copy of signed contract
☐	Project-specific purchase order for subcontractor
☐	Copy of the subcontractor's business license and training certificates (task specific)
☐	Copy of task specific THAs/Job Hazard Analyses (JHAs) and inspection/tailgate forms
☐	Competent Person documentation

Prequalification Status		
Supplier Status		**Action(s)**
☒ Approved		None – skip to the next subcontractor.
☐ Conditionally Approved		Complete and submit a Subcontractor Variance Form – Americas with this plan for approval.
☐ Pending Approval		Subcontractor must not be used until approved or conditionally approved.

Subcontractor 4		
Name of Subcontractor	Island Pump And Tank LLC	
Assigned Task	**High Risk Task (Yes or No)**	**Contractor Site Supervisor Name and Number**
Investigation derived waste management	No	Matthew Schieferstein 631-462-2226

Required Subcontractor Documents	
The Project Manager must verify that the following documents are in place for each subcontractor:	
Select one	☒ Subcontractor will work under AECOM's SH&E Plan and field personnel will sign the AECOM SH&E Plan Acknowledge Form

Select all that apply and have been verified

☒	Copy of signed contract

Subcontractor 2	
☐	Project-specific purchase order for subcontractor
☐	Copy of the subcontractor's business license and training certificates (task specific)
☐	Copy of task specific THAs/Job Hazard Analyses (JHAs) and inspection/tailgate forms
☐	Competent Person documentation

Prequalification Status		
Supplier Status		**Action(s)**
☐ Approved		None – skip to the next subcontractor.
☒ Conditionally Approved		Complete and submit a Subcontractor Variance Form – Americas with this plan for approval.
☐ Pending Approval		Subcontractor must not be used until approved or conditionally approved.

8. Monitoring Performance

8.1 Safety Observations and Near Miss Reporting

1. Safety observations are a tool used by AECOM to identify both at-risk behaviors, including unsafe conditions and acts, and positive safety behaviors. These observations can be made informally during normal site operations when conditions or behaviors are addressed or as part of a more formal observation program. Employees may perform a formal safety observation on another AECOM employee or subcontractor.

2. Following the activity, the Observer must provide immediate one-on-one feedback to the Employee, noting the safe behaviors and at-risk behaviors identified during the observation. The Observer and the person being observed (employee or contractor) are required to discuss the identified barriers to safe behaviors and the potential solutions.

3. Formal Safety Observations must be entered into Vector EHS Management (a.k.a. IndustrySafe), LifeGuard, or project-based system, where applicable. If an individual does not have access to a system, a member of the Regional SH&E Team must be contacted to obtain hard stock observation cards.

8.2 Corrective Actions for Non-Conformances

1. The intent of issuing non-conformances, observations and corrective and preventive actions is to confirm criteria and systems deviations are logged, actioned, and closed out as part of the continuous improvement process. When non-conformances are identified in audits, inspections, reviews, and observations, corrective actions should be created and tracked to completion in the appropriate online data management system (e.g., Vector EHS Management [a.k.a. IndustrySafe], LifeGuard, or a project-based system).

2. The Project Manager, SH&E Manager, and Regional Management Team, as required, must document necessary follow-up actions, assign accountability for corrective actions, and confirm that all corrective actions are closed within the assigned timeframe. Corrective actions identified must be taken in a timely manner by the responsible parties who have been identified. Immediate corrective action must be taken for Imminent Danger. When it is not possible to immediately rectify non-conformances, interim actions must be implemented to prevent injury, illness, property loss, or impairment to the environment until planned/long-term corrective measures are implemented.

8.3 Incident Reporting and Response

Refer to Appendix A Emergency Response Plan.

8.4 Audits, Inspections, and Reviews

1. Refer to Monitoring SH&E Performance and Continuous Improvement – Americas for definitions of the different types of audits, inspections, and reviews.

9. Variance to SH&E Management System Requirement

The Project Manager request for variance to or waiver of any SH&E Management System requirement must provide an equal or greater level of protection, be substantiated with the relevant SH&E Plan and THA(s) for the activity seeking a variance, and must be documented using the SH&E Management System Variance Request – Americas or equivalent documentation.

10. Personal Acknowledgement

By signing below, the undersigned acknowledges that they, including managed subcontractors, have reviewed the AECOM SH&E Plan for the 338 Broadway site. The undersigned people also acknowledge that they have been instructed in the contents of this document and understand the information pertaining to the specified work and will comply with the provisions contained therein. The undersigned people understand 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 undersigned people understand to notify the Site Supervisor or Site Safety Lead 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
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.
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Click here to enter		Click here to enter	Click or tap to enter a date.
Click here to enter		Click here to enter	Click or tap to enter a date.

Disclaimer: This SH&E Plan, 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 SH&E 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.

Appendix A Emergency Response Plan

A.1 Phone List

All incidents and near misses, regardless of type and perceived severity, must be reported in accordance with SH&E Incident Response and Investigation – Americas.

Contact Type	Phone Number	Availability	Instructions
SH&E Incident Hotline	**1-800-348-5046**	24/7	**After the scene has been stabilized, immediately report all incidents** including any potential work-related injuries, illnesses, discomfort/pain, property damage, security issues, regulatory inspections, and environmental impacts/spills
AECOM Nurse Line Direct	**U.S.: 512-419-5016** **Canada:1-877-424-5256**	24/7	The SH&E Incident Hotline operator (number above) will transfer injured/ill employee to nurse. If the transfer fails or employee's condition worsens following initial consultation, call direct.

Resource Type	Phone #	Site-Specific Name	Address	Hours of Operation
Site Emergency Response	**911**	N/A	N/A	24/7
Note:	**If, during your injury reporting call to the Incident Hotline you could not speak with an AECOM or Workcare Nurse and feel your condition requires immediate attention, you should utilize the clinic identified below.**			
Clinic	(845) 331-3131	HealthAlliance Broadway	396 Broadway, Kingston, NY 12401	24 Hours
Hospital	(845) 338-2500	HealthAlliance Hospital Emergency Department	Emergency Department, 105 Marys Ave, Kingston, NY 12401	24 Hours
First Aid/CPR Providers	(631) 965-0532	Julie Healy	On-site	During operational hours
Fire	(845) 331-1507	Kingston Fire Department	19 E O'Reilly St, Kingston, NY 12401	24 Hours
Police	(845) 331-1671	1 Garraghan Dr #1, Kingston, NY 12401	N/A	24 Hours
U.S. Poison Control	**1-800-222-1222**	N/A	N/A	24/7
Other	Phone #	Name(s)	Address	Hours of Operation

A.2 Additional Phone Numbers

Support Resource / Company	Name	Phone #
Fleet Management	Holman	1-800-227-2273
HazMat Shipping Emergency Response Support	INFO TRAC AECOM Account Number: 74984	1-800-535-5053

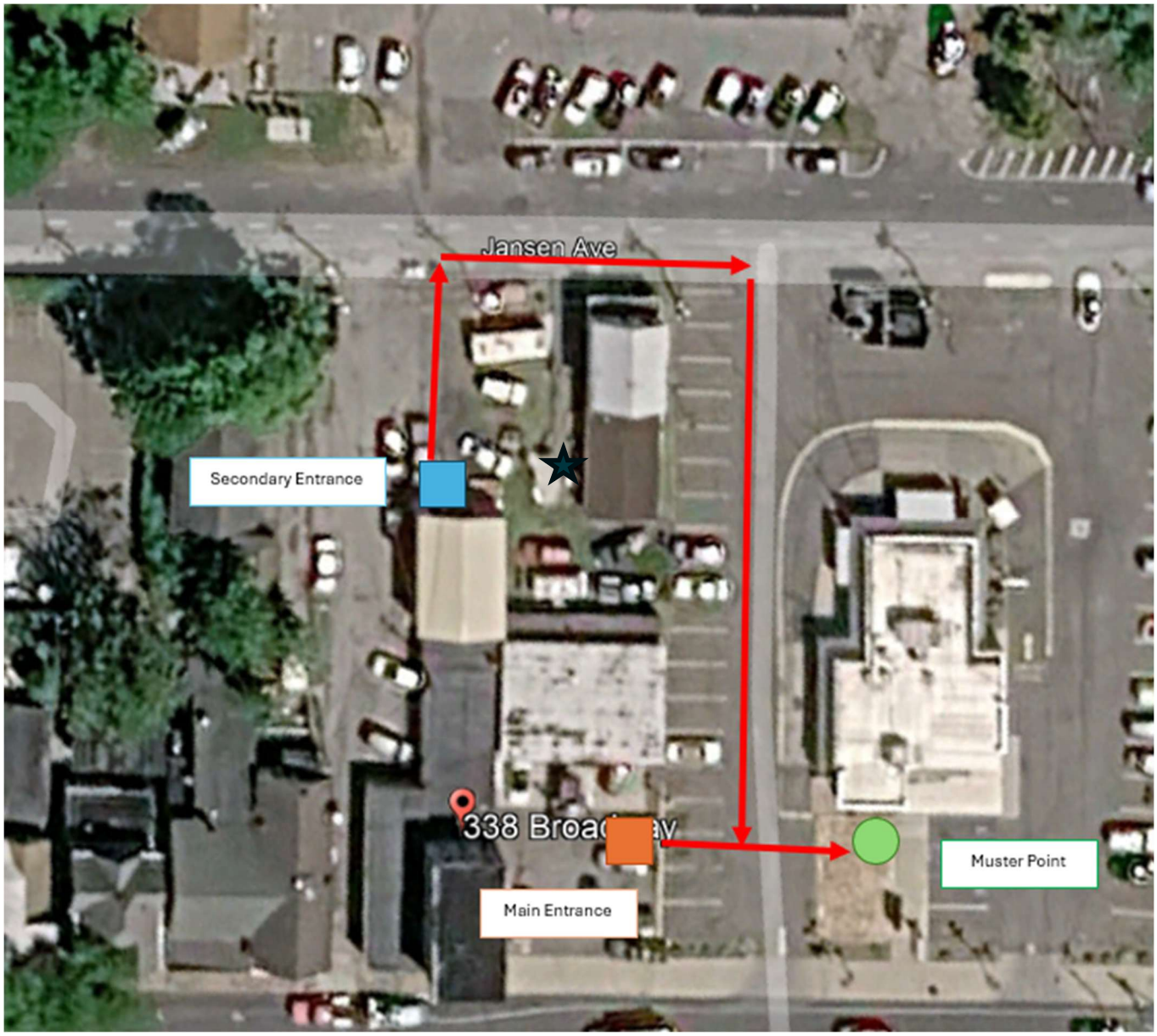
Utility and Pipeline Information

Select one based on the scope of work.	
☐	Scope of work does NOT involve activities that could interfere with overhead or underground utilities or facilities.
☒	Scope of work DOES involve activities that could interfere with overhead or underground utilities or facilities.

Utility Type	Name	Phone #
State One-Call System	UDig NY	811
Cable/Telecommunications	Unknown	N/A
Electric	Central Hudson	(845) 452-2700
Natural Gas	Central Hudson	(845) 452-2700
Sewer	City of Kingston Public Works	(845) 338-2114
Water	City of Kingston Public Works	(845) 338-2114
Pipeline	N/A	N/A

Note: Verify the above information against the 811 / Dig ticket prior to starting any activity that could impact overhead and/or underground utilities or facilities.

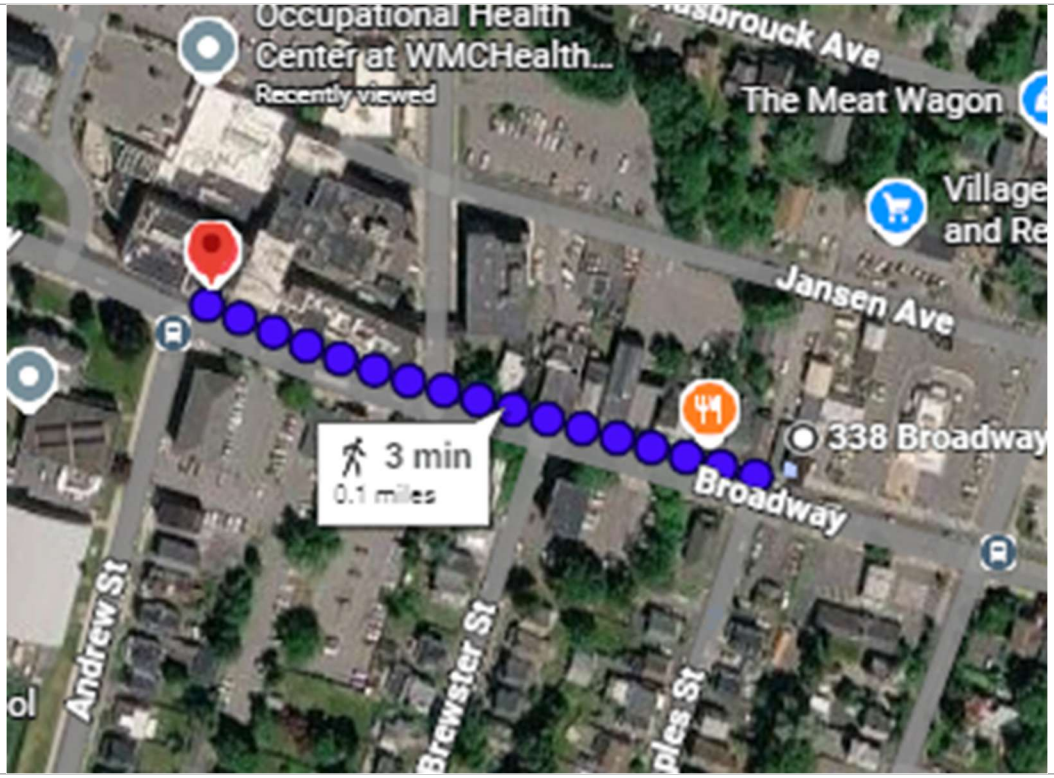
A.3 Location Emergency Map(s)



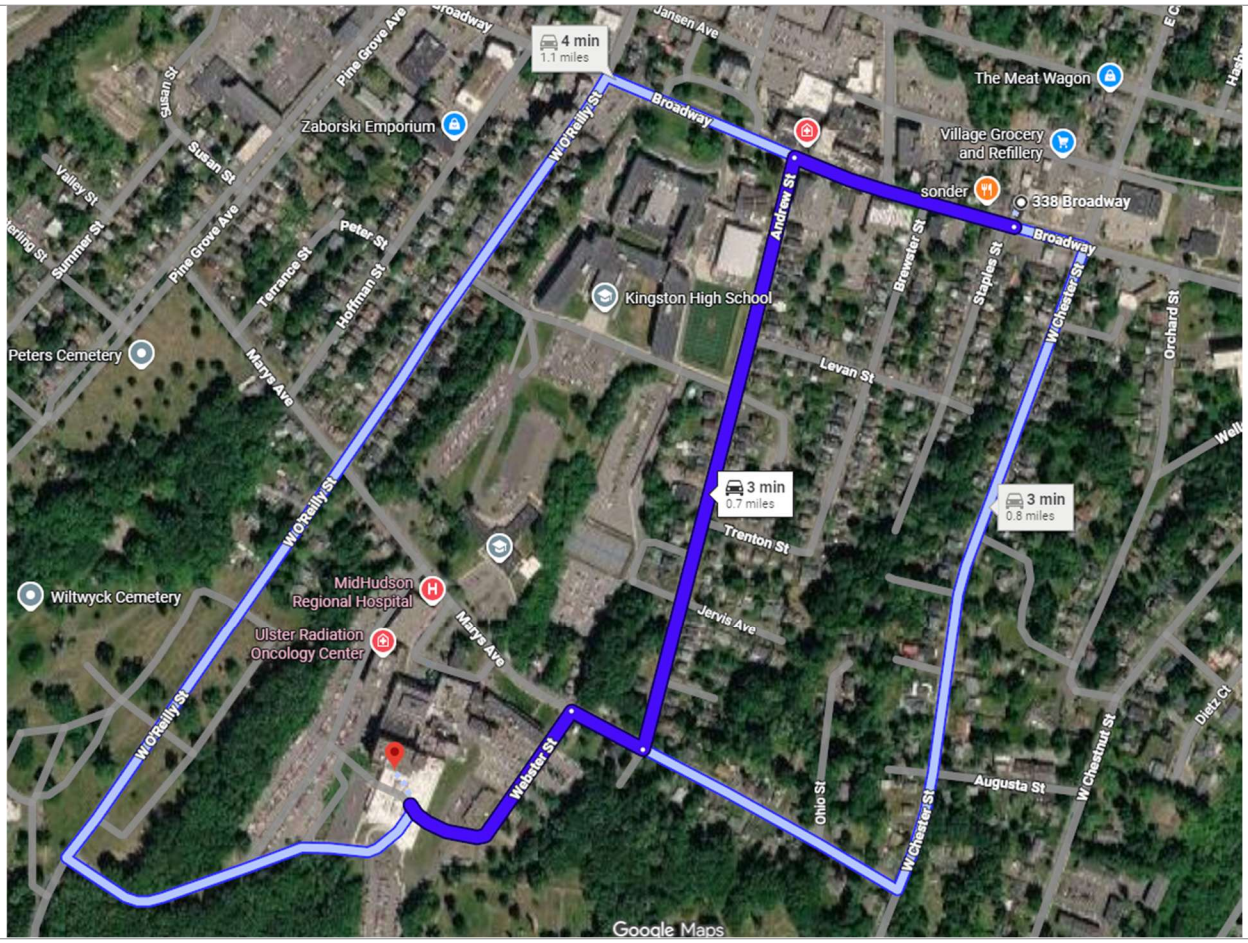
A.4 Site Emergency Equipment and Its Location

Item	Item Description		Location(s)
First Aid Kit(s)	ANSI Z308.1 Class A, Type III		AECOM Field Vehicle
Automated External Defibrillator(s)	Standard AED		N/A
Fire Extinguisher(s)	2A:10B:C (5 lb. ABC) 4A:80B:C (10 lb. ABC) 4A:80B:C (10 lb. ABC) 8A:120B:C (20 lb. ABC)		AECOM Fleet Vehicle(s) Drill Rig or Support Vehicle
Spill Kit(s)	Universal Absorbents/Pads		Drill Rig/Geoprobe
Cold/Heat Stress Aid(s)	Climate-Controlled Environment		Inside 334/338 Broadway buildings, inside vehicles present on site.
	Other:	Shade canopies/ tent when sampling in direct sunlight, drinking water at the site.	

A.5 Directions to Clinic



A.6 Directions to Hospital



A.7 Method(s) of Emergency Alarm

In the event of emergency personal notification or via cell phone will be used to notify workers on site to begin to evacuate to the Muster Point or to Shelter-In Place.

Evacuation and Sheltering in Place

1. If a situation requires an evacuation or emergency muster/assembly, the pre-determined alarm must be initiated.
2. All personnel (e.g., employees, consultants, visitors) in the office requiring evacuation must immediately assemble at the designated muster point, assembly point or shelter-in-place as determined by the alarm or communication.
3. Employees accompanying visitors working directly with AECOM must escort the visitors to the muster point.
4. Elevators must not be used unless pre-arranged due to known circumstances.
5. The Site Supervisor or designee must take action to account for all personnel, including visitors (i.e. head count, roll call).
6. Upon evacuation or dismissal, only authorized or essential employees are allowed access to the facility or project area during an emergency. Other personnel must await further instruction (e.g., all clear and re-entry or further evacuation) from the Site Supervisor or designee.

A.8 Medical Emergency

1. Stop the work activity.
2. Assess the cause of the injury to avoid injury to yourself (e.g., live wires, gases, hazardous materials).
3. Do not move the casualty unless they remain in danger.

4. A First Aid Provider must designate an individual to call for medical assistance (e.g., 911, ambulance, site medic).
5. A First Aid Provider must 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 (ABCs)
    e. Control severe bleeding.
7. If CPR is deemed necessary:
    a. Begin chest compressions at a rate of at least 100-120 compressions per minute.
    b. CPR shall be continued until:
        i. An AED is applied,
        ii. casualty begins to respond,
        iii. Another First Aid Provider takes over,
        iv. A medical responder takes over, or
        v. The Aid Provider is 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. The individual in communication with the designated medical assistance must attempt to answer any questions, stay on the line until information is verified and follow instructions.
10. Arrange for medical transport as needed. A designated individual should be positioned to direct medical transport to the casualty.
11. Personnel must await further instruction from the Site Supervisor or designee (e.g., resume activity).

A.9 Fire

1. Alert others in the area of the fire.

Sound the alarm or confirm that the applicable notification system is initiated.

All personnel must vacate the building or site and proceed to the muster point. DO NOT use elevators.

The Site Supervisor or designee must confirm that all personnel have exited.

Employees are not expected to extinguish a fire. However, if the fire is small enough to be contained and if trained to do so, employees can decide to attempt to extinguish a fire with the correct type of extinguisher, applying the contents from an upwind position. 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

Employees must:

a. Retreat and call the local fire department if the fire cannot be contained or there is any concern of an extinguished fire reigniting. Give directions to the location; stay on the line until information is verified.
b. Never face away from a fire. Always back away until at a safe distance.
c. Stay low and close to the floor if smoke and heat are strong.

d. Never return a discharged fire extinguisher to its normal location. Take it out of service, tag the extinguisher for recharging, and replace it with a fully charged unit.

The Site Supervisor or designee must take action to account for all personnel, including visitors (e.g., head count, roll call).

A designated individual should be positioned to direct the fire truck to the fire location.

Personnel must await further instruction (e.g., all clear and re-entry or further evacuation) from the Site Supervisor or designee.

A.10 Workplace Violence

1. **Active Workplace Violence Event:** If you become aware of an active workplace violence incident posing a threat to AECOM employees, contractors or visitors, immediately contact local emergency services using the appropriate emergency number. If you are in the vicinity of the incident, evacuate the area if it is safe to do so, or seek shelter where possible.

Potential for Workplace Violence: All AECOM employees are responsible for reporting any information related to potential workplace violence. Reports should be made to your manager, Human Resources, or through the AECOM Ethics and Compliance Hotline.

AECOM Workplace Violence Procedure: AECOM's Workplace Violence Procedure – Americas outlines the company's zero-tolerance policy toward workplace violence. It defines what constitutes workplace violence, details employee responsibilities, explains reporting mechanisms, and describes the procedures followed during investigations and follow-up actions.

Training: AECOM Global Security & Resilience (GSR) has a Field Security Briefing and Office Security Briefing available to offices and projects through Teams. Topics included in both trainings cover situational awareness, active shooter awareness, tips on how to identify someone who could be a threat and tips on how to de-escalate a situation. Active Shooter Awareness training is also available on AECOM University. Contact GSR@aecom.com for details or to schedule the training.

A.11 Spill, Leak, or 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, or 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 designee.
7. Consult the product Safety Data Sheet for accidental release / handling procedures.
8. If it is not possible to stop or control the release, call 911 or appropriate emergency services.
9. Tend to any injured personnel (follow Medical Emergency steps).
10. Personnel must await further instruction (e.g., further evacuation or resume activity) from the Site Supervisor or designee.

A.12 Vehicle Incident

The Employee(s) involved in a collision must:

1. Assess the situation to confirm everyone is safe and remove any vehicle occupants from harm's way if safe to do so.
2. Turn on the vehicle's flashers to warn other motorists.
3. Call or have someone else call the appropriate local emergency phone number (e.g., 911) immediately when necessary.
4. As appropriate, remain at the scene of a collision for police to arrive. If the scene is unsafe, immediately move to a safe place of refuge proximate to the incident.
5. As applicable, consider moving the vehicle out of the traffic flow if it is safe to do so. Do not operate a damaged vehicle if its:
   a. safety is questionable,
   b. operating condition is illegal per applicable local law, or

c. condition is such that further damage would likely result from its operation.

6. Obtain:
   a. Names, phone numbers, and addresses of owner(s), driver(s), and occupants of the other car(s) involved.
   b. Other party's insurance company's name, address, phone number, policy number, and insurance agent.
   c. Names, phone numbers, and addresses of all witnesses.
   d. Photographs of the accident scene when safe to do so.
7. Do not discuss liability (e.g. who is at fault), agree to pay for damage, or sign a document related to an incident except as required by local law.
8. If requested, provide information to the police. Obtain the officer's jurisdiction, name, and badge number, as well as a copy of the police report.
9. If contacted by a third party, do not answer any questions. Immediately report this contact to the Project Manager and AECOM Legal.

A.13 Floods/Heavy Rain

1. If external to a building:
   a. Monitor conditions and escape routes.
   b. Monitor Regional Resiliency communications, television, radio or other sources identified as reliable (e.g., social media, websites) for information, updates and evacuation orders.
   c. Shut off electrical power and utilities if flooding is imminent.
   d. Implement measures to minimize rain or flood damage if time permits (e.g., stacking sandbags, clearing drainpipes, clearing culverts, confirming sump pump operation).
   e. If ordered to evacuate, do so immediately as directed. Evacuation should be to higher ground and/or appropriate shelter, as floodwaters often rise rapidly.
   f. Avoid walking through water-covered areas as hazards may not be visible.
   g. Watch for and avoid low-lying areas. Don't drive through flooded areas. If your vehicle stalls, abandon it immediately.
   h. Don't attempt to cross a flowing stream, or to swim to safety.
   i. Beware of wildlife displaced by floodwater.
   j. Do not return unless the Site Supervisor, designee, or authorities permit.
2. If internal to a building:
   a. Assume any electrical equipment that may not be disconnected, is live and should be treated as a potential electrocution threat.
   b. Protect contents from damage by relocating them if time permits.
   c. Begin cleanup operations as quickly as possible.

A.14 Wildfire and Wildfire Smoke

1. During a wildfire

   a. The most important information will come from your local government. Authorities will let you know when you should leave to stay safe. If wildfire impacts your home, follow instructions from the local government. If wildfire impacts your office, follow instructions from AECOM and the local government. Your Human Resources/SH&E partners will reach out to confirm your safety.
   b. All wildfire events will be monitored and responded to by the Regional Resilience Team. Employees should access AECOM's website and phone message systems for status or direction updates.

c. Do not return to a closed office until it is authorized by the Regional Resilience Team.

d. Follow SH&E and Facilities guidance for office re-entry.

2. During wildfire smoke

a. The Site Supervisor or designee must take steps to reduce or eliminate continued exposure to wildfire smoke as appropriate. Warning signs to consider include an individual's symptoms, intensity of exposure, air quality index levels, and exposure controls in place. Actions to take include but are not limited to:

i. Stop work;

ii. Reschedule work;

iii. Stay inside a building or vehicle with proper ventilation;

iv. Reduce the work schedule;

v. Contact the SH&E Manager for guidance; and

vi. Wear respiratory protection.

b. Air quality should be monitored using the appropriate national index (e.g., the U.S. Air Quality Index [AQI] or Canada's Air Quality Health Index [AQHI]) which provides real-time information on outdoor air pollution levels and associated health risks through government websites and mobile apps.

c. Symptoms of wildfire smoke-related illness can include:

i. Coughing, difficulty breathing, wheezing, shortness of breath, asthma attack, runny nose, sore throat, sinus pain or pressure.

ii. Chest pain or discomfort; fast or irregular heartbeat; feeling weak, light-headed, faint, or dizzy; pain or discomfort in the jaw, neck, or back.

iii. Sudden numbness or weakness in the face, arm, or leg—especially on one side of the body; sudden confusion; trouble speaking or difficulty understanding speech; sudden trouble seeing in one or both eyes; sudden trouble walking, dizziness, loss of balance, or lack of coordination; sudden severe headache with no known cause.

iv. Headache, scratchy or irritated eyes, fatigue, or tiredness.

d. The following actions should be taken if an individual is experiencing a wildfire smoke exposure related illness:

i. Move individual to a safe location away from the hazards.

ii. Let the individual(s) rest and move them to an area of better air quality.

iii. The Employee must call the AECOM Incident Hotline (800-348-5046) if experiencing symptoms of wildfire smoke exposure and submit an incident report of the incident within 24 hours into IndustrySafe. In the event of a medical emergency related to smoke inhalation, call 911.

A.15 Hurricane

1. Monitor Regional Resiliency communications, television, radio or other sources identified as reliable (e.g., social media, websites) for information, updates and evacuation orders.
2. Monitor the progress of the storm and estimate the amount of time required to perform all essential tasks.
3. If ordered to evacuate, do so immediately.
4. Move valuables out of the area or to upper floors if located in a flood or storm surge zone.
5. Secure or store furniture, equipment, signs or other objects outside the building.
6. If required to remain, stay inside and away from windows, doors and outside walls. Watch for roof leaks, pipe breakage, fire or structural damage. Workers should never remain alone.
7. During the height of the hurricane, personnel should remain in a place that has been identified as safe from wind and flood.
8. During a power failure, turn off electrical switches to prevent reactivation before necessary checks are completed.

9. Remember that a lull often signifies the storm's eye—not its end. Anyone riding out a hurricane should wait for authorities to announce that the danger has passed.

A.16 Lightning

1. Lightning can strike several miles/kilometres from its source, so early precautions are crucial. If thunderstorms are in the forecast, reassess your plans for outdoor activities.
2. If you can hear thunder, then you are close enough to the storm to be at risk. Use the 30/30 Rule to help you. If you can count 30 seconds or less between seeing lightning and hearing thunder, you should seek shelter immediately. Take cover and lower elevated equipment (e.g., booms) if possible.
3. Seek shelter inside a house, large building or motor vehicle and keep windows and doors shut. Stand clear from windows, doors and electrical appliances and avoid contact with piping, including sinks and faucets.
4. Unplug equipment well before a storm nears—never during.
5. Avoid contact with metal and water. If boating, head for shore or, if the threat is immediate, crouch low in the boat.
6. If no shelter is readily available, stay clear of high ground, open spaces, trees, sheds and small or open buildings. If in a flat open field:
    a. Crouch as low as possible but do not lie flat
    b. Only the balls of the feet should contact the ground with heels together
    c. Bend forward with head down
    d. Cover ears with hands, elbows pointing down
    e. Maintain at least 17 feet (5 meters) between personnel
    f. Refer to Figure 1Figure 1 for a sketch of the lightning position described above.

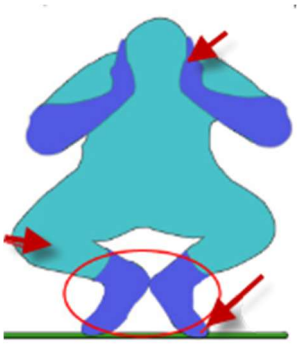


Figure 1. Lightning Position

7. Contact emergency services and First Aid Provider(s) if someone is struck by lightning.
8. Look for cardiopulmonary distress, broken bones, burns, and entry and exit wounds when treating lightning-related injuries.
9. Avoid contact with piping including sinks and faucets.
10. Check for and extinguish fires.
11. If power is lost, shut down equipment.

A.17 Tornado

1. Monitor Regional Resiliency communications, television, radio or other sources identified as reliable (e.g., social media, websites) for information, updates and evacuation orders.
2. Go to a center stairwell or corridor of the building's lowest level possible. Move away from the perimeter of the building and exterior glass.
3. Close any exterior office doors.

4. Sit or kneel down to protect yourself from a possible head injury.
5. Take shelter under a desk if there is no stairwell, basement, or other protected location.
6. Avoid seeking shelter in large open shop areas. Seek shelter in interior rooms, preferably with concrete surround. AVOID TAKING SHELTER IN ANY TRAILER UNIT OR VEHICLE.
7. Tornados generate considerable static electricity and can damage electrical lines, creating electrical shock hazards through telephone lines; therefore, do not use “land-line” telephone systems until they are rendered safe.
8. If the facility is so equipped, listen for information and directions via the Public Address system.
9. Follow the directions of the Site Supervisor or designee or Emergency Services personnel.
10. If outside, seek a safe place in a sturdy nearby building. As a last resort, take cover in a ditch or low-lying area away from trees; lie flat with hands covering head and neck.
11. If driving pull over, exit the vehicle and take cover in a ditch away from the vehicle as described above OR if flying debris is encountered, stay in the vehicle, seatbelt on, and cover your head with your hands, keeping your head below closed windows.

A.18 Earthquake

1. **If inside, DUCK, COVER, and HOLD:**
    a. Take cover under a desk or table, or sit or stand against an inside wall (not inside a doorway, unless you know it is strongly supported and load bearing).
    b. Hold tightly to the desk or table until the shaking stops.
    c. Move away from windows or objects that may fall and utilize suitable material to shield head and face if available.
    d. Do not run outside during the shaking.
    e. After the shaking has stopped, evacuate the building if structural damage is apparent (per local guidance; use stairs, not the elevator).
    f. Avoid use of the telephone. Replace telephone handsets shaken off the hook.
    g. Do not create an ignition source due to possible gas leaks.
2. **If outside:**
    a. Do not enter any building.
    b. Move clear of buildings, falling glass, utility poles, wires and large trees.
    c. Get on the ground — DUCK, COVER, HOLD.
    d. After the shaking stops, watch for falling glass, electrical wires, poles and other debris.
3. **If driving:**
    a. Drive away from overpasses and underpasses.
    b. Stop in a safe place.
    c. Set the parking brake.
    d. Stay in the vehicle. If wires fall onto the vehicle, stay inside until rescued.
4. **Be prepared for aftershocks and fires.**
5. **Personnel must obtain or wait for instructions (i.e., all clear and re-entry or further evacuation) from the Site Supervisor, his or her designee, or Emergency Services personnel.**

A.19 Severe Weather Storms

1. Monitor Regional Resiliency communications, television, radio or other sources identified as reliable (e.g., social media, websites) for information, updates and road closures.

2. Consider requesting staff to work from home to reduce travel risk or sending staff home prior to the start of a storm.
3. Locate the emergency supplies, such as flashlights, water and medical supplies.
4. If conditions deteriorate to the point of closure, confirm that employees know road conditions and that remaining on site may be the best decision.

A.20 Power Outage

1. If it is safe to do so, shut down any equipment or processes that could be hazardous if the power suddenly returns.

Ensure appropriate personnel have been notified if there are critical areas that require power.

Retrieve flashlights from emergency supplies.

If unsafe to continue working due to inadequate lighting or any other hazard, evacuation to the designated in-place shelter location should be initiated.

The Site Supervisor or designee must conduct a roll call to confirm all personnel are accounted for.

If it is unsafe to go to the in-place shelter location continue to the designated muster point.

If unable to proceed to the designated location (e.g., it is unsafe to leave the area due to inadequate lighting) inform other personnel of the situation and wait for assistance. Do not attempt to proceed unless there is immediate danger.

Personnel should await further instruction (i.e., all clear and re-entry or further evacuation) from the emergency response coordinator or designee.

A.21 Electrical Live Line Contact

1. All personnel must evacuate to the designated muster point if safely able to do so.
2. Establish the danger zone: 33-foot (10-meter) radius from anything in contact with the live line.
3. If contact was made while operating a vehicle or equipment, the operator should, if feasible:
    a. Remain on the equipment or inside the cab. All other personnel must keep away from the machine and any other applicable connected or contacted components such as rope or load.
    b. Try, unaided and without anyone approaching the machine, to back off the equipment until it is well clear of the power line.
    c. If the machine cannot be self-propelled away or disentangled from the line, remain inside the machine until the electrical authorities de-energize the circuit and confirm that conditions are safe.
    d. If the cable or equipment appears to be welded to the line do not try to back the equipment off. This could cause the line to whip or snap.
    4. If hazards such as fire are present that require the operator to leave the equipment or vehicle, the operator must jump to the ground, taking critical care to keep both feet together and not fall or touch the equipment or ground with any other body part.
5. To leave the danger zone the individual must Hydro Shuffle* or bunny hop with both feet leaving and making contact with the ground at the same time. Hopping should be the secondary choice as the potential to fall is increased.
6. Notify emergency response coordinator or designee. Contact the electrical company.
7. Assess the scene. Lock out power supply if it is possible to do so safely. Identify potential hazards, such as fire, explosion, or slack lines away from the immediate area.
8. Take appropriate control measures to prevent further hazards if it is safe to do so.
9. Should it be determined that a worker is still within the hazard zone, establish whether a rescue can be safely attempted. Follow emergency rescue procedures if a rescue attempt will not put another life in danger.
10. Ensure any piece of equipment that has sustained a live line contact is inspected.

* Note on how to Hydro Shuffle: To avoid electrical shock keep both feet tightly together. Shuffle, using short steps where the heel of one foot never moves beyond the toe of the other foot. Hopping with both feet together can also prevent shock as you leave the hazard area.

A.22 Gas Odor or Major Leak

1. If safe to do so, restrict ignition sources from the area (e.g. electrical devices, engines, smoking, etc.) from the area.
2. Leave the area immediately and warn others in the area to leave as well.
3. Sound the alarm or confirm applicable notification system is initiated.
4. All personnel must vacate the building or site and proceed to the Muster Point.
5. If gas is burning, call **911**. Give directions to the location; stay on the line until information is verified.
6. Notify the appropriate authorities (e.g. utility owner emergency line, client).
7. Provide responding utility and emergency personnel with any relevant information.
8. Personnel should await further instructions (i.e., all clear and re-entry or further evacuation) from the Site Supervisor or designee.

Appendix B Pre-Task Forms

1. Assessment of SH&E Training Requirements – Americas
2. Project Hazardous Materials Communication Plan – Americas
3. Project Hazardous Substance Exposure Control Plan – Americas
4. Utilities and Subsurface Clearance Checklist – Americas
5. Weather Plan – Americas

AECOM

Americas

Assessment of SH&E Training Requirements

S3AM-003-FM1

Instructions

1. **This form must be completed in accordance with SH&E Training – Americas S3AM-003-PR2.**
2. **This form should be used as a guideline for providing SH&E training to employees per the requirements of their role, in relation to the specific risks posed by their work activity, and in accordance with legal, client, and industry requirements. Other applicable region-, business line-, or project-specific training assessments should also be consulted.**
3. **The completed form must be retained in the employee or project files.**

If the assessment is for an individual		For project-based assessments, or optionally for individual assessments	
Employee Name	….	**Project Number**	60781325
Employee Email	….	**Project Location**	338 Broadway Kingston NY 12401

Required Training for All Employees

Applies?	Course Title	Regulatory	Frequency	Additional Information
☒	Core Curriculum	N	Annual	Based on regional training plans.
☒	Global SH&E Orientation	N	Within one week of starting at AECOM	Training will set the expectations of the AECOM Safety for Life program.
☒	New Employee SH&E Orientation	Y	Once	Accomplished via a combination of AECOM U modules and region-specific training plans.
☒	Emergency Preparedness Plan/ Emergency Action Plan	Y	As needed	For office personnel, this is covered as part of office-specific orientation. For field/site personnel, this is covered in project/site-specific orientation

Risk- and Role-Based Training

Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
SH&E Risk Assessment and Planning					
☒	Field Safety Training	N	Annual	Required for all employees performing field work who are not in the hazardous waste or mine safety training programs. This training is also required for any DCS Project Manager that manages projects where field work is performed.	Specific content and delivery method will depend on the office and the employees' expected work.
☒	• 10-Hour Construction Safety & Health Course • 30-hour Construction Safety & Health Course • Equivalent level of certification, with prior approval obtained by SH&E	N	Once	U.S. only: 1. You perform work that exposes you to active construction/demolition. 2. You perform work that exposes you to construction-like hazards. 3. As required by client or local law.	1. Project sites where we, our client, or another contractor (whether AECOM managed or not) are presently building, removing, or disassembling structures or digging excavations of any size by mechanical means. 2. On sites where the focus is NOT construction/ demolition, but where our work scope includes use of heavy machinery movement, work at heights, confined space, hot work, lifting/hoisting loads, and/or ground breaking (includes drill rig, direct push and vac truck use).

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
					3. Some jurisdictions, clients and/or controlling contractors require OSHA refresher training. Note: It is not applicable if your work area is separated from the construction/demolition with enough distance or physical barriers that fully prevent exposure of our team to those hazards. Note: If an AECOM employee is escorted by another employee, contractor, client, or third party, with training equivalent to 10-hour Construction training, for the entire duration of their site visit, 10-hour training for the escortee may not be required. The escort's level of training must be confirmed prior to conducting the site visit.
SH&E Incident Response and Investigation					
☐	Cardiac Pulmonary Resuscitation (CPR)	Y	As established by the training provider – typically biennial	Required: 1. For employees who are designated as first aid responders; 2. For employees who are performing high hazard activities (e.g., potential for falls, suffocation, electrocution, amputation) and medical attention is more than 4 minutes away; or 3. by client contract.	Acquire training from recognized source (e.g., Red Cross, American Heart).
☐	Automated External Defibrillator (AED)	Y	As established by the training provider	You are designated to be an AED user at an office or project site.	
☐	First Aid	Y	As established by the training provider – typically biennial	Required for 1. employees who are designated as first aid responders; 2. employees who are performing high hazard activities (e.g., potential for falls, suffocation, electrocution, amputation) and medical attention is more than 4 minutes away; or 3. required by client contract.	Acquire training from a recognized source (e.g., Red Cross, American Heart).
☐	Bloodborne Pathogens	Y	Annual	Required for employees designated as a first aid responder or others who have a potential bloodborne pathogen exposure.	May be included in first aid or CPR class.
☐	Fire Extinguisher	Y	Annual	You may be expected to use fire extinguishers (fixed facilities and project sites).	

Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
Safety Gear					
☒	Risk-Based Personal Protective Equipment	Y	Minimally once and then as required by procedure and/or regulation.	When PPE is required to complete the project/program.	Staff will receive adequate instruction on the correct use, limitations, and assigned maintenance duties for the equipment to be used. The following information, at a minimum, will be covered during PPE training: • What, when, and why PPE is required. • How to properly don, doff, adjust, and wear the PPE described. • The limitations of the PPE, including its expected useful life. • How to properly care for, maintain, and dispose of the PPE
Confined Spaces					
☐	Confined Space Entry Awareness	N	As needed	Employees who work around confined spaces but are not responsible for performing entry/authorizer/attendant duties.	Available online through AECOM U.
☐	Confined Space Entry (Performance Based)	Y	Once	You perform confined space entry/authorizer/attendant duties (including anyone performing non-entry rescue activities).	
☐	Confined Space Refresher	N	As needed	Recommended if you perform entry activities.	
☐	Confined Space Rescuer (Performance Based)	Y	Once	You may have to enter a confined space to perform a rescue.	
Driving					
☒	Vehicle/Driver Safety	N	Once	Required for all employees who drive on behalf of AECOM.	Generally completed upon hire by employees who may become authorized drivers. Available online through the AECOM U.
☒	Defensive Driving	N	Once, followed by refresher every three years	Required for all DCS employees who drive on behalf of AECOM.	National Safety Council, Alert Driving, Smith System or equivalent.
☐	Off-Highway Vehicle (OHV) Driving	N	As required	Required for all employees who operate an OHV.	Refer to local law and OHV manufacturer instructions.
Ground Disturbance					
☐	Excavations/Trenching Awareness	N	As needed	Employees who could potentially be exposed to or directly involved with excavation and trenching activities.	Available online through AECOM U.
☐	Competent Person – Excavations	Y	Once and as required by client or training provider	Required for employees serving the role of Competent Person. To be completed via formal training or documented experience reviewed and approved by SH&E.	Frequency may be established by an applicable standard
☒	Driller's Safety Training	N	Once and as required by client or training provider	Required for employees involved in overseeing drilling activities.	Frequency may be established by an applicable standard. Available online through AECOM U.
☐	24-Hour Surface Miner Training	Y	Once	You perform work at surface mine sites regulated by MSHA.	Training is conducted by MSHA-approved instructors under MSHA-approved training plan.

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
Hand and Power Tools					
☐	Hand Safety Awareness	N	As needed	Recommended for employees who are required to work with various hand and/or power tools	Available online through AECOM U.
☐	Hand and Power Tool-Specific Training (Performance-based)	Y	As needed	Required for employees whose job duties include these activities.	This includes site-level training. Manufacturer's specifications must be reviewed and followed in addition to regulatory requirements.
Hazardous Energy Control					
☐	Lockout/Tagout Awareness – Affected Person	Y	Once; refresher as required by local law	You work with and around equipment that may need to be locked out/tagged out. (You are not responsible for applying tags/locks).	May be included in OSHA 10 or other classes
☐	Lockout/Tagout – Authorized Person	Y	Once; refresher as required by local law	You lock out or tag out machines or equipment in order to perform servicing or maintenance on that machine or equipment.	Specific to individual machines.
☐	Electrical Safety (Awareness level)	Y	Once	Employees who have potential exposures to electrical hazards but are not working on live electrical equipment (not including power tools)	Available online through AECOM U.
Heavy Equipment and Machines					
☐	Powered Industrial Trucks (Forklifts)	Y	Once	Your job assignments include operating a powered industrial truck (forklift).	Required more frequently if assessments indicate the need.
☒	Heavy Equipment Safety	N	As needed	You work around heavy equipment but are not operating them.	Available online through AECOM U. May be included as part of a 10- or 30- hour Construction Health and Safety course.
Railroads					
☐	Agency-Specific Roadway Worker Protection Training	Y	As required		
Underground Work					
☐	24-Hour New Surface Miner Training	Y	Once	You perform work at surface mine sites regulated by the U.S. Mine Safety and Health Administration (MSHA). Training is conducted by MSHA-approved instructors under MSHA-approved training plan.	
☐	Experienced Miner Training	Y	Once, followed by annual refreshers	You meet the MSHA definition of an “Experienced Miner.”	See Surface Miner and Underground Miner training for information on annual refreshers.
☐	8-Hour Surface Miner Training – Annual Refresher	Y	Annual	You perform work at surface mine sites regulated by MSHA.	Training is conducted by MSHA-approved instructors under MSHA-approved training plan.
☐	40-Hour Underground Miner Training – New	Y	Once	You perform work in underground mine sites regulated by MSHA.	Training is conducted by MSHA-approved instructors under MSHA-approved training plan.
☐	8-Hour Underground Miner Training – Annual Refresher	Y	Annual	You perform work in underground mine sites regulated by MSHA.	Training is conducted by MSHA-approved instructors under MSHA-approved training plan.

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
Work at Height					
☐	Fall Protection – Awareness	Y	Once and as needed	You are able to recognize hazards to avoid areas where fall protection is needed.	May be included in OSHA 10 or other classes
☐	Fall Protection Authorized User	Y	Once and as needed	You perform duties at a locations where exposure to fall hazards and personal fall arrest systems are required.	
☐	Fall Protection – Competent	Y	Once and as needed	You review/approve fall protection plans. You supervise, implement and monitor fall protection programs.	
☐	Fall Protection – Qualified Person	Y	Once and as needed	You possess a recognized degree or professional certificate and can design/analyze fall protection systems via extensive knowledge, training, and experience.	
☐	Mobile Elevating Work Platform (MEWP) Training (Performance Based)	Y	Once	You are required to operate MEWPs such as bucket trucks, manlifts, and under bridge inspection units.	
☐	Under Bridge Inspection Units (Awareness Level}	N	Once	You are required to occupy/operate Under Bridge Inspection Units (UBIUs) or to manage a project involving UBIUs.	Available online through AECOM U. This training is an AECOM requirement and not a substitute for ANSI/SAIA A92.24-2018 training requirements adopted by AECOM.
Work On, In, and Near Water					
☐	U.S. Coast Guard Safe Boating Course or equivalent	N	Once	Required if you operate watercraft.	
☐	Water and Ice Safety Awareness	N	Annually	Recommended if you work over or near water.	
☐	Marine Trash and Debris Awareness and Limitation	Y	Annual	You work on contract operations for lessees and/or operators of oil and gas operations in the Gulf of Mexico.	Provided by lessee or operator.
Biological and Wildlife					
☐	Biological Hazards	N	As required	Employees potentially exposed to wildlife or poisonous plants.	Available online through AECOM U.
☐	Bloodborne Pathogens	Y	Annually, as required	Employees working in areas that may expose them to human bodily fluids (waste treatment plants, sanitary sewers, etc.).	Available online through AECOM U.
☐	Bear Aware	N	As required	Employees working in areas with known bear populations.	Available online through AECOM U.
Ergonomics					
☐	Ergonomics Self-Assessment	N	Once	For Employees who work in a home office, AECOM office, or project office.	Generally completed upon hire or change in assignment. Available online through the AECOM U.
Fitness for Duty					
☐	Fitness for Duty	N	Once, refresher as needed.	Recommended for applicable field projects (i.e., safety sensitive, night work, etc.)	Available online through AECOM U.
☐	Reasonable Suspicion for Supervisors	N	Once, refresher as needed.	For People Managers.	Available online through AECOM U.

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
Injury and Illness Claims Management					
☐	Injury and Illness Claims Management Flow	N	As required	Required for Employees who sustain an injury or illness that involves claims management.	Available online through AECOM U.
Heat and Cold Stress					
☒	Heat Stress	N	Once, refresher as required by local law	For employees that might be exposed to heat stress	Can be completed via AECOM U or other approved training, including 10-/30-hour Construction Health and Safety courses.
☐	Cold Stress	N	Once, refresher as required by local law	For employees that might be exposed to cold stress.	Can be completed via AECOM U or other approved training, including 10-/30-hour Construction Health and Safety courses.
Noise					
☒	Hearing Conservation	Y	Annual	Employees exposed to noise ≥ 85 decibels averaged over an 8-hour day, or who otherwise utilize hearing protectors.	Project-specific hearing conservation training and available online through AECOM U.
Radiological					
☐	Nuclear Density Gauge Operator	Y	Contact your Business Group Radiation Safety Officer for region-specific training requirements	You operate nuclear density gauges / densometers.	Troxler or equivalent training.
☐	Nuclear Density Gauge Transporter	Y		You transport nuclear density gauges / densometers.	Hazardous Materials shipping - ground and/or air.
☐	Radiation Worker (Nuclear Energy Worker)	Y		You may require non-routine or short-term unescorted access to radiological controlled areas (excluding High Radiation Areas and Airborne Radiation Areas), or you work in areas where radioactive materials are stored.	Occupational dose limits apply.
☐	Radiation Safety Officer	Y		You are designated as a Radiation Safety Officer.	
Respirator Usage					
☐	Respiratory Protection	Y	Annual	Required for any employee who may be required to wear a respirator.	May be included in HAZWOPER refresher training
☐	Self-Contained Breathing Apparatus (SCBA)/Cascade Systems	Y	Once	Required for any employee required to wear SCBAs or to operate a supplied air system.	Part of Project Safety training as needed.
Hazardous Substances and Communication					
☒	40-Hour Hazardous Waste Operations	Y	Once	Anyone performing work or expected to perform at hazardous waste sites or treatment, storage, and disposal facilities or those responding to emergency releases of hazardous substances.	Training must have a 'hands-on' component (i.e., donning/doffing PPE). Any exceptions must be approved by a Regional SH&E Manager.
☐	8-Hour Hazardous Waste Operations – Refresher	Y	Annual	Only attend if you have completed the 40-Hour Hazardous Waste Operations training - see above.	When offered as a combination of online modules and classroom instruction, online modules must be completed prior to the classroom portion for participants to receive credit. Both portions (online and classroom) need to be completed within the same calendar year.

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
☐	8-Hour Hazardous Waste Operations – Supervisor	Y	Once	Required for anyone serving as the site supervisor or overseeing subcontractor activities at a hazardous waste site.	When offered as a combination of online modules and classroom instruction, online modules must be completed prior to the classroom portion for participants to receive credit. Both portions (online and classroom) need to be completed within the same calendar year.
☐	Anhydrous Ammonia Awareness	Y	Once - refresher as required by local law	You perform work where you may be potentially exposed to anhydrous ammonia. This may include tasks associated with industrial refrigeration equipment or piping, petroleum refineries, and agricultural fertilizer.	Available online through AECOM U and provided by Vector Solutions.
☐	Asbestos Awareness	Y	Once; refresher as required by local law	You perform work where you work in areas that contain or may contain asbestos and have the potential to disturb the asbestos-containing material	Available online through AECOM U.
☐	Asbestos Inspector	Y	Annual	You perform asbestos sampling tasks.	
☐	Asbestos Planner	Y	Annual	You serve as the project asbestos planner.	
☐	Cadmium Awareness	Y	Once, followed by annual refreshers		Available through AECOM U – Vector Solutions.
☐	Crystalline Silica Awareness	Y	Once; refresher as required by local law	You perform work where you may be potentially exposed to silica.	Available through AECOM U – Vector Solutions.
☐	Hazard Communication	Y	Initially and if hazards change	Required for anyone who is potentially exposed to/works with hazardous chemicals.	Training must occur before any work with hazardous chemicals. Included (as needed) in safety orientation. After the initial training, required updates will typically be handled as part of project-specific safety training.
☐	Hazardous Materials Shipping	Y	Every 3 years	Required for anyone who packages, labels, transports, completes paperwork for, or offers for shipment, hazardous materials/dangerous goods.	
☐	Hot Work	Y	Once	Your job duties include these activities.	
☐	Hydrogen Sulfide (H2S) Alive	Y	Annual	For employees performing ground disturbance activities in the oil and gas industries.	
☐	Hydrogen Sulfide (H2S) Awareness	Y	Annual	For employees performing ground disturbance activities who are at risk of hydrogen sulfide exposure, but do not work in the oil or gas industry	
☐	Laboratory Safety (Awareness Level)	Y	Once	You work in a laboratory.	Available through AECOM U – Vector Solutions.
☐	Lead Awareness	Y	Once - refresher as required by local law	You perform work where you may be potentially exposed to lead.	
☐	Lead Project Designer	Y	Every 3 years	You are a lead project designer.	
☐	Lead Risk Assessor	Y	Every 3 years	You are a project lead risk assessor inspector.	

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Applies?	Course Title	Regulatory	Frequency	Should You Attend?	Additional Information
☐	Substance Specific	Y	Once	Any U.S. employee potentially exposed to a substance covered by the 29 CFR substance specific regulations.	Includes Ammonia, Benzene, Cadmium, Chromium (VI), Hydrogen Sulfide, Silica and Lead. Offered as part of project-specific training.
☐	Waste Specialist	Y	Once with annual refresher	You are responsible for waste management at a small or large quantity generator facility.	
☐	Workplace Hazardous Materials Information System (WHMIS)	Y	Annual	You are assigned to a Canadian facility and work with or around hazardous materials.	Canadian Hazard Communications
Highway and Road Work					
☐	Flagger Training	Y	Once	Anytime a worker is responsible for directing or controlling traffic on a construction site, road maintenance project, or any other area where they need to manage vehicular or pedestrian flow	Available through external vendor approved by SH&E Manager.
☐	Work Zone Safety (Awareness Level)	N	Once	Work on or adjacent to roadway live traffic.	Available online through AECOM U.

AECOM

Americas

Project Hazardous Materials Communication Plan

S3AM-110-FM2

Instructions

1. **This form, or equivalent, is to be completed in accordance with Hazardous Substances and Communication – Americas S3AM-110-PR2.**
2. **This form, or equivalent, must be completed and attached as an appendix as part of the Project-Specific SH&E Plan – Americas S3AM-209-FM2 when the project scope of work requires chemical materials (i.e., hazardous materials/substance and/or Materials of Trade) to be brought onto the site to perform work.**
3. **Materials to be brought to the Site by AECOM and/or its subcontractors and chemical hazards that will be encountered on the Site must have a Safety Data Sheet (SDS) maintained in an accessible location for workers to review.**
4. **Applicable SDSs must be attached to this form.**
5. **The completed form must be retained in the project files as part of the project-specific SH&E plan.**

Materials to be brought or encountered on the Site will include the following (add rows as necessary):

Chemical Name		Purpose/use/source
1.	Hydrogen Chloride (HCl)	Sample Preservative
2.	Gasoline	Fuel Generators and/or Equipment
3.	Diesel	Fuel Generators and/or Heavy Equipment
4.	Alconox	Decontamination of Equipment
5.	Benzene	PID Calibration
6.	Gasoline	Fuel Generators and/or Equipment
7.	….	….
8.	….	….

The applicable SDSs are attached to this form below:

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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.

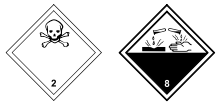
Other adverse effects : No known significant effects or critical hazards.

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

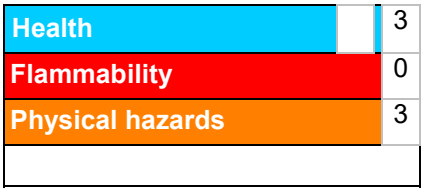
WHMIS (Canada) : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

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.)

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
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

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

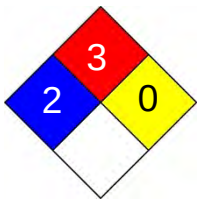
Component Analysis - Inventory

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

SAFETY DATA SHEET

1. Identification

Product identifier **DIESEL FUELS**

Other means of identification

SDS number 102-GHS

Synonyms Diesel Fuels All Grades, Diesel Fuel No.2, Fuel Oil No.2, High Sulfur Diesel Fuel, Low Sulfur Diesel Fuel, Ultra Low Sulfur Diesel Fuel, CARB (California Air Resource Board) Diesel Fuel, Off-Road Diesel Fuel, Dyed Diesel Fuel, X Grade Diesel Fuel, X-1 Diesel Fuel, R5 ULSD, B5 ULS D See section 16 for complete information.

Recommended use Motor Fuel
Refinery feedstock.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer/Supplier Valero Marketing & Supply Company and Affiliates
One Valero Way
San Antonio, TX 78269-6000

General Assistance 210-345-4593

E-Mail CorpHSE@valero.com

Contact Person Industrial Hygienist

Emergency Telephone 24 Hour Emergency 866-565-5220
1-800-424-9300 (CHEMTREC USA)

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 3
Health hazards	Acute toxicity, inhalation	Category 4
	Skin corrosion/irritation	Category 2
	Carcinogenicity	Category 2
	Reproductive toxicity	Category 2
	Specific target organ toxicity, repeated exposure	Category 2
	Aspiration hazard	Category 1
Environmental hazards	Hazardous to the aquatic environment, long-term hazard	Category 2

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Flammable liquid and vapor. Harmful if inhaled. Causes skin irritation. Suspected of causing cancer. Suspected of damaging fertility or the unborn child. May cause damage to organs (blood, thymus, liver) through prolonged or repeated exposure. May be fatal if swallowed and enters airways.

Precautionary statement

Prevention Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. 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 discharges. Do not breathe mist/vapors/spray. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area.

Response	If skin irritation occurs: Get medical advice/attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If exposed or concerned: Get medical advice/attention. If swallowed: Immediately call a poison center/doctor. Take off contaminated clothing and wash before reuse. In case of fire: Use foam, carbon dioxide, dry powder or water fog for extinction.
Storage	Store locked up. Store in a well-ventilated place. Keep cool.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Fuels, diesel, no. 2	68476-34-6	85 - 100
Biodiesel - Fatty acid methyl esters	67762-38-3	0 - 10
Fuels, diesel, C9-18-alkane branched and linear	1159170-26-9	0 - 5
n-Nonane	111-84-2	1 - 3
Octane (All isomers)	111-65-9	1 - 2
Hexane (Other isomers)	96-14-0	0 - 1
Naphthalene	91-20-3	0 - 1
n-Heptane	142-82-5	0 - 1
n-Hexane	110-54-3	0 - 1

4. First-aid measures

Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Skin contact	Remove contaminated clothing and shoes. Wash off immediately with soap and plenty of water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes. If high pressure injection under the skin occurs, always seek medical attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.
Ingestion	Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Do not give mouth-to-mouth resuscitation. If vomiting occurs, keep head low so that stomach content does not get into the lungs. Never give anything by mouth to a victim who is unconscious or is having convulsions. Get medical attention immediately.
Most important symptoms/effects, acute and delayed	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash. The toxicological properties of this product have not been thoroughly investigated. Use appropriate precautions. Hydrogen sulfide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulfide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odor does not provide a reliable indicator of the presence of hazardous levels in the atmosphere.
Indication of immediate medical attention and special treatment needed	In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed. The toxicological properties of this material have not been fully investigated.
General information	If exposed or concerned: get medical attention/advice. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

5. Fire-fighting measures

Suitable extinguishing media	Water spray. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards arising from the chemical	The product is flammable, and heating may generate vapors which may form explosive vapor/air mixtures. Thermal decomposition or combustion may liberate toxic gases or fumes.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire-fighting equipment/instructions	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of tanks due to fire. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Cool containers exposed to flames with water until well after the fire is out. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Water runoff can cause environmental damage. Use compatible foam to minimize vapor generation as needed.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Local authorities should be advised if significant spills cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 of the SDS for Personal Protective Equipment.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Local authorities should be advised if significant spillages cannot be contained. Stop leak if you can do so without risk. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas. Use non-sparking tools and explosion-proof equipment. Small Spills: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste. Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system. Should not be released into the environment. Clean up in accordance with all applicable regulations.
Environmental precautions	If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Flammable. Review Firefighting Measures, Section 5, before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g. by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Use compatible foam to minimize vapor generation as needed. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 1-800-424-8802. For highway or railways spills, contact Chemtrec at 1-800-424-9300.

7. Handling and storage

Precautions for safe handling	Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Wear personal protective equipment. Avoid breathing mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Avoid prolonged exposure. Use only with adequate ventilation. Wash thoroughly after handling. The product is combustible, and heating may generate vapors which may form explosive vapor/air mixtures. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. When using, do not eat, drink or smoke. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities

Flammable liquid storage. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. The pressure in sealed containers can increase under the influence of heat. Keep container tightly closed in a cool, well-ventilated place. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Naphthalene (CAS 91-20-3)	PEL	50 mg/m3
		10 ppm
n-Heptane (CAS 142-82-5)	PEL	2000 mg/m3
		500 ppm
n-Hexane (CAS 110-54-3)	PEL	1800 mg/m3
		500 ppm
Octane (All isomers) (CAS 111-65-9)	PEL	2350 mg/m3
		500 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Fuels, diesel, no. 2 (CAS 68476-34-6)	TWA	100 mg/m3	Inhalable fraction and vapor.
Hexane (Other isomers) (CAS 96-14-0)	STEL	1000 ppm	
	TWA	500 ppm	
Naphthalene (CAS 91-20-3)	STEL	15 ppm	
	TWA	10 ppm	
n-Heptane (CAS 142-82-5)	STEL	500 ppm	
	TWA	400 ppm	
n-Hexane (CAS 110-54-3)	TWA	50 ppm	
n-Nonane (CAS 111-84-2)	TWA	200 ppm	
Octane (All isomers) (CAS 111-65-9)	TWA	300 ppm	

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Hexane (Other isomers) (CAS 96-14-0)	Ceiling	1800 mg/m3
		510 ppm
	TWA	350 mg/m3
		100 ppm
Naphthalene (CAS 91-20-3)	STEL	75 mg/m3
		15 ppm
	TWA	50 mg/m3
		10 ppm
n-Heptane (CAS 142-82-5)	Ceiling	1800 mg/m3
		440 ppm
	TWA	350 mg/m3
		85 ppm
n-Hexane (CAS 110-54-3)	TWA	180 mg/m3
		50 ppm
n-Nonane (CAS 111-84-2)	TWA	1050 mg/m3
		200 ppm
Octane (All isomers) (CAS 111-65-9)	Ceiling	1800 mg/m3
		385 ppm
	TWA	350 mg/m3
		75 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
n-Hexane (CAS 110-54-3)	0.4 mg/l	2,5-Hexanedion, without hydrolysis	Urine	*
	0.4 mg/l	2,5-Hexanedi - on, without hydrolysis		*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

n-Hexane (CAS 110-54-3) Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Fuels, diesel, no. 2 (CAS 68476-34-6) Can be absorbed through the skin.
Naphthalene (CAS 91-20-3) Can be absorbed through the skin.
n-Hexane (CAS 110-54-3) Can be absorbed through the skin.

Appropriate engineering controls Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses. If splash potential exists, wear full face shield or chemical goggles.

Skin protection

Hand protection Wear chemical-resistant, impervious gloves. Suitable gloves can be recommended by the glove supplier. Be aware that the liquid may penetrate the gloves. Frequent change is advisable.

Other Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.

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. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn. Proper respirator selection should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. This equipment should be available for nonroutine and emergency use.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Consult supervisor for special handling instructions. Avoid contact with eyes. Avoid contact with skin. Keep away from food and drink. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance Liquid (may be dyed red).

Physical state Liquid.

Form Liquid.

Color Clear. Straw.

Odor Kerosene (strong).

Odor threshold Not available.

pH Not available.

Melting point/freezing point -60.07 °F (-51.15 °C) Estimated

Initial boiling point and boiling range 325 - 700 °F (162.78 - 371.11 °C)

Flash point > 100.0 °F (> 37.8 °C) Closed Cup

Evaporation rate 0.02

Flammability (solid, gas) Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%)	0.4 %
Flammability limit - upper (%)	8 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	< 1 mm Hg (20°C)
Vapor density	3 (Air = 1)
Relative density	0.82 - 0.87
Relative density temperature	60 °F (15.56 °C)
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	494.96 °F (257.2 °C)
Decomposition temperature	Not available.
Viscosity	2 - 4.5 mm²/s

10. Stability and reactivity

Reactivity	Stable at normal conditions.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, flames and sparks. Ignition sources. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	May be fatal if swallowed and enters airways.
Inhalation	Harmful if inhaled. In high concentrations, vapors and spray mists are narcotic and may cause headache, fatigue, dizziness and nausea.
Skin contact	Causes skin irritation.
Eye contact	May cause eye irritation.
Symptoms related to the physical, chemical and toxicological characteristics	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash. The toxicological properties of this product have not been thoroughly investigated. Use appropriate precautions.

Information on toxicological effects

Acute toxicity	Harmful if inhaled. Harmful: may cause lung damage if swallowed. The toxicological properties of this material have not been fully investigated.

Components	**Species**	**Test Results**
Fuels, diesel, no. 2 (CAS 68476-34-6)		
Acute		
Inhalation		
LC50	Rat	4.1 mg/l, 4 hours

Components	Species	Test Results
Naphthalene (CAS 91-20-3)		
Acute		
Dermal		
LD50	Rabbit	> 2 g/kg
Oral		
LD50	Rat	490 mg/kg
n-Heptane (CAS 142-82-5)		
Acute		
Inhalation		
LC50	Rat	103 mg/l, 4 Hours
n-Hexane (CAS 110-54-3)		
Acute		
Oral		
LD50	Rat	28710 mg/kg
n-Nonane (CAS 111-84-2)		
Acute		
Inhalation		
LC50	Rat	3200 mg/l, 4 Hours
Octane (All isomers) (CAS 111-65-9)		
Acute		
Inhalation		
LC50	Rat	118 mg/l, 4 Hours

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Based on available data, the classification criteria are not met.

Respiratory or skin sensitization

Respiratory sensitization Based on available data, the classification criteria are not met.

Skin sensitization Based on available data, the classification criteria are not met.

Germ cell mutagenicity Based on available data, the classification criteria are not met.

Carcinogenicity Suspected of causing cancer.
International Agency for Research on Cancer (IARC): Whole diesel engine exhaust – IARC Group 1. Exposure may cause lung cancer and also noted a positive association with an increased risk of bladder cancer.
Diesel exhaust has been reported to be an occupational hazard due to NIOSH-reported potential carcinogenic properties.

IARC Monographs. Overall Evaluation of Carcinogenicity

Fuels, diesel, no. 2 (CAS 68476-34-6)	3 Not classifiable as to carcinogenicity to humans.
Naphthalene (CAS 91-20-3)	2B Possibly carcinogenic to humans.

NTP Report on Carcinogens

Naphthalene (CAS 91-20-3)	Reasonably Anticipated to be a Human Carcinogen.

Reproductive toxicity Suspected of damaging fertility or the unborn child.
Napthalene interferes with embryo development in experimental animals at dose levels that cause maternal toxicity. In humans, excessive exposure to this agent may cause hemolytic anemia in the mother and fetus.

Specific target organ toxicity - single exposure Based on available data, the classification criteria are not met.

Specific target organ toxicity - repeated exposure May cause damage to the following organs through prolonged or repeated exposure: Blood. Liver. Thymus.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Contains organic solvents which in case of overexposure may depress the central nervous system causing dizziness and intoxication. Repeated exposure to naphthalene may cause cataracts, allergic skin rashes, destruction of red blood cells, and anemia, jaundice, kidney and liver damage. Danger of serious damage to health by prolonged exposure. Prolonged or repeated overexposure may cause central nervous system, kidney, liver, and lung damage.

Further information Symptoms may be delayed. Hydrogen sulfide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulfide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odor does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. Toxicological properties of this material have not been fully investigated.

12. Ecological information

Ecotoxicity Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Components		Species	Test Results
Fuels, diesel, no. 2 (CAS 68476-34-6)			
Aquatic			
Acute			
Crustacea	EL50	Daphnia magna	68 mg/l, 48 hours
Fish	LL50	Oncorhynchus mykiss	65 mg/l, 96 hours
Naphthalene (CAS 91-20-3)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	1.09 - 3.4 mg/l, 48 hours
Fish	LC50	Pink salmon (Oncorhynchus gorbuscha)	0.95 - 1.62 mg/l, 96 hours
n-Heptane (CAS 142-82-5)			
Aquatic			
Fish	LC50	Western mosquitofish (Gambusia affinis)	4924 mg/l, 96 hours
n-Hexane (CAS 110-54-3)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	2.101 - 2.981 mg/l, 96 hours

Persistence and degradability Not available.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

Hexane (Other isomers) (CAS 96-14-0)	3.6
Octane (All isomers) (CAS 111-65-9)	5.18
n-Heptane (CAS 142-82-5)	4.66
n-Hexane (CAS 110-54-3)	3.9
n-Nonane (CAS 111-84-2)	5.46

Mobility in soil Not available.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. This material and its container must be disposed of as hazardous waste. Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

Hazardous waste code D001: Waste Flammable material with a flash point <140 °F

US RCRA Hazardous Waste U List: Reference

Naphthalene (CAS 91-20-3) U165

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Offer rinsed packaging material to local recycling facilities.

14. Transport information

DOT

UN number UN1202

UN proper shipping name Diesel fuel

Transport hazard class(es)

Class Combustible Liquid

Subsidiary risk -

Packing group III

Environmental hazards

Marine pollutant	Yes
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	144, B1, IB3, T2, TP1
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242

IATA

UN number	UN1202
UN proper shipping name	Diesel fuel
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	III
Environmental hazards	Yes
ERG Code	3L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1202
UN proper shipping name	DIESEL FUEL
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	III
Environmental hazards	
Marine pollutant	Yes
EmS	F-E, S-E
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable. However, this product is a liquid and if transported in bulk covered under MARPOL 73/78, Annex I.

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

n-Nonane (CAS 111-84-2)	1.0 % One-Time Export Notification only.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Hexane (Other isomers) (CAS 96-14-0)	LISTED
Naphthalene (CAS 91-20-3)	LISTED
n-Heptane (CAS 142-82-5)	LISTED
n-Hexane (CAS 110-54-3)	LISTED
n-Nonane (CAS 111-84-2)	LISTED
Octane (All isomers) (CAS 111-65-9)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Naphthalene	91-20-3	0 - 1

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Naphthalene (CAS 91-20-3)
n-Hexane (CAS 110-54-3)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

Hexane (Other isomers) (CAS 96-14-0)
Naphthalene (CAS 91-20-3)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
n-Nonane (CAS 111-84-2)
Octane (All isomers) (CAS 111-65-9)

US. New Jersey Worker and Community Right-to-Know Act

Fuels, diesel, no. 2 (CAS 68476-34-6)
Naphthalene (CAS 91-20-3)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
n-Nonane (CAS 111-84-2)
Octane (All isomers) (CAS 111-65-9)

US. Pennsylvania Worker and Community Right-to-Know Law

Fuels, diesel, no. 2 (CAS 68476-34-6)
Hexane (Other isomers) (CAS 96-14-0)
Naphthalene (CAS 91-20-3)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
n-Nonane (CAS 111-84-2)
Octane (All isomers) (CAS 111-65-9)

US. Rhode Island RTK

Naphthalene (CAS 91-20-3)
n-Hexane (CAS 110-54-3)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Benzene (CAS 71-43-2)
Toluene (CAS 108-88-3)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No

Country(s) or region	Inventory name	On inventory (yes/no)*
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

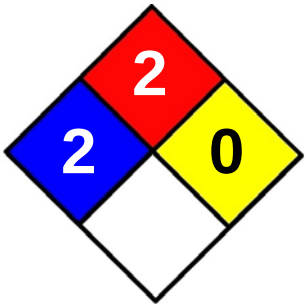
Issue date 13-May-2013

Revision date 23-May-2014

Version # 04

Further information HMIS® is a registered trade and service mark of the NPCA.

NFPA Ratings



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• SAFETY DATA SHEET

Version 6.20
Revision Date 11/06/2025
Print Date 11/07/2025

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Benzene

Product Number : 319953
Brand : SIGALD
Index-No. : 601-020-00-8
CAS-No. : 71-43-2

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 number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

Flammable liquids : Category 2

Skin irritation : Category 2

Eye irritation : Category 2A

Germ cell mutagenicity : Category 1B

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Carcinogenicity	:	Category 1A
Specific target organ toxicity - repeated exposure	:	Category 1 (Blood)
Aspiration hazard	:	Category 1
Long-term (chronic) aquatic hazard	:	Category 3

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements :
H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to organs (Blood) through prolonged or repeated exposure.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 Keep container tightly closed.
P240 Ground and bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting equipment.
P242 Use non-sparking tools.
P243 Take action to prevent static discharges.
P260 Do not breathe mist or vapours.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye

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protection/ face protection.

Response:

P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P331 Do NOT induce vomiting.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

Storage:

P403 + P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

CAS-No. : 71-43-2

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
benzene	71-43-2*	>= 80 - <= 100	TSC

* Indicates that the identifier is a CAS No.
TSC- the actual concentration or concentration range is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

General advice : Show this safety data sheet to the doctor in attendance.

If inhaled : After inhalation: fresh air. Call in physician.

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In case of skin contact	:	In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.
In case of eye contact	:	After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.
If swallowed	:	After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.
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
Protection of first-aiders	:	For personal protection see section 8.
Notes to physician	:	No data available

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Foam Dry powder
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
		For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Flash back possible over considerable distance. Container explosion may occur under fire conditions.
		Combustible.
		Pay attention to flashback.
		Vapours are heavier than air and may spread along floors.

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		Development of hazardous combustion gases or vapours possible in the event of fire. Forms explosive mixtures with air at ambient temperatures.
Hazardous combustion products	:	Carbon oxides
Specific extinguishing methods	:	No data available
Further information	:	Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-fighters	:	Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Advice for non-emergency personnel: Do not breathe vapours, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	:	Do not let product enter drains. Risk of explosion.
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 with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

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SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on protection against fire and explosion	:	Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.
Advice on safe handling	:	Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.
Further information on storage conditions	:	Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorised persons.
Storage class	:	3, Flammable liquids
Recommended storage temperature	:	Recommended storage temperature see product label.
Packaging material	:	Suitable material: Any Metal Drum

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
benzene	71-43-2	TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL

Engineering measures : No data available

Personal protective equipment

Respiratory protection	:	required when 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.
Recommended Filter	:	Filter A-(P3)

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type:

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

required when 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.

Filter type ABEK

Hand protection

Material	:	Fluorinated rubber
Break through time	:	480 min
Glove thickness	:	0.7 mm
Protective index	:	Full contact
Manufacturer	:	Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Material	:	Fluorinated rubber
Break through time	:	480 min
Glove thickness	:	0.7 mm
Protective index	:	Splash contact
Manufacturer	:	Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Manufacturer	:	data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

Remarks	:	Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as

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offering an approval for any specific use scenario.

Eye protection	:	Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses
Skin and body protection	:	Flame retardant antistatic protective clothing.
Hygiene measures	:	Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Color	:	clear, colourless
Odor	:	No data available
Odor Threshold	:	No data available
pH	:	No data available
Melting point/ range	:	41.9 °F / 5.5 °C Method: lit.
Boiling point/boiling range	:	176 °F / 80 °C Method: lit.
Flash point	:	12 °F / -11 °C (1,013.5 hPa) Method: DIN 51755 Part 1
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Flammability (liquids)	:	No data available
Burning rate	:	No data available
Self-ignition	:	928 °F / 498 °C 1,013.5 hPa
Upper explosion limit / Upper flammability limit	:	Upper explosion limit 8.0 %(V)
Lower explosion limit /	:	Lower explosion limit

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Lower flammability limit		1.2 %(V)
Vapor pressure	:	100 hPa (68 °F / 20 °C)
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	0.874 g/cm3 (77 °F / 25 °C) Method: lit.
Solubility(ies) Water solubility	:	ca. 1.88 g/l soluble (74.3 °F / 23.5 °C) pH: 7
Partition coefficient: n-octanol/water	:	log Pow: 2.13 (77 °F / 25 °C) pH: 7 Bioaccumulation is not expected. (ECHA)
Autoignition temperature	:	928 °F / 498 °C (1,013.5 hPa)
Decomposition temperature	:	No data available
Viscosity Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	0.604 mm2/s (77 °F / 25 °C)
Flow time	:	No data available
Explosive properties	:	Not classified as explosive.
Oxidizing properties	:	none
Molecular weight	:	78.11 g/mol
Particle characteristics Particle size	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Vapours may form explosive mixture with air. Vapours may form explosive mixture with air.
Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) . The product is chemically stable under standard

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ambient conditions (room temperature) .

Possibility of hazardous reactions	:	Exothermic reaction with: halogens Halogenated hydrocarbon in the presence of: Light metals Risk of explosion with: halogen-halogen compounds Nitric acid Boranes Ozone peroxi compounds perchlorates permanganic acid perchloryl fluoride Strong oxidizing agents Chlorine fluorides uranium hexafluoride Oxygen liquid Risk of ignition or formation of inflammable gases or vapours with: chromium(VI) oxide Fluorine nitryl compounds Oxygen oxyhalogenic compounds Violent reactions possible with: mineral acids sulfur
Conditions to avoid	:	Warming. Warming.
Incompatible materials	:	No data available
Hazardous decomposition products	:	In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - > 2,000 mg/kg
(OECD Test Guideline 401)
Symptoms: Nausea

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LD50 Oral - Rat - male and female - 3,002 mg/kg
(OECD Test Guideline 401)
Symptoms: Risk of aspiration upon vomiting., Aspiration may cause pulmonary oedema and pneumonitis.
Inhalation: No data available
Symptoms: mucosal irritations
LD50 Dermal - Rabbit - 13,630 mg/kg
Remarks: (IUCLID)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: irritating
(OECD Test Guideline 404)
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Irritating to eyes.
(OECD Test Guideline 405)
Remarks: (IUCLID)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Respiratory or skin sensitization
Maximisation Test - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
May cause genetic defects.
Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster lung cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative

Test Type: Mutagenicity (mammal cell test): micronucleus.
Species: Mouse
Cell type: Bone marrow
Application Route: inhalation (vapour)
Method: OECD Test Guideline 474
Result: positive

Carcinogenicity

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May cause cancer. Positive evidence from human epidemiological studies.

IARC: 1 - Group 1: Carcinogenic to humans (benzene)

NTP: Known - Known to be human carcinogen (benzene)

OSHA: OSHA specifically regulated carcinogen (benzene)

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure.
- Blood
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard
Aspiration may cause pulmonary oedema and pneumonitis.

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - No observed adverse effect level - 600 mg/kg

RTECS: CY1400000
Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased., Blood disorders
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption of large quantities:

narcosis
respiratory arrest
Convulsions

Possible damages:

Damage to:

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Liver
Kidney
Central nervous system

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

benzene:

Toxicity to fish	:	LC50 (Oryzias latipes (Orange-red killifish)): > 100 mg/l End point: mortality Exposure time: 96 h Test Type: semi-static test Analytical monitoring: yes Method: OECD Test Guideline 203 GLP: yes
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): > 1,000 mg/l End point: Immobilization Exposure time: 48 h Test Type: semi-static test Analytical monitoring: yes Method: OECD Test Guideline 202 GLP: yes NOEC (Daphnia magna (Water flea)): > 1,000 mg/l End point: Immobilization Exposure time: 48 h Test Type: semi-static test Analytical monitoring: yes Method: OECD Test Guideline 202 GLP: yes
Toxicity to algae/aquatic plants	:	ErC50 (Pseudokirchneriella subcapitata (green algae)): > 1,000 mg/l Exposure time: 72 h Test Type: static test Analytical monitoring: yes Method: OECD Test Guideline 201 GLP: yes NOEC (Pseudokirchneriella subcapitata (green algae)):

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>= 1,000 mg/l
Exposure time: 72 h
Test Type: static test
Analytical monitoring: yes
Method: OECD Test Guideline 201
GLP: yes

Toxicity to fish (Chronic toxicity) : NOEC (Pimephales promelas (fathead minnow)): 0.8 mg/l
Exposure time: 32 d
Test Type: flow-through test
Analytical monitoring: yes
Remarks: (ECHA)

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : LC50 (Daphnia magna (Water flea)): > 100 mg/l
End point: mortality
Exposure time: 21 d
Test Type: semi-static test
Analytical monitoring: yes
Method: OECD Test Guideline 211
GLP: yes

Toxicity to microorganisms : EC50 (activated sludge): > 1,000 mg/l
Exposure time: 3 h
Test Type: static test
Method: OECD Test Guideline 209
GLP: yes

Ecotoxicology Assessment

Chronic aquatic toxicity : Harmful to aquatic life with long lasting effects.

Persistence and degradability

Components:

benzene:

Biodegradability : aerobic
Inoculum: activated sludge, non-adapted
Concentration: 17 mg/l
Result: Readily biodegradable.
Biodegradation: 96 %
Exposure time: 28 d
Method: OECD Test Guideline 301F
GLP: yes

Bioaccumulative potential

Components:

benzene:

Bioaccumulation : Species: Leuciscus idus (Golden orfe)
Bioconcentration factor (BCF): 10

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Exposure time: 3 d
Concentration: 0.05 mg/l

Partition coefficient: n-octanol/water	:	log Pow: 2.13 (77 °F / 25 °C) pH: 7 Remarks: Bioaccumulation is not expected. (ECHA)

Mobility in soil

No data available

Other adverse effects

Product:

Ozone-Depletion Potential	:	Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

Components:

benzene:

Additional ecological information	:	Endangers drinking-water supplies if allowed to enter soil or water. Discharge into the environment must be avoided.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	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.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1114
Proper shipping name	:	Benzene
Class	:	3
Packing group	:	II
Labels	:	Class 3 - Flammable liquids
Packing instruction (cargo	:	364

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aircraft)
Packing instruction (passenger aircraft) : 353

IMDG-Code

UN number : UN 1114
Proper shipping name : BENZENE

Class : 3
Packing group : II
Labels : 3
EmS Code : F-E, S-D
Marine pollutant : no

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR Road

UN/ID/NA number : UN 1114
Proper shipping name : Benzene

Class : 3
Packing group : II
Labels : Class 3 - Flammable liquids
ERG Code : 130
Marine pollutant : no

Poison Inhalation Hazard : No

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
benzene	71-43-2	10	10
benzene	71-43-2	10	10 (D018)

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard

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Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

benzene	71-43-2	>= 90 - <= 100 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

benzene	71-43-2	>= 90 - <= 100 %

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

benzene	71-43-2	>= 90 - <= 100 %

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

benzene	71-43-2	>= 90 - <= 100 %

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

benzene	71-43-2	>= 90 - <= 100 %

This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

benzene	71-43-2	>= 90 - <= 100 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

benzene	71-43-2	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

benzene	71-43-2

Pennsylvania Right To Know

benzene	71-43-2

Maine Chemicals of High Concern

benzene	71-43-2

Vermont Chemicals of High Concern

benzene	71-43-2

Washington Chemicals of High Concern

benzene	71-43-2

California Prop. 65

WARNING: This product can expose you to chemicals including benzene, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

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The components of this product are reported in the following inventories:

TSCA	:	All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
NIOSH REL	:	USA. NIOSH Recommended Exposure Limits
OSHA Z-2	:	USA. Occupational Exposure Limits (OSHA) - Table Z-2
ACGIH / TWA	:	8-hour, time-weighted average
ACGIH / STEL	:	Short-term exposure limit
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek
NIOSH REL / ST	:	STEL - 15-minute TWA exposure that should not be exceeded at any time during a workday
OSHA Z-2 / TWA	:	8-hour time weighted average
OSHA Z-2 / CEIL	:	Acceptable ceiling concentration
OSHA Z-2 / Peak	:	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development;

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OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. 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.
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Revision Date : 11/06/2025

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US / EN

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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.

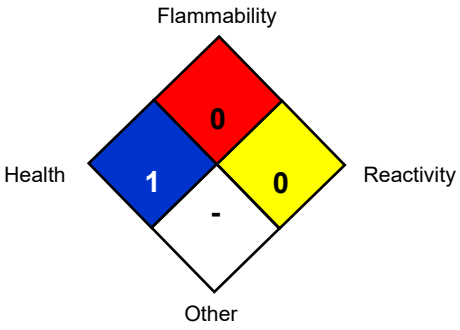
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

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.

Project Hazardous Substance Exposure Control Plan

S3AM-110-FM3

Materials to be brought or encountered on the Site will include the following:

Note 1: **Max. Conc.** = Maximum Concentration | **PEL** = Permissible Exposure Limit | **TLV** = Threshold Limit Value | **IP** = Ionization Potential | **eV** = Electron Volt | **mg** = milligrams | **µg** = micrograms | **cm^3** = centimeters cubed | **m^3** = meters cubed | **f** = fiber | **ppm** = parts per million

Note 2: Examples of media include but are not limited to soil, groundwater, vapor, and fumes.

Note 3: Exposure routes could be dermal (absorption), ingestion, inhalation, and injection.

Chemical Name	Media (list all that apply)	Exposure Route(s)	Max. Conc. Observed at Site	PEL– U.S. OSHA (Cal/OSHA or Canadian province where noted)	TLV	IP (eV)
Metals						
Copper	Surface Soil	Dermal	51.9 ppm	1 mg/m^3	1 mg/m^3	n/a
Lead	Surface Soil	Dermal	365 ppm	0.05 mg/m^3 Cal OSHA: 0.01 mg/m^3	0.05 mg/m^3	n/a
Nickel	Surface Soil & Subsurface Soil	Dermal	36.8 ppm	1 mg/m^3	0.1 mg/m^3	n/a
Mercury	Surface Soil	Dermal	…. 0.27 ppm	0.1 mg/m^3	0.025 mg/m^3	n/a
Zinc	Surface Soil	Dermal	…. 508 ppm	15 mg/m^3	10 mg/m^3	n/a
Other Common Site Constituents of Concern						
Dust	Air	Inhalation	n/a	15 mg/m^3	10 mg/m^3	n/a
Tetrachloroethylene (PCE)	Subsurface Soil/Groundwater	Dermal	…. 21 ppb	100 ppm	25 ppm	9.32
Trichloroethene (TCE)	Subsurface Soil/Groundwater	Dermal	6.6 ppb	0.2 ppm	10 ppm	9.45
Cis-1,2-dichloroethene	Soil/G Subsurface Soil/Groundwater	Dermal	130 ppb	200	200 ppm	9.65
Methyl Chloride	Subsurface Soil/Groundwater	Dermal	Unknown	1 ppm	1 ppm	9.99
Perfluorooctane Sulfonic Acid (PFOS)	Soil/GW	Dermal	24 ng/L	n/a	1 mg/m^3	n/a

Exposure Monitoring Needs Assessment

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During the performance of the scope of work, there is a reasonable potential for exposure to chemical hazards. These may originate from materials brought on site, constituents of concern present in environmental media under investigation, or simultaneous operations conducted by the property owner or third parties. Such exposures could result in vapors, fumes, aerosols, mists, or airborne particulates/dusts approaching permissible exposure limits. Therefore, the worker exposure monitoring measures to be implemented are described below.

Industrial Hygiene Sampling

☒ Industrial hygiene (IH) sampling will **NOT** be used as part of worker exposure monitoring
☐ Industrial hygiene (IH) sampling **WILL** be used as part of worker exposure monitoring. IH sampling will consist of ____.

Point Source Monitoring

☐ Direct-read instruments will **NOT** be used to collect point source readings to guide field investigation and sample selection.
☒ One or more direct-read instruments **WILL** be used to collect point source readings, as a standard industry practice, to guide field investigation and sample selection. These readings are **NOT** representative of worker exposure.

Instrument Selection

Worker exposure monitoring will be conducted using a combination of direct-read instruments and industrial hygiene sampling methods, as outlined below. Monitoring will take place within the work area to detect the presence and relative levels of toxic substances. All monitoring activities will be performed in accordance with the work permit and Task Hazard Analysis (THA). Instruments used on site must be intrinsically safe to prevent fire or explosion.

Instrument	Manufacturer/Model	Hazard Detected/Measured
☒ Photo Ionization Detector (PID)	**RAE Systems mii-RAE** **Photovac Microtip** **Hnu Model Hnu (min. 10.6 eV bulb)**	Petroleum hydrocarbons Organic solvents
☐ Multi or 4 Gas Detectors	RAE Systems Multi-RAE	Lower Explosive Limit Oxygen Carbon Monoxide Hydrogen Sulfide
☒ Particulate Monitor	MIE Model PDM-3 mini-RAM	Aerosols, mist, dust, and fumes
☐ Personal Monitoring/Badges	N/A	N/A
☐ Other:	N/A	N/A

Instrument Calibration/Bump Checks

Direct-read instruments must be calibrated prior to use each day following the procedure outlined by the manufacturer in the instrument manual. Calibration results shall be documented in a digital or hardcopy field form or logbook. Full calibration records from the instrument provider (i.e., rental company) shall be retained in the central project file.

Direct-Read Instrument Monitoring Procedures and Action Levels

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 more than 1 time the action level. A reading more than action level outlined below will require additional ventilation (natural or mechanical) for 30 minutes, followed by re-monitoring.

Parameter	Zone Location and Monitoring Interval	Action Level	Response Activity

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☒ **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 Lead, Site Supervisor, and Project Manager.
☐ **Benzene** (by PID with benzene-specific separation tube)	Breathing zone, continuously where indicated by VOC readings	> 0.25 ppm	Cease work, exit the area, and contact the Site Safety Lead, Site Supervisor, and Project Manager.
☐ **Hydrogen Sulfide** (multi-gas detector or individual H2S meter)	Breathing zone, continuously during tasks where exposure to hydrogen sulfide is possible	< 5 ppm	Continue work activities. Contact the Site Safety Lead to investigate the potential for contributing factors.

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		> 5 ppm	Cease work, exit the area or confined space, and contact the Site Safety Lead, Site Supervisor and Project Manager.
☐ **Flammable Gas** (multi-gas meter or individual combustible gas indicator, CGI)	Breathing zone or in the immediate work area continuously during tasks where explosive atmospheres are possible	> 5% of LEL	Cease work, exit, and contact the Site Safety Lead, Site Supervisor, and Project Manager.
☐ **Oxygen (O2)** (multi-gas detector or individual O2 meter)	Breathing zone, continuously during tasks were oxygen enriched or deficient atmospheres are possible	< 19.5 % O_2	Cease work (deficient atmosphere), exit the area or confined space, and contact the Site Safety Lead, Site Supervisor, and Project Manager.
		> 23.5 % O_2	Cease work (enriched atmosphere), exit the area or confined space, and contact the Site Safety Lead, Site Supervisor, and Project Manager.
☐ **Carbon Monoxide (CO)** (multi-gas detector or individual CO meter)	Breathing zone, continuously during tasks where exposure to CO is possible		
☒ **Dust not otherwise classified** (total by aerosol monitor)	Breathing zone every 30 minutes during field activities where exposure to excessive dusts are possible		
☒ **Dust not otherwise classified** (total by aerosol monitor)	Edge of Exclusion Zone, every 30 minutes during excavation activities		
☐ **Lead** (Cal OSHA 1532.1) Note: California Sites Only	Edge of Exclusion Zone, every 30 minutes during excavation activities		
☐ **Other:** Insert Information OR type N/A			
☐ **Facility Chemical Release**	Breathing zone within designated areas/buildings or site-wide, as appropriate for the facility/site	Chemical Release Detected	1. **STOP WORK** and immediately leave the area/building 2. Report to the designated muster location 3. Contact the Site Safety Lead, Site Supervisor and Project Manager 4. Wait for All-Clear to return to work area

Instrument Recordkeeping

Instrument readings collected for the purpose of monitoring or determining worker exposure will include the date, time, activity being performed, location, and result/reading. Results will be recorded at the following frequency:

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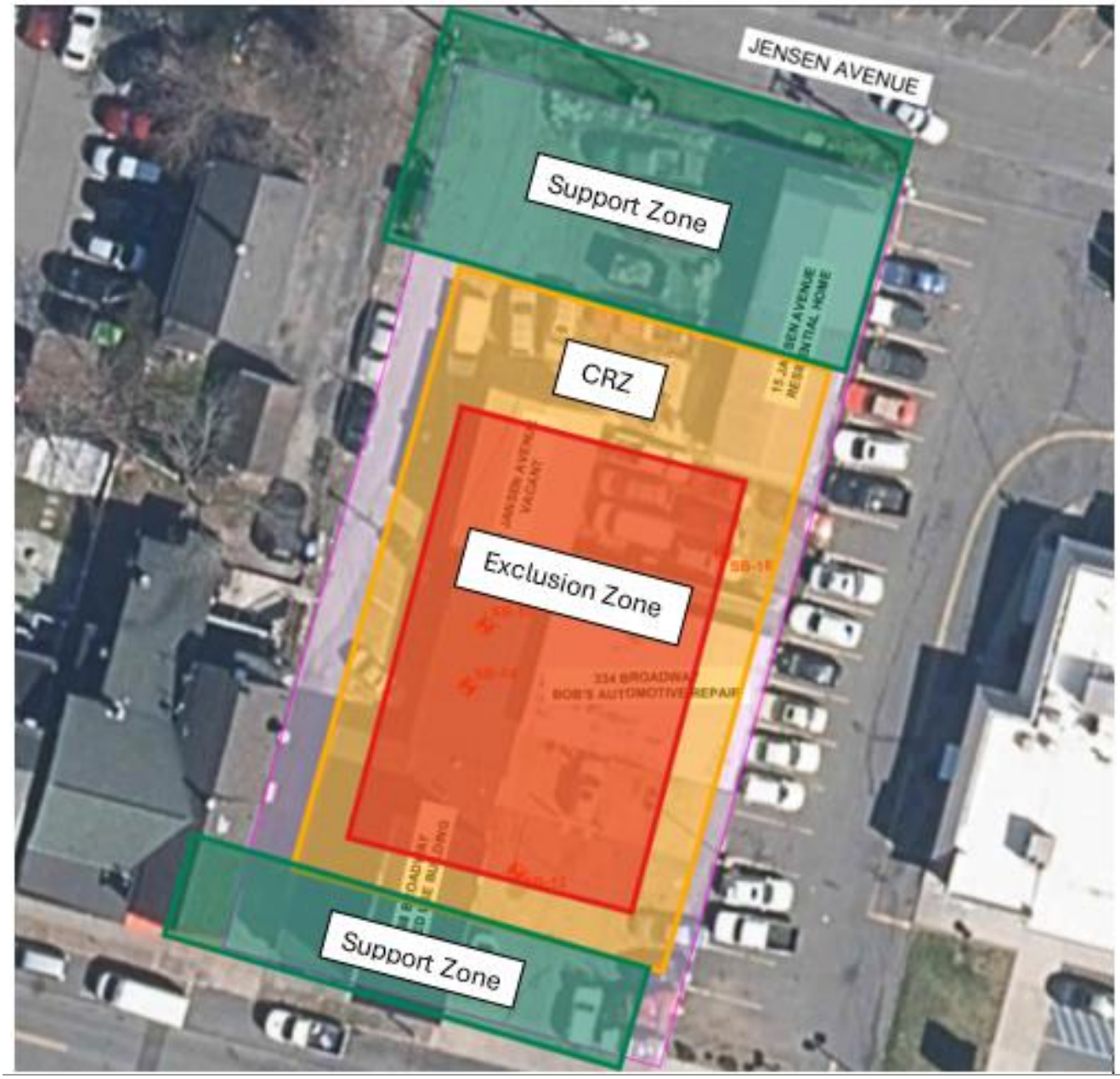
Decontamination

Contact with chemicals and/or contaminated/impacted materials while performing field activities may occur. All practical steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities. All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ). Decontamination procedures, solutions and equipment are summarized in the table(s) below.

Site Map and Controls



Personnel Decontamination

Procedure	Decontamination Solution	Equipment & Materials Needed

Remove disposable PPE	N/A	Container for used PPE
Wash hands after work and before eating, drinking, smoking, or touching unprotected skin.	Soap and Potable Water	Paper towels or sanitary wipes

Equipment Decontamination

Equipment Type	Decontamination Solution	Procedure
Larger equipment	Water Detergent Chemical cleaner	A high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to ensure proper decontamination.
Smaller equipment	Water Detergent Chemical cleaner	• Remove majority of visible gross contamination in EZ. • Wash equipment in decontamination solution with a scrub brush and/or power was heavy equipment. • Rinse equipment. Visually inspect for remaining contamination.

Waste Management

AECOM and AECOM subcontractor activities that generate waste on behalf of our client must be appropriately managed and disposed of in accordance with regulatory requirements. The following waste streams/products are anticipated to be generated by the project scope of work and be handling, management and disposed of as outlined in the table below.
DELETE THIS SECTION IF NO WASTE WILL BE GENERATED

Summary of Investigation and Site Activities Derived Waste

Waste Streams/Products	Handling and Disposal Procedures
Purge Water	Collected in 55-gallon metal drums, labeled appropriately and removed on a regular basis.
Solid Waste	Collected in 55-gallon metal drums, segregated (recyclable, non-flammable, and flammable) labeled appropriately and removed on a regular basis.

Medical Surveillance

Medical surveillance is required for employees who:

1. Are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
2. All employees who wear a respirator for 30 days or more a year.
3. All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and
4. Members of HAZMAT teams.

Based on potential exposures is supplemental medical surveillance appropriate?	☐ Yes (contact a SH&E Manager for assistance) X No N/A

The applicable SDSs are attached to this form below:

SAFETY DATA SHEET

Methyl Chloride (R40)

Section 1. Identification

GHS product identifier : Methyl Chloride (R40)

Chemical name : chloromethane

Other means of identification : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride); Monochloromethane; methyl chloride; R40; R 40; Methyl chloride (I,T); Methane, chloro- (I, T); Preparations containing methyl chloride; chloromethyl; Methane, chloro; Methyl chroride

Product type : Liquefied gas.

Product use : Synthetic/Analytical chemistry.

Synonym : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride); Monochloromethane; methyl chloride; R40; R 40; Methyl chloride (I,T); Methane, chloro- (I, T); Preparations containing methyl chloride; chloromethyl; Methane, chloro; Methyl chroride

SDS # : 001036

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253
Inside the US: 1-800-424-9300 (Chemtrec, 24 hours)
Outside the US: 1-703-527-3887 (Chemtrec, 24 hours)

24-hour telephone : Airgas Emergency Response Center 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
ACUTE TOXICITY (inhalation) - Category 4
CARCINOGENICITY - Category 2
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
Contains gas under pressure; may explode if heated.
Harmful if inhaled.
Suspected of causing cancer.
May cause damage to organs through prolonged or repeated exposure. (central nervous system (CNS))
May cause frostbite.
May displace oxygen and cause rapid suffocation.
May form explosive mixtures with air.

Precautionary statements

General :

Section 2. Hazards identification

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 : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves, protective clothing and eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Do not breathe gas.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. IF exposed or concerned: Get medical advice or attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor if you feel unwell.

Storage : Store locked up. Protect from sunlight. 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 : Liquid can cause burns similar to frostbite.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : chloromethane

Other means of identification : methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride); Monochloromethane; methyl chloride; R40; R 40; Methyl chloride (I,T); Methane, chloro- (I, T); Preparations containing methyl chloride; chloromethyl; Methane, chloro; Methyl chroride

Product code : 001036

CAS number/other identifiers

CAS number : 74-87-3

Ingredient name	%	CAS number
Methyl Chloride (R40)	100	74-87-3

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.

Inhalation : 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. Get medical attention. If necessary, call a poison center or physician. 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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Section 4. First aid measures

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. Continue to rinse for at least 10 minutes. Get medical attention. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. 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. As this product rapidly becomes a gas when released, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Liquid can cause burns similar to frostbite.

Inhalation : Harmful if inhaled.

Skin contact : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : Ingestion of liquid can cause burns similar to frostbite.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
frostbite

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
frostbite

Ingestion : Adverse symptoms may include the following:
frostbite

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

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.

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. The vapor/gas is heavier than air and will spread along the ground. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.

Section 5. Fire-fighting measures

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

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. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

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. Do not touch or walk through spilled material. 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. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. 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. Do not get in eyes or on skin or clothing. 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. 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. Do not breathe gas. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

Section 7. Handling and storage

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. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or 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
Methyl Chloride (R40)	**ACGIH TLV (United States, 1/2022).** **Absorbed through skin.** TWA: 50 ppm 8 hours. TWA: 103 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 207 mg/m³ 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** TWA: 50 ppm 8 hours. TWA: 105 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 210 mg/m³ 15 minutes. **OSHA PEL Z2 (United States, 2/2013).** TWA: 100 ppm 8 hours. CEIL: 200 ppm AMP: 300 ppm 5 minutes. **CAL OSHA PEL (United States, 5/2018).** STEL: 210 mg/m³ 15 minutes. STEL: 100 ppm 15 minutes. C: 300 ppm TWA: 105 mg/m³ 8 hours. TWA: 50 ppm 8 hours.

Biological exposure indices

No exposure indices known.

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

Section 8. Exposure controls/personal protection

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

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. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. 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.

Thermal hazards : If there is a risk of contact with the liquid, all protective equipment worn should be suitable for use with extremely low temperature materials.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Compressed gas.]

Color : Colorless.

Odor : Mild. Sweetish.

Odor threshold : Not available.

pH : Not applicable.

Melting point : -97°C (-142.6°F)

Boiling point : -23.7°C (-10.7°F)

Critical temperature : 143.65°C (290.6°F)

Flash point : Closed cup: 10°C (50°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: 8.1%
Upper: 17.4% [EU A.11]

Vapor pressure : 58.7 (psig)

Vapor density : 1.8 (Air = 1)

Specific Volume (ft ^{3}/lb) : 1.0977

Gas Density (lb/ft ^{3}) : 0.911 (25°C / 77 to °F)

Relative density : Not applicable.

Section 9. Physical and chemical properties

Solubility in water : 5.32 g/l [OECD 105]

Partition coefficient: n-octanol/water : 0.91

Auto-ignition temperature : 632°C (1169.6°F) [EU A.15]

Decomposition temperature : Not available.

Flow time (ISO 2431) : Not available.

Molecular weight : 50.49 g/mole

Aerosol product

Heat of combustion : -12304540 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. Do not allow gas to accumulate in low or confined areas.

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
Methyl Chloride	LC50 Inhalation Gas. LC50 Inhalation Vapor LD50 Oral	Rat Rat Rat	8300 ppm 5300 mg/m³ 1800 mg/kg	4 hours 4 hours -

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
Methyl Chloride	-	3	-

Section 11. Toxicological information

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
Methyl Chloride	Category 2	-	central nervous system (CNS)

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Liquid can cause burns similar to frostbite.

Inhalation : Harmful if inhaled.

Skin contact : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

Ingestion : Ingestion of liquid can cause burns similar to frostbite.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following: frostbite

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following: frostbite

Ingestion : Adverse symptoms may include the following: frostbite

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 : May cause damage to organs through prolonged or repeated exposure.

Carcinogenicity : Suspected of causing cancer. Risk of cancer depends on duration and level of exposure.

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.

Section 11. Toxicological information

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (gases) Inhalation (vapors)	8300 ppm 11 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Methyl Chloride	Acute LC50 270 ppm Marine water	Fish - *Menidia beryllina*	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Methyl Chloride	0.91	-	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 pressure vessels should be returned to the supplier. 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.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Methyl chloride (I,T)	74-87-3	Listed	U045

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1063	UN1063	UN1063	UN1063	UN1063
UN proper shipping name	METHYL CHLORIDE, OR REFRIGERANT GAS R 40	METHYL CHLORIDE, OR REFRIGERANT GAS R 40	METHYL CHLORIDE, OR REFRIGERANT GAS R 40	METHYL CHLORIDE, OR REFRIGERANT GAS R 40	METHYL CHLORIDE, OR REFRIGERANT GAS R 40
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 : **Reportable quantity** 100 lbs / 45.4 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 Exceptions: 306. Non-bulk: 304. Bulk: 314, 315.
Quantity limitation Passenger aircraft/rail: 5 kg. Cargo aircraft: 100 kg.
Special provisions N86, 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 Vessel Index Forbidden
Passenger Carrying Road or Rail Index 5

IMDG : **Emergency schedules** F-D, S-U

IATA : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Packaging instructions: Forbidden. Cargo Aircraft Only: 100 kg. Packaging instructions: 200. Limited Quantities - Passenger Aircraft: Forbidden. Packaging instructions: Forbidden.
Special provisions A1

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 IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations :

TSCA 8(a) CDR Exempt/Partial exemption: Not determined

Clean Water Act (CWA) 307: chloromethane

Clean Air Act (CAA) 112 regulated toxic substances: chloromethane

Section 15. Regulatory information

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : 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.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	chloromethane	74-87-3	100
Supplier notification	chloromethane	74-87-3	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.

California Prop. 65

⚠ **WARNING**: This product can expose you to Methyl chloride, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Methyl chloride	-	-

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

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

Section 15. Regulatory information

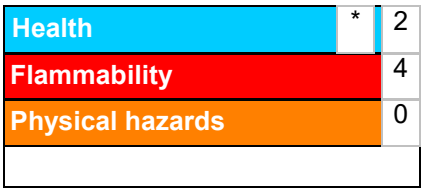
Not listed.

Inventory list

Australia	:	This material is listed or exempted.
Canada	:	This material is listed or exempted.
China	:	This material is listed or exempted.
Eurasian Economic Union	:	**Russian Federation inventory**: This material is listed or exempted.
Japan	:	**Japan inventory (CSCL)**: This material is listed or exempted. **Japan inventory (ISHL)**: 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.
Thailand	:	This material is listed or exempted.
Turkey	:	Not determined.
United States	:	This material is active or exempted.
Viet Nam	:	This material is listed or exempted.

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.)

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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

Section 16. Other information

Classification	Justification
FLAMMABLE GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment
ACUTE TOXICITY (inhalation) - Category 4	On basis of test data
CARCINOGENICITY - Category 2	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Expert judgment

History

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Date of issue/Date of revision : 2/26/2025

Date of previous issue : 12/19/2022

Version : 0.03

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 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.

SAFETY DATA SHEET

Nonflammable Gas Mixture: 1,1-Dichloroethylene / 1,2-Dichloroethane / Carbon Tetrachloride / Cis-1,2-Dichloroethylene / Nitrogen / Perchloroethylene / Trans-1, 2-Dichloroethylene

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier : Nonflammable Gas Mixture: 1,1-Dichloroethylene / 1,2-Dichloroethane / Carbon Tetrachloride / Cis-1,2-Dichloroethylene / Nitrogen / Perchloroethylene / Trans-1, 2-Dichloroethylene

Other means of identification : Not available.

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

SDS # : 024561

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

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : 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.

Prevention : Not applicable.

Response : Not applicable.

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 : Mixture

Other means of identification : Not available.

Product code : 024561

Ingredient name	%	CAS number
Nitrogen	99	7727-37-9
1,1-dichloroethylene	0.0001 - 0.0999	75-35-4
cis-dichloroethylene	0.0001 - 0.0999	156-59-2
trans-dichloroethylene	0.0001 - 0.0999	156-60-5
1,2-dichloroethane	0.0001 - 0.0999	107-06-2
carbon tetrachloride	0.0001 - 0.0999	56-23-5
tetrachloroethylene	0.0001 - 0.0999	127-18-4

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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. 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 : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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 : 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

Section 4. First aid measures

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

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. 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:
nitrogen oxides

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. 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.

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. Avoid breathing gas. 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.

Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous.

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). 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
Nitrogen	**ACGIH TLV (United States, 3/2017). Oxygen Depletion [Asphyxiant].**
1,1-dichloroethylene	**ACGIH TLV (United States, 3/2017).** TWA: 5 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 4 mg/m³ 8 hours. TWA: 1 ppm 8 hours.
cis-dichloroethylene	**ACGIH TLV (United States, 3/2017).** TWA: 200 ppm 8 hours. TWA: 793 mg/m³ 8 hours.
trans-dichloroethylene	**ACGIH TLV (United States, 3/2017).** TWA: 200 ppm 8 hours. TWA: 793 mg/m³ 8 hours.
1,2-dichloroethane	**ACGIH TLV (United States, 3/2017).** TWA: 40 mg/m³ 8 hours. TWA: 10 ppm 8 hours. **NIOSH REL (United States, 10/2016).** STEL: 8 mg/m³ 15 minutes. STEL: 2 ppm 15 minutes. TWA: 4 mg/m³ 10 hours. TWA: 1 ppm 10 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 8 mg/m³ 15 minutes. STEL: 2 ppm 15 minutes. TWA: 4 mg/m³ 8 hours. TWA: 1 ppm 8 hours. **OSHA PEL Z2 (United States, 2/2013).** AMP: 200 ppm 5 minutes. CEIL: 100 ppm TWA: 50 ppm 8 hours.
carbon tetrachloride	**ACGIH TLV (United States, 3/2017).** **Absorbed through skin.**

Section 8. Exposure controls/personal protection

	TWA: 5 ppm 8 hours. TWA: 31 mg/m³ 8 hours. STEL: 10 ppm 15 minutes. STEL: 63 mg/m³ 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** TWA: 2 ppm 8 hours. TWA: 12.6 mg/m³ 8 hours. **OSHA PEL Z2 (United States, 2/2013).** TWA: 10 ppm 8 hours. CEIL: 25 ppm AMP: 200 ppm 5 minutes. **NIOSH REL (United States, 10/2016).** STEL: 2 ppm 60 minutes. STEL: 12.6 mg/m³ 60 minutes.
tetrachloroethylene	**ACGIH TLV (United States, 3/2017).** STEL: 685 mg/m³ 15 minutes. STEL: 100 ppm 15 minutes. TWA: 170 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** TWA: 170 mg/m³ 8 hours. TWA: 25 ppm 8 hours. **OSHA PEL Z2 (United States, 2/2013).** AMP: 300 ppm 5 minutes. CEIL: 200 ppm TWA: 100 ppm 8 hours.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

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

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.

Section 8. Exposure controls/personal protection

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.

Color : Not available.

Odor : Not available.

Odor threshold : Not available.

pH : Not available.

Melting point : -210.01°C (-346°F) This is based on data for the following ingredient: nitrogen.

Boiling point : Not available.

Critical temperature : Lowest known value: -146.95°C (-232.5°F) (nitrogen).

Flash point : Not available.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : Highest known value: 0.97 (Air = 1) (nitrogen).

Gas Density (lb/ft ^{3}) : Only known value: 0.072 (nitrogen).

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

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.

Section 10. Stability and reactivity

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
1,1-dichloroethylene	LC50 Inhalation Gas.	Rat	12700 ppm	1 hours
	LC50 Inhalation Gas.	Rat	6350 ppm	4 hours
	LD50 Oral	Rat	200 mg/kg	-
trans-dichloroethylene	LC50 Inhalation Gas.	Rat	24100 ppm	4 hours
	LD50 Dermal	Rabbit	>5 g/kg	-
	LD50 Oral	Rat	1235 mg/kg	-
1,2-dichloroethane	LC50 Inhalation Gas.	Rat	2646 ppm	1 hours
carbon tetrachloride	LC50 Inhalation Gas.	Rat	8000 ppm	4 hours
	LD50 Dermal	Rabbit	>20 g/kg	-
	LD50 Dermal	Rat	5070 mg/kg	-
	LD50 Oral	Rat	2350 mg/kg	-
tetrachloroethylene	LC50 Inhalation Vapor	Rat	14255 ppm	1 hours
	LD50 Oral	Rat	2629 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
trans-dichloroethylene	Eyes - Moderate irritant	Rabbit	-	10 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
1,2-dichloroethane	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Eyes - Severe irritant	Rabbit	-	63 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	625 milligrams	-
carbon tetrachloride	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Eyes - Mild irritant	Rabbit	-	0.5 minutes 2200 Micrograms	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	4 milligrams	-
tetrachloroethylene	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Eyes - Mild irritant	Rabbit	-	162 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Severe irritant	Rabbit	-	24 hours 810 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Section 11. Toxicological information

Classification

Product/ingredient name	OSHA	IARC	NTP
1,1-dichloroethylene	-	2B	-
1,2-dichloroethane	-	2B	Reasonably anticipated to be a human carcinogen.
carbon tetrachloride	-	2B	Reasonably anticipated to be a human carcinogen.
tetrachloroethylene	-	2A	Reasonably anticipated to be a human carcinogen.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
1,2-dichloroethane	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
carbon tetrachloride	Category 1	Not determined	Not determined

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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 : 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.

Section 11. Toxicological information

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

Product/ingredient name	Result	Species	Exposure
1,1-dichloroethylene	Acute EC50 9.12 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours
	Acute EC50 410000 µg/l Fresh water	Algae - Scenedesmus abundans	96 hours
	Acute LC50 >798 ppm Marine water	Crustaceans - Americamysis bahia	48 hours
	Acute LC50 11600 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 74 mg/l Fresh water	Fish - Lepomis macrochirus - Young of the year	96 hours
	Chronic EC10 3.94 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours
trans-dichloroethylene	Acute LC50 220000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
1,2-dichloroethane	Acute EC50 189 ppm Fresh water	Algae - Scenedesmus subspicatus	72 hours
	Acute EC50 155 mg/l Fresh water	Daphnia - Daphnia magna - Instar	48 hours
	Acute LC50 110 ppm Marine water	Crustaceans - Americamysis bahia	48 hours
	Acute LC50 115 mg/l Marine water	Fish - Pleuronectiformes	96 hours
	Chronic NOEC 29000 µg/l Fresh water	Fish - Pimephales promelas - Larvae	32 days
carbon tetrachloride	Acute EC50 0.246 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours
	Acute EC50 180.54 mg/l Fresh water	Crustaceans - Cypris subglobosa	48 hours
	Acute LC50 35000 µg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 10400 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic EC10 0.0717 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours
tetrachloroethylene	Acute EC50 504 ppm Marine water	Algae - Skeletonema costatum	96 hours
	Acute EC50 3.64 mg/l Fresh water	Algae - Chlamydomonas reinhardtii - Exponential growth phase	72 hours
	Acute EC50 7.49 mg/l Fresh water	Daphnia - Daphnia magna - Instar	48 hours
	Acute LC50 3.5 mg/l Marine water	Crustaceans - Elminius modestus	48 hours
	Acute LC50 4000 µg/l Fresh water	Fish - Jordanella floridae - Juvenile (Fledgling, Hatchling, Weanling)	96 hours
	Chronic NOEC 0.01 mg/l Fresh water	Algae - Pseudokirchneriella subcapitata - Exponential growth phase	72 hours

Section 12. Ecological information

	Chronic NOEC 0.4 mg/l Fresh water Chronic NOEC 500 µg/l Fresh water	Daphnia - Daphnia magna Fish - Pimephales promelas - Larvae	21 days 32 days

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Nitrogen	0.67	-	low
1,1-dichloroethylene	2.13	12.88	low
cis-dichloroethylene	1.86	-	low
trans-dichloroethylene	2.09	-	low
1,2-dichloroethane	1.45	2	low
carbon tetrachloride	2.83	49.9 to 75.1	low
tetrachloroethylene	2.53	49	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

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1956	UN1956	UN1956	UN1956	UN1956
UN proper shipping name	COMPRESSED GAS, N.O.S. (nitrogen, 1, 1-dichloroethylene)	COMPRESSED GAS, N.O.S. (nitrogen, 1, 1-dichloroethylene)	COMPRESSED GAS, N.O.S. (nitrogen, 1, 1-dichloroethylene)	COMPRESSED GAS, N.O.S. (nitrogen, 1, 1-dichloroethylene)	COMPRESSED GAS, N.O.S. (nitrogen, 1, 1-dichloroethylene)
Transport hazard class(es)	2.2	2.2	2.2	2.2	2.2
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

Section 14. Transport information

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : **Reportable quantity** 10010 lbs / 4544.5 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

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
Passenger Carrying Road or Rail Index 75

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 4(a) final test rules**: 1,2-dichloroethane

TSCA 8(a) PAIR: 1,1-dichloroethylene; 1,2-dichloroethane

TSCA 8(a) CDR Exempt/Partial exemption: Not determined

Clean Water Act (CWA) 307: 1,1-dichloroethylene; cis-dichloroethylene; trans-dichloroethylene; 1,2-dichloroethane; carbon tetrachloride; tetrachloroethylene

Clean Water Act (CWA) 311: 1,1-dichloroethylene; 1,2-dichloroethane; carbon tetrachloride

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : 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 : The following components are listed: NITROGEN; NITROGEN (LIQUIFIED)

New York : None of the components are listed.

New Jersey : The following components are listed: NITROGEN

Pennsylvania : The following components are listed: NITROGEN

Section 15. Regulatory information

California Prop. 65

⚠ **WARNING**: This product can expose you to chemicals including Vinylidene chloride, Ethylene dichloride, Carbon tetrachloride, Tetrachloroethylene, which are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Vinylidene chloride	-	-
Ethylene dichloride	Yes.	-
Carbon tetrachloride	Yes.	-
Tetrachloroethylene	Yes.	-

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 : All components are listed or exempted.

Canada : At least one component is not listed in DSL but all such components are listed in NDSL.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : **Japan inventory (ENCS)**: Not determined.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : All components are listed or exempted.

Philippines : Not determined.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Thailand : Not determined.

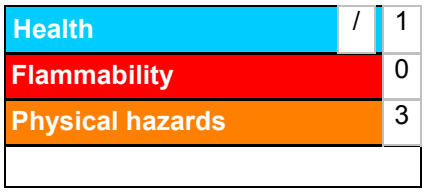
Turkey : Not determined.

United States : All components are listed or exempted.

Viet Nam : Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Section 16. Other information

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.)

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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
GASES UNDER PRESSURE - Compressed gas	On basis of test data

History

Date of printing : 12/26/2018

Date of issue/Date of revision : 12/26/2018

Date of previous issue : No previous validation

Version : 1

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 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Other special considerations : WARNING: Contains, CARBON TETRACHLORIDE, a substance that harms public health and environment by destroying ozone in the upper atmosphere.

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

Version 6.13
Revision Date 11/06/2025
Print Date 05/15/2026

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Zinc

Product Number : 96454
Brand : Sigma-Aldrich
CAS-No. : 7440-66-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

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 number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

Combustible dust

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Short-term (acute) aquatic hazard : Category 1

Long-term (chronic) aquatic hazard : Category 1

Other hazards

Combustible dust
May form explosible dust-air mixture if dispersed.

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : May form combustible dust concentrations in air.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P273 Avoid release to the environment.

Response:

P391 Collect spillage.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

CAS-No. : 7440-66-6

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
zinc powder, zinc dust stabilized	7440-66-6*	>= 90 - <= 100	-
Zinc oxide	1314-13-2*	>= 1 - < 5	-

* Indicates that the identifier is a CAS No.
Actual concentration is withheld as a trade secret

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SECTION 4. FIRST AID MEASURES

If inhaled	:	After inhalation: fresh air.
In case of skin contact	:	In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.
In case of eye contact	:	After eye contact: rinse out with plenty of water. Remove contact lenses.
If swallowed	:	After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.
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
Protection of first-aiders	:	For personal protection see section 8.
Notes to physician	:	No data available

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Special powder against metal fire Sand Cement Water Foam Carbon dioxide (CO2) Dry powder
Unsuitable extinguishing media	:	Water Foam For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Combustible. Risk of dust explosion. Development of hazardous combustion gases or

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vapours possible in the event of fire.

Hazardous combustion products	:	Zinc/zinc oxides
Specific extinguishing methods	:	No data available
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-fighters	:	In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Advice for non-emergency personnel: Avoid inhalation of dusts. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	:	Do not let product enter drains.
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 dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on protection against fire and explosion	:	Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.
Further information on storage conditions	:	Tightly closed. Dry.
Storage class	:	11, Combustible Solids

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Recommended storage temperature : Recommended storage temperature see product label.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Zinc oxide	1314-13-2	TWA (Respirable particulate matter)	2 mg/m3	ACGIH
		STEL (Respirable particulate matter)	10 mg/m3	ACGIH
		TWA (Dust)	5 mg/m3	NIOSH REL
		TWA (Fumes)	5 mg/m3	NIOSH REL
		ST (Fumes)	10 mg/m3	NIOSH REL
		C (Dust)	15 mg/m3	NIOSH REL
		TWA (Fumes)	5 mg/m3	OSHA Z-1
		TWA (total dust)	15 mg/m3	OSHA Z-1
		TWA (respirable fraction)	5 mg/m3	OSHA Z-1

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when dusts 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.

Recommended Filter type: : Filter type P1

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

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Hand protection

Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0.11 mm
Protective index	:	Full contact
Manufacturer	:	Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0.11 mm
Protective index	:	Splash contact
Manufacturer	:	Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Manufacturer	:	data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

Remarks	:	Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Eye protection	:	Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Hygiene measures	:	Change contaminated clothing. Wash hands after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	powder

Color	:	grey

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Odor	:	odourless
Odor Threshold	:	No data available
pH	:	Not applicable
Melting point/ range	:	788 °F / 420 °C Method: lit.
Boiling point/boiling range	:	1665 °F / 907 °C Method: lit.
Flash point	:	Not applicable
Evaporation rate	:	No data available
Flammability (solid, gas)	:	May form combustible dust concentrations in air.
Flammability (liquids)	:	No data available
Burning rate	:	No data available
Self-ignition	:	does not ignite
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower flammability limit	:	No data available
Vapor pressure	:	Not applicable
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	7.133 g/mL (77 °F / 25 °C) Method: lit.
Bulk density	:	1.8 - 3.2 kg/m3
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Not applicable
Autoignition temperature	:	No data available
Decomposition temperature	:	No data available

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Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	During processing, dust may form explosive mixture in air.
Oxidizing properties	:	No data available
Molecular weight	:	65.39 g/mol
Particle characteristics Particle size	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	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.
Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) .
Possibility of hazardous reactions	:	Dust may form explosive mixture in air.
Conditions to avoid	:	no information available
Incompatible materials	:	Strong oxidizing agents Acids and bases
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 - 2,500 mg/kg
(Calculation method)
Acute toxicity estimate Inhalation - 4 h - 5.36 mg/l - dust/mist(Calculation method)

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Acute toxicity estimate Dermal - > 5,000 mg/kg
(Calculation method)

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component 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 component 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
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: ZG8600000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

zinc powder, zinc dust stabilized:

Toxicity to fish	:	LC50 (other fish): 0.439 mg/l End point: mortality Exposure time: 96 h Test Type: flow-through test Analytical monitoring: yes Remarks: (ECHA)

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Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Ceriodaphnia dubia (water flea)): 0.155 mg/l End point: Immobilization Exposure time: 48 h Test Type: static test Analytical monitoring: yes Method: US-EPA
Toxicity to algae/aquatic plants	:	NOEC (Pseudokirchneriella subcapitata (green algae)): 0.05 mg/l Exposure time: 3 d Test Type: static test Analytical monitoring: yes Method: OECD Test Guideline 201 GLP: yes
M-Factor (Acute aquatic toxicity)	:	1
Toxicity to fish (Chronic toxicity)	:	NOEC (other fish): 0.169 mg/l End point: mortality Exposure time: 30 d Test Type: flow-through test Analytical monitoring: yes Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC (Daphnia magna (Water flea)): 0.100 mg/l End point: reproduction rate Exposure time: 3 Weeks Test Type: semi-static test Analytical monitoring: yes Remarks: (ECHA)
M-Factor (Chronic aquatic toxicity)	:	1
Toxicity to microorganisms	:	NOEC (activated sludge): 0.1 mg/l Exposure time: 4 h Test Type: static test Method: ISO 9509 Remarks: (in analogy to similar products)

Zinc oxide:

Toxicity to fish	:	LC50 (Danio rerio (zebra fish)): 2.525 mg/l End point: mortality Exposure time: 96 h Test Type: semi-static test Analytical monitoring: yes Remarks: (ECHA)
Toxicity to daphnia and other aquatic	:	EC50 (Daphnia magna (Water flea)): 1 mg/l End point: Immobilization

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invertebrates		Exposure time: 48 h Test Type: static test Analytical monitoring: yes Method: OECD Test Guideline 202
Toxicity to algae/aquatic plants	:	NOEC (Pseudokirchneriella subcapitata (microalgae)): 0.024 mg/l Exposure time: 72 h Test Type: static test Analytical monitoring: yes Method: OECD Test Guideline 201 GLP: yes
M-Factor (Acute aquatic toxicity)	:	1
Toxicity to fish (Chronic toxicity)	:	NOEC (Oncorhynchus mykiss (rainbow trout)): 0.2 mg/l End point: mortality Exposure time: 30 d Test Type: flow-through test Analytical monitoring: yes Method: OECD Test Guideline 215 Remarks: (in analogy to similar products) The value is given in analogy to the following substances: zinc chloride
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	EC50 (Daphnia magna (Water flea)): 0.08 mg/l End point: reproduction rate Exposure time: 21 d Test Type: semi-static test Analytical monitoring: yes Method: OECD Test Guideline 211
M-Factor (Chronic aquatic toxicity)	:	1
Toxicity to microorganisms	:	EC50 (activated sludge): > 1,000 mg/l Exposure time: 3 h Test Type: static test Method: OECD Test Guideline 209 GLP: yes

Persistence and degradability

Components:

zinc powder, zinc dust stabilized:

Biodegradability	:	Remarks: The methods for determining the biological degradability are not applicable to inorganic substances.

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Zinc oxide:

Biodegradability : Remarks: The methods for determining the biological degradability are not applicable to inorganic substances.

Bioaccumulative potential

Components:

zinc powder, zinc dust stabilized:

Bioaccumulation : Remarks: Not persistent, bioaccumulative, and toxic (PBT).

Partition coefficient: n-octanol/water : Remarks: Not applicable for inorganic substances

Zinc oxide:

Partition coefficient: n-octanol/water : Remarks: Not applicable for inorganic substances

Mobility in soil

No data available

Other adverse effects

Product:

Ozone-Depletion Potential : Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances
Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : 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.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No. : UN 3077

Proper shipping name : Environmentally hazardous substance, solid, n.o.s.

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(zinc powder, zinc dust stabilized)

Class	:	9
Packing group	:	III
Labels	:	Class 9 - Miscellaneous dangerous substances and articles
Packing instruction (cargo aircraft)	:	956
Packing instruction (passenger aircraft)	:	956

IMDG-Code

UN number	:	UN 3077
Proper shipping name	:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (zinc powder, zinc dust stabilized)
Class	:	9
Packing group	:	III
Labels	:	9
EmS Code	:	F-A, S-F
Marine pollutant	:	yes

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR Road

UN/ID/NA number	:	UN 3077
Proper shipping name	:	Environmentally hazardous substance, solid, n.o.s. (zinc powder, zinc dust stabilized)
Class	:	9
Packing group	:	III
Labels	:	Class 9 - Miscellaneous dangerous substances and articles
ERG Code	:	171
Marine pollutant	:	no
Poison Inhalation Hazard	:	No

Special precautions for user

Remarks	:	EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

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Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
zinc powder, zinc dust stabilized	7440-66-6	1000	1020

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : No SARA Hazards

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

zinc powder, zinc dust stabilized	7440-66-6	>= 90 - <= 100 %
Zinc oxide	1314-13-2	>= 1 - < 5 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489).

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.
This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.
This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

zinc powder, zinc dust stabilized	7440-66-6	>= 90 - <= 100 %
Zinc oxide	1314-13-2	>= 1 - < 5 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

zinc powder, zinc dust stabilized	7440-66-6	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

zinc powder, zinc dust stabilized	7440-66-6
Zinc oxide	1314-13-2

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Pennsylvania Right To Know

zinc powder, zinc dust stabilized	7440-66-6
Zinc oxide	1314-13-2

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

The components of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

The following substance(s) is/are subject to TSCA 12(b) export notification requirements:
zinc powder, zinc dust stabilized 7440-66-6

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
NIOSH REL	:	USA. NIOSH Recommended Exposure Limits
OSHA Z-1	:	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
ACGIH / TWA	:	8-hour, time-weighted average
ACGIH / STEL	:	Short-term exposure limit
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek
NIOSH REL / ST	:	STEL - 15-minute TWA exposure that should not be exceeded at any time during a workday
NIOSH REL / C	:	Ceiling value not be exceeded at any time.
OSHA Z-1 / TWA	:	8-hour time weighted average

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory

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concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. 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.
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Revision Date : 11/06/2025

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US / EN

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• SAFETY DATA SHEET

Version 8.12
Revision Date 12/24/2025
Print Date 12/25/2025

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Trichloroethylene

Product Number : 133124
Brand : Aldrich
Index-No. : 602-027-00-9
CAS-No. : 79-01-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : After June 16, 2025, this chemical/product is and can only be domestically manufactured, imported, processed, or distributed in commerce for the following purposes until the following prohibitions take effect: (1) Processing as an intermediate a) for the manufacture of HFC–134a until June 18, 2033, and b) for all other processing as a reactant/intermediate until December 18, 2026; (2) Industrial and commercial use as a solvent for open-top batch vapor degreasing until December 18, 2025; (3) Industrial and commercial use as a solvent for closed-loop batch vapor degreasing until December 18, 2025, except for industrial and commercial use in batch vapor degreasing for land-based DoD defense systems by Federal agencies and their contractors until December 18, 2029, and except for industrial and commercial use as a solvent for closed-loop batch vapor degreasing necessary for rocket engine cleaning by Federal agencies and their contractors until December 18, 2031, and except for industrial and commercial use of TCE in closed-loop and open-top batch vapor degreasing for essential aerospace parts and components and narrow tubing used in medical devices until December 18, 2031, and except for industrial and commercial use as a solvent for closed-loop batch vapor degreasing for rayon fabric scouring for end use in rocket booster nozzle production by Federal agencies and their contractors until December 18, 2034; (4) Industrial and commercial use in processing aid (a) for lithium battery separator manufacturing until December 18, 2029, and (b) for lead-acid battery separator manufacturing until December 18, 2044, and (c) for specialty polymeric microporous sheet

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material manufacturing until December 18, 2039, and (d) in process solvent used in battery manufacture; in process solvent used in polymer fiber spinning, fluoroelastomer manufacture and Alcantara manufacture; in extraction solvent used in caprolactam manufacture; and in precipitant used in beta-cyclodextrin manufacture until December 18, 2026; (5) Industrial and commercial uses for vessels of the Armed Forces and their systems, and in the maintenance, fabrication, and sustainment for and of such vessels and systems until December 18, 2034; and (6) Industrial and commercial use for laboratory use (a) for essential laboratory activities until December 18, 2074 and (b) for asphalt testing and recovery using manual centrifuge processes until December 18, 2029 and for asphalt testing and recovery until December 18, 2034.

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 number

Emergency Phone #	:	800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

Skin irritation	:	Category 2
Eye irritation	:	Category 2A
Skin sensitisation	:	Sub-category 1B
Germ cell mutagenicity	:	Category 2
Carcinogenicity	:	Category 1B
Specific target organ toxicity - single exposure	:	Category 3 (Central nervous system)
Short-term (acute) aquatic hazard	:	Category 3
Long-term (chronic)	:	Category 3

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aquatic hazard

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.
H341 Suspected of causing genetic defects.
H350 May cause cancer.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing mist or vapours.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P272 Contaminated work clothing must not be allowed out of the workplace.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.

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Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

CAS-No. : 79-01-6

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
trichloroethylene	79-01-6*	>= 90 - <= 100	-

* Indicates that the identifier is a CAS No.
Actual concentration is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

General advice : Show this safety data sheet to the doctor in attendance.

If inhaled : After inhalation: fresh air. Call in physician.

In case of skin contact : In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact : After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed : After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

Protection of first-aiders : For personal protection see section 8.

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Notes to physician	:	No data available

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Not combustible. Ambient fire may liberate hazardous vapours.
Hazardous combustion products	:	Carbon oxides Hydrogen chloride gas
Specific extinguishing methods	:	No data available
Further information	:	Suppress (knock down) gases/vapours/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-fighters	:	Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Advice for non-emergency personnel: Do not breathe vapours, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.

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Environmental precautions	:	Do not let product enter drains.
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 with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on safe handling	:	Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.
Further information on storage conditions	:	Tightly closed. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorised persons.
Storage class	:	6.1D, Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects
Recommended storage temperature	:	Recommended storage temperature see product label.
Further information on storage stability	:	Light sensitive. Handle and store under inert gas.
Packaging material	:	Suitable material: Any Metal Drum

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
trichloroethylene	79-01-6	TWA	10 ppm	ACGIH
		STEL	25 ppm	ACGIH
		TWA	100 ppm	OSHA Z-2
		CEIL	200 ppm	OSHA Z-2
		Peak	300 ppm (5 mins. in any 2 hrs.)	OSHA Z-2
		TWA	50 ppm	OSHA P0

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			270 mg/m3	
		STEL	200 ppm 1,080 mg/m3	OSHA P0
		ECEL-TWA (Inhalation exposure)	0.2 ppm 1.07 mg/m3	TSCA ECEL

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
trichloroethylene	79-01-6	Trichloroacetic acid	Urine	End of shift at end of workweek	15 mg/l	ACGIH BEI
		Trichloroethanol	In blood	End of shift at end of workweek	0.5 mg/l	ACGIH BEI

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when 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.

Recommended Filter type: : Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Hand protection

Material	:	Viton®
Break through time	:	480 min
Glove thickness	:	0.7 mm
Protective index	:	Full contact
Manufacturer	:	Vitoject® (KCL 890 / Aldrich Z677698, Size M)
Material	:	Nitrile rubber

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Break through time	:	10 min
Glove thickness	:	0.4 mm
Protective index	:	Splash contact
Manufacturer	:	Camatril® (KCL 730 / Aldrich Z677442, Size M)
Remarks	:	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 EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Eye protection	:	Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses
Skin and body protection	:	protective clothing
Hygiene measures	:	Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid (68 °F / 20 °C, 1,013 hPa)
Color	:	colourless
Odor	:	characteristic
Odor Threshold	:	28 ppm
pH	:	No data available
Melting point/ range	:	-120.6 °F / -84.8 °C Method: lit.
Boiling point/boiling range	:	188.1 °F / 86.7 °C Method: lit.
Flash point	:	Method: closed cup, closed cup does not flash
Evaporation rate	:	No data available

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Flammability (solid, gas)	:	No data available
Flammability (liquids)	:	The product is not flammable.
Burning rate	:	No data available
Self-ignition	:	770.0 °F / 410.0 °C
Upper explosion limit / Upper flammability limit	:	Upper explosion limit > 99 %(V) (Saturation - at high volume fractions, explosion turns into a decomposition reaction)
Lower explosion limit / Lower flammability limit	:	Lower explosion limit 7.9 %(V)
Vapor pressure	:	81.3 hPa (68.0 °F / 20.0 °C)
Relative vapour density	:	No data available
Relative density	:	1.46 (68 °F / 20 °C)
Density	:	1.463 g/mL (77 °F / 25 °C) Method: lit.
Solubility(ies)		
Water solubility	:	1.1 g/l (68 °F / 20 °C) pH: 7
Partition coefficient: n-octanol/water	:	log Pow: 2.53 (68 °F / 20 °C) pH: 7 Bioaccumulation is not expected.
Autoignition temperature	:	770 °F / 410 °C (ca. 1,013 hPa)
Decomposition temperature	:	No data available
Viscosity		
Viscosity, dynamic	:	0.58 mPa.s (68 °F / 20 °C)
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	Not classified as explosive.
Oxidizing properties	:	none
Molecular weight	:	131.39 g/mol

Particle characteristics

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Particle size	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No data available
Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) .
Possibility of hazardous reactions	:	Violent reactions possible with: Oxygen (as liquefied gas) Alkaline earth metals alkali amides semimetallic hydrogen compounds perchloric acid Light metals aluminium chloride Strong oxidizing agents potassium nitrate Risk of explosion with: Alkali metals Aluminium Barium alkali hydroxides Lithium magnesium Powdered metals sodium amide Strong oxidizing agents nitrogen dioxide Boranes Oxygen with alkali hydroxides Oxygen with Pressure Risk of ignition or formation of inflammable gases or vapours with: Titanium Beryllium Epoxy constituents
Conditions to avoid	:	no information available
Incompatible materials	:	No data available
Hazardous decomposition products	:	In the event of fire: see section 5

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SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
LC50 Inhalation - Rat - male - 4 h - 67.41 mg/l

Remarks: (ECHA)
LD50 Dermal - Rabbit - > 20,000 mg/kg
Remarks: (RTECS)

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
Remarks: Drying-out effect resulting in rough and chapped skin.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h
Remarks: (RTECS)
Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: positive
(OECD Test Guideline 429)

Germ cell mutagenicity
Suspected of causing genetic defects.
Test Type: Ames test
Test system: S. typhimurium
Metabolic activation: Metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Result: negative
Remarks: (ECHA)

Test Type: in vivo assay
Species: Mouse

Result: negative

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Remarks: (ECHA)

Carcinogenicity
Presumed to have carcinogenic potential for humans

IARC: 1 - Group 1: Carcinogenic to humans (trichloroethylene)

NTP: Known - Known to be human carcinogen (trichloroethylene)

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
May cause drowsiness or dizziness. - Central nervous system
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., Gastrointestinal disturbance, Kidney injury may occur., narcosis
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

trichloroethylene:

Toxicity to fish	:	LC50 (Jordanella floridae): 28.3 mg/l End point: mortality Exposure time: 96 h Test Type: flow-through test Analytical monitoring: yes Method: US-EPA
Toxicity to algae/aquatic plants	:	ErC50 (Chlamydomonas reinhardtii (green algae)): 36.5 mg/l Exposure time: 72 h Analytical monitoring: yes Remarks: (ECHA)
Toxicity to fish (Chronic toxicity)	:	NOEC (Jordanella floridae (flagfish)): 5.76 mg/l End point: mortality

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Exposure time: 10 d
Test Type: flow-through test
Analytical monitoring: yes
Remarks: (ECHA)

Toxicity to microorganisms : EC50 (activated sludge): 260 mg/l
Exposure time: 3 h
Test Type: static test
Method: OECD Test Guideline 209

Persistence and degradability

Components:

trichloroethylene:

Biodegradability : aerobic
Inoculum: activated sludge
Result: Not readily biodegradable.
Biodegradation: 19 %
Exposure time: 28 d
Method: OECD Test Guideline 301D

Bioaccumulative potential

Components:

trichloroethylene:

Bioaccumulation : Species: Lepomis macrochirus
Bioconcentration factor (BCF): 17
Exposure time: 14 d

Partition coefficient: n-octanol/water : log Pow: 2.53 (68 °F / 20 °C)
pH: 7
Remarks: Bioaccumulation is not expected.

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : 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.

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SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1710
Proper shipping name	:	Trichloroethylene
Class	:	6.1
Packing group	:	III
Labels	:	Division 6.1 - Toxic substances
Packing instruction (cargo aircraft)	:	663
Packing instruction (passenger aircraft)	:	655

IMDG-Code

UN number	:	UN 1710
Proper shipping name	:	TRICHLOROETHYLENE
Class	:	6.1
Packing group	:	III
Labels	:	6.1
EmS Code	:	F-A, S-A
Marine pollutant	:	no

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR Road

UN/ID/NA number	:	UN 1710
Proper shipping name	:	Trichloroethylene
Class	:	6.1
Packing group	:	III
Labels	:	Division 6.1 - Toxic substances
ERG Code	:	160
Marine pollutant	:	no
Poison Inhalation Hazard	:	No

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

Components	CAS-No.	Component	Calculated product

The life science business of Merck KGaA, Darmstadt, Germany
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		RQ (lbs)	RQ (lbs)
trichloroethylene	79-01-6	100	100
trichloroethylene	79-01-6	100	100 (D040)

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

trichloroethylene	79-01-6	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

trichloroethylene 79-01-6

Pennsylvania Right To Know

trichloroethylene 79-01-6

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

California Prop. 65

WARNING: This product can expose you to chemicals including trichloroethylene, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

The components of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

The following substance(s) is/are subject to a Significant New Use Rule:

trichloroethylene	79-01-6	See 40 CFR § 721.10851; Final Rule

After June 16, 2025, this chemical/product is and can only be domestically manufactured, imported, processed, or distributed in commerce for the following purposes until the following prohibitions take effect: (1) Processing as an intermediate a) for the manufacture of HFC–

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134a until June 18, 2033, and b) for all other processing as a reactant/intermediate until December 18, 2026; (2) Industrial and commercial use as a solvent for open-top batch vapor degreasing until December 18, 2025; (3) Industrial and commercial use as a solvent for closed-loop batch vapor degreasing until December 18, 2025, except for industrial and commercial use in batch vapor degreasing for land-based DoD defense systems by Federal agencies and their contractors until December 18, 2029, and except for industrial and commercial use as a solvent for closed-loop batch vapor degreasing necessary for rocket engine cleaning by Federal agencies and their contractors until December 18, 2031, and except for industrial and commercial use of TCE in closed-loop and open-top batch vapor degreasing for essential aerospace parts and components and narrow tubing used in medical devices until December 18, 2031, and except for industrial and commercial use as a solvent for closed-loop batch vapor degreasing for rayon fabric scouring for end use in rocket booster nozzle production by Federal agencies and their contractors until December 18, 2034; (4) Industrial and commercial use in processing aid (a) for lithium battery separator manufacturing until December 18, 2029, and (b) for lead-acid battery separator manufacturing until December 18, 2044, and (c) for specialty polymeric microporous sheet material manufacturing until December 18, 2039, and (d) in process solvent used in battery manufacture; in process solvent used in polymer fiber spinning, fluoroelastomer manufacture and Alcantara manufacture; in extraction solvent used in caprolactam manufacture; and in precipitant used in beta-cyclodextrin manufacture until December 18, 2026; (5) Industrial and commercial uses for vessels of the Armed Forces and their systems, and in the maintenance, fabrication, and sustainment for and of such vessels and systems until December 18, 2034; and (6) Industrial and commercial use for laboratory use (a) for essential laboratory activities until December 18, 2074 and (b) for asphalt testing and recovery using manual centrifuge processes until December 18, 2029 and for asphalt testing and recovery until December 18, 2034.

The following substance(s) is/are subject to TSCA 12(b) export notification requirements:
trichloroethylene 79-01-6

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
ACGIH BEI	:	ACGIH - Biological Exposure Indices (BEI)
OSHA P0	:	USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values)
OSHA Z-2	:	USA. Occupational Exposure Limits (OSHA) - Table Z-2
TSCA ECEL	:	TSCA Existing Chemical Exposure Limit
ACGIH / TWA	:	8-hour, time-weighted average
ACGIH / STEL	:	Short-term exposure limit
OSHA P0 / TWA	:	8-hour time weighted average
OSHA P0 / STEL	:	Short-term exposure limit
OSHA Z-2 / TWA	:	8-hour time weighted average
OSHA Z-2 / CEIL	:	Acceptable ceiling concentration
OSHA Z-2 / Peak	:	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift
TSCA ECEL / ECEL-TWA	:	Existing Chemical Exposure List (TWA)

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AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

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Revision Date : 12/24/2025

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• SAFETY DATA SHEET

Version 6.19
Revision Date 11/06/2025
Print Date 05/15/2026

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Copper

Product Number : 203122
Brand : Aldrich
Index-No. : 029-024-00-X
CAS-No. : 7440-50-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

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 number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

Short-term (acute) : Category 1

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aquatic hazard

Long-term (chronic) aquatic hazard : Category 1

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : H410 Very toxic to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P273 Avoid release to the environment.

Response:

P391 Collect spillage.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

CAS-No. : 7440-50-8

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
Copper	7440-50-8*	>= 80 - <= 100	TSC

* Indicates that the identifier is a CAS No.
TSC- the actual concentration or concentration range is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

If inhaled : After inhalation: fresh air.

In case of skin contact : In case of skin contact: Take off immediately all

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contaminated clothing. Rinse skin with water/ shower.

In case of eye contact	:	After eye contact: rinse out with plenty of water. Remove contact lenses.
If swallowed	:	After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.
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
Protection of first-aiders	:	For personal protection see section 8.
Notes to physician	:	No data available

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Water Foam Carbon dioxide (CO2) Dry powder
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Combustible. Vapours 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.
Hazardous combustion products	:	Copper oxides
Specific extinguishing methods	:	No data available
Further information	:	Prevent fire extinguishing water from contaminating

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surface water or the ground water system.

Special protective equipment for fire-fighters	:	In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Advice for non-emergency personnel: Avoid inhalation of dusts. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	:	Do not let product enter drains.
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 dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Further information on storage conditions	:	Tightly closed. Dry.
Storage class	:	11, Combustible Solids
Recommended storage temperature	:	Recommended storage temperature see product label.
Packaging material	:	Suitable material: Amber Glass Bottle/Jar

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Copper	7440-50-8	TWA (Dust	1 mg/m3	ACGIH

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		and mist)	(Copper)	
		TWA (Fumes)	0.2 mg/m3 (Copper)	ACGIH
		TWA (Dust)	1 mg/m3 (Copper)	NIOSH REL
		TWA (Mist)	1 mg/m3 (Copper)	NIOSH REL
		TWA (dusts and mists)	1 mg/m3 (Copper)	OSHA Z-1
		TWA (Fumes)	0.1 mg/m3 (Copper)	OSHA Z-1

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when dusts 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.

Recommended Filter type: : Filter type P1

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Hand protection

Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0.11 mm
Protective index	:	Full contact
Manufacturer	:	KCL 741 Dermatril® L

Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0.11 mm
Protective index	:	Splash contact
Manufacturer	:	KCL 741 Dermatril® L

Remarks : Handle with impervious gloves.
This recommendation applies only to the product stated in the safety data sheet, supplied by us and

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for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Eye protection	:	Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses
Hygiene measures	:	Change contaminated clothing. Wash hands after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	powder
Color	:	copper, coloured
Odor	:	odourless
Odor Threshold	:	No data available
pH	:	No data available
Melting point/ range	:	1,982.1 °F / 1,083.4 °C Method: lit.
Boiling point/boiling range	:	4,653 °F / 2,567 °C Method: lit.
Flash point	:	Not applicable
Evaporation rate	:	No data available
Burning rate	:	No data available
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower flammability limit	:	No data available
Vapor pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	No data available

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Density	:	8.94 g/mL (77 °F / 25 °C) Method: lit.
Solubility(ies) Water solubility	: :	 insoluble
Partition coefficient: n-octanol/water	:	Not applicable for inorganic substances
Autoignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	Not explosive
Oxidizing properties	:	none
Molecular weight	:	63.55 g/mol
Particle characteristics Particle size	: :	 No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No dangerous reaction known under conditions of normal use. 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.
Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) .
Possibility of hazardous	:	Exothermic reaction with:

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reactions		Ethylene oxide Fluorine hydrogen sulphide halogen-halogen compounds alkali oxides nitrides Salts of hydrazine Sulfuric acid Risk of ignition or formation of inflammable gases or vapours with: Oxidizing agents Chlorine Risk of explosion with: Acetylene azides ammonium compounds iodates bromopropine perchlorates bromates picrates chlorates Peroxides
Conditions to avoid	:	Strong heating.
Incompatible materials	:	No data available
Hazardous decomposition products	:	In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
Inhalation: No data available
Dermal: No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

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NTP: No component 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
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: GL5325000
Symptoms of systemic copper poisoning may include: capillary damage, headache, cold sweat, weak pulse, and kidney and liver damage, central nervous system excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure. Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with Wilson's disease. It has also been reported that copper poisoning has lead to hemolytic anemia and accelerates arteriosclerosis., Damage to the lungs., Vomiting, Diarrhoea, Abdominal pain, Blood disorders
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Liver - Irregularities - Based on Human Evidence

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Copper:

Toxicity to fish	:	LOEC (Oncorhynchus mykiss (rainbow trout)): 0.022 mg/l Exposure time: 96 h Test Type: mortality LC50 (Oncorhynchus mykiss (rainbow trout)): 0.15 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	NOEC (Daphnia (water flea)): 0.004 mg/l Exposure time: 24 h Test Type: mortality

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EC50 (Daphnia magna (Water flea)): 0.04 - 0.05 mg/l
Exposure time: 48 h

M-Factor (Acute aquatic toxicity)	:	10
Toxicity to fish (Chronic toxicity)	:	NOEC (Oncorhynchus mykiss (rainbow trout)): 0.024 mg/l Exposure time: 60 d Test Type: mortality
M-Factor (Chronic aquatic toxicity)	:	10

Persistence and degradability

Components:

Copper:

Biodegradability	:	Remarks: Not applicable

Bioaccumulative potential

Components:

Copper:

Partition coefficient: n-octanol/water	:	Remarks: Not applicable for inorganic substances

Mobility in soil

No data available

Other adverse effects

Product:

Ozone-Depletion Potential	:	Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	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

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itself.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 3077
Proper shipping name	:	Environmentally hazardous substance, solid, n.o.s. (Copper)
Class	:	9
Packing group	:	III
Labels	:	Class 9 - Miscellaneous dangerous substances and articles
Packing instruction (cargo aircraft)	:	956
Packing instruction (passenger aircraft)	:	956

IMDG-Code

UN number	:	UN 3077
Proper shipping name	:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Copper)
Class	:	9
Packing group	:	III
Labels	:	9
EmS Code	:	F-A, S-F
Marine pollutant	:	yes

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR Road

UN/ID/NA number	:	UN 3077
Proper shipping name	:	Environmentally hazardous substance, solid, n.o.s. (Copper)
Class	:	9
Packing group	:	III
Labels	:	Class 9 - Miscellaneous dangerous substances and articles
ERG Code	:	171
Marine pollutant	:	yes
Poison Inhalation Hazard	:	No

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety

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Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Fire Hazard
Chronic Health Hazard

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489).

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.
This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.
This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

Copper	7440-50-8	>= 90 - <= 100 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

Copper	7440-50-8	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know

Copper	7440-50-8

Maine Chemicals of High Concern

Product does not contain any listed chemicals

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Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

The components of this product are reported in the following inventories:

TSCA	:	All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
NIOSH REL	:	USA. NIOSH Recommended Exposure Limits
OSHA Z-1	:	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
ACGIH / TWA	:	8-hour, time-weighted average
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek
OSHA Z-1 / TWA	:	8-hour time weighted average

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development;

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OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

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Revision Date : 11/06/2025

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US / EN

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• SAFETY DATA SHEET

Version 6.10
Revision Date 11/06/2025
Print Date 05/15/2026

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Mercury(II) oxide yellow

Product Number : 221082
Brand : SIGALD
Index-No. : 080-002-00-6
CAS-No. : 21908-53-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Scientific research and development, Reagent for analysis
Uses advised against :

The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

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 number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

Acute toxicity (Oral) : Category 2

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Acute toxicity (Inhalation)	:	Category 2
Acute toxicity (Dermal)	:	Category 1
Specific target organ toxicity - repeated exposure	:	Category 2 (Kidney)
Short-term (acute) aquatic hazard	:	Category 1
Long-term (chronic) aquatic hazard	:	Category 1

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H300 + H310 + H330 Fatal if swallowed, in contact with skin or if inhaled.
H373 May cause damage to organs (Kidney) through prolonged or repeated exposure.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P260 Do not breathe dust.
P262 Do not get in eyes, on skin, or on clothing.
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.
P284 Wear respiratory protection.

Response:

P301 + P310 + P330 IF SWALLOWED: Immediately call a POISON CENTER/ doctor. Rinse mouth.
P302 + P350 + P310 IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.
P304 + P340 + P310 IF INHALED: Remove person to

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fresh air and keep comfortable for breathing.
Immediately call a POISON CENTER/ doctor.
P314 Get medical advice/ attention if you feel unwell.
P362 Take off contaminated clothing and wash before reuse.
P391 Collect spillage.

Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

CAS-No. : 21908-53-2

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
Mercury(II) oxide	21908-53-2*	>= 90 - <= 100	-

* Indicates that the identifier is a CAS No.
Actual concentration is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

General advice : First aiders need to protect themselves.
Show this 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 : In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.
Call a physician immediately.

In case of eye contact : After eye contact: rinse out with plenty of water.
Call in ophthalmologist.
Remove contact lenses.

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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.
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
Protection of first-aiders	:	For personal protection see section 8.
Notes to physician	:	No data available

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Not combustible. Ambient fire may liberate hazardous vapours.
Hazardous combustion products	:	Mercury/mercury oxides.
Specific extinguishing methods	:	No data available
Further information	:	Suppress (knock down) gases/vapours/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-fighters	:	Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

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SECTION 6. ACCIDENTAL RELEASE MEASURES

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. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	:	Do not let product enter drains.
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.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on safe handling	:	Work under hood. Do not inhale substance/mixture.
Further information on storage conditions	:	Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorised persons.
Storage class	:	6.1B, Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials
Recommended storage temperature	:	Recommended storage temperature see product label.
Further information on storage stability	:	Light sensitive.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible	Basis

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			concentration	
Mercury(II) oxide	21908-53-2	TWA	0.025 mg/m3 (Mercury)	ACGIH
		TWA (Vapour)	0.05 mg/m3 (Mercury)	NIOSH REL
		C	0.1 mg/m3 (Mercury)	NIOSH REL

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when dusts 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.

Recommended Filter type: : Filter type P3

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Hand protection

Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0.11 mm
Protective index	:	Full contact
Manufacturer	:	KCL 741 Dermatril® L

Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0.11 mm
Protective index	:	Splash contact
Manufacturer	:	KCL 741 Dermatril® L

Remarks : 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 EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

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Eye protection	:	Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses
Skin and body protection	:	protective clothing
Hygiene measures	:	Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	powder
Color	:	No data available
Odor	:	No data available
Odor Threshold	:	No data available
pH	:	No data available
Melting point/ range	:	932 °F / 500 °C Method: dec.
Boiling point/boiling range	:	No data available
Flash point	:	Not applicable
Evaporation rate	:	No data available
Flammability (solid, gas)	:	The product is not flammable.
Flammability (liquids)	:	No data available
Burning rate	:	No data available
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower flammability limit	:	No data available
Vapor pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	11.1 g/cm3 (68 °F / 20 °C)

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Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Autoignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Molecular weight	:	216.59 g/mol
Particle characteristics Particle size	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No data available
Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) .
Possibility of hazardous reactions	:	Risk of explosion with: nitrates Chlorine boron compounds hypophosphites various alloys Potassium magnesium sodium phosphorus Reducing agents sulfur iodine with Methanol butadiene with

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ethanol
iodine
Hydrocarbons
with
Chlorine
hydrogen peroxide
with
Nitric acid
Risk of ignition or formation of inflammable gases or vapours with:
Alcohols
nitrates
halogens
semimetallic halides
hydrazine and derivatives
Light metals
nonmetals
nonmetallic hydrogen compounds
hydrogen peroxide
Nitric acid
Reducing agents
Ozone
Violent reactions possible with:
Alkali metals
Ozone
Sulphur trioxide
mercaptans

Conditions to avoid	:	no information available
Incompatible materials	:	No data available
Hazardous decomposition products	:	In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 18 mg/kg
Remarks: (RTECS)
Oral: absorption
Acute toxicity estimate Inhalation - 4 h - 0.051 mg/l - dust/mist

(Expert judgement)
Inhalation: absorption
Acute toxicity estimate Dermal - 5 mg/kg
(Expert judgement)
No data available

Skin corrosion/irritation
No data available

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Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
Sensitisation possible in predisposed persons.

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component 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 component 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
Laboratory experiments have shown teratogenic effects.
Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

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.
- Kidney

Aspiration hazard
No data available

11.2 Additional Information

RTECS: OW8750000
Liver injury may occur., Kidney injury may occur., Nausea, Vomiting, Diarrhoea, Tremors, Salivation

Mercury compounds have a cytotoxic and protoplasmatoxic effect. Intoxication symptoms: acute: contact with eye causes severe lesions. Swallowing and inhalation of dusts damages mucous membranes of gastrointestinal and respiratory tract (metallic taste, nausea, vomiting, abdominal pain, bloody diarrhoea, intestinal burns, glottal oedema, aspiration pneumonia); drop in blood pressure, cardiac dysrhythmia, circulatory collapse, and renal failure; chronic: inflammation of the mouth with loss of teeth and mercurial line. The principal signs manifest themselves in the CNS (impaired speech, vision, hearing, and sensitivity, loss of memory, irritability, hallucinations, delirium inter alia).

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

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SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Mercury(II) oxide:

Toxicity to fish	:	LC50 (Cyprinus carpio (Carp)): 0.16 mg/l Exposure time: 96 h Test Type: mortality Remarks: The value is given in analogy to the following substances: The value is given in analogy to the following substances: Mercury dichloride
Toxicity to daphnia and other aquatic invertebrates	:	NOEC (Daphnia magna (Water flea)): 0.001 mg/l Exposure time: 21 d Remarks: The value is given in analogy to the following substances: The value is given in analogy to the following substances: Mercury dichloride
M-Factor (Acute aquatic toxicity)	:	1
M-Factor (Chronic aquatic toxicity)	:	100

Persistence and degradability

Components:

Mercury(II) oxide:

Biodegradability	:	Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

Bioaccumulative potential

No data available

Mobility in soil

Components:

Mercury(II) oxide:

Stability in soil	:	Remarks: No data available

Other adverse effects

No data available

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SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	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.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1641
Proper shipping name	:	Mercury oxide
Class	:	6.1
Packing group	:	II
Labels	:	Division 6.1 - Toxic substances
Packing instruction (cargo aircraft)	:	676
Packing instruction (passenger aircraft)	:	669

IMDG-Code

UN number	:	UN 1641
Proper shipping name	:	MERCURY OXIDE
Class	:	6.1
Packing group	:	II
Labels	:	6.1
EmS Code	:	F-A, S-A
Marine pollutant	:	yes

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR Road

UN/ID/NA number	:	UN 1641
Proper shipping name	:	Mercury oxide
Class	:	6.1
Packing group	:	II
Labels	:	Division 6.1 - Toxic substances
ERG Code	:	151
Marine pollutant	:	yes
Poison Inhalation Hazard	:	No

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Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Mercury(II) oxide	21908-53-2	500	500

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

Components	CAS-No.	Component TPQ (lbs)
Mercury(II) oxide	21908-53-2	10000
Mercury(II) oxide	21908-53-2	500*

*: Solid in the molten or powdered form (particles < 100 microns), in solution, or meeting the NFPA reactivity criteria

SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

Mercury(II) oxide	21908-53-2	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

Mercury(II) oxide 21908-53-2

Pennsylvania Right To Know

Mercury(II) oxide 21908-53-2

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Mercury(II) oxide 21908-53-2

Washington Chemicals of High Concern

Mercury(II) oxide 21908-53-2

California Prop. 65

WARNING: This product can expose you to chemicals including Mercury(II) oxide, which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

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International Regulations

Rotterdam Convention (Prior Informed Consent) : Mercury(II) oxide

The components of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
NIOSH REL	:	USA. NIOSH Recommended Exposure Limits
ACGIH / TWA	:	8-hour, time-weighted average
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek
NIOSH REL / C	:	Ceiling value not be exceeded at any time.

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the

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European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. 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.
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Revision Date : 11/06/2025

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US / EN

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SAFETY DATA SHEET according to the OSHA Hazard Communication Standard

Version 8.0
Revision Date 04/23/2026
Print Date 04/24/2026

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Nickel

Product Number : 266981
Brand : Aldrich
Index-No. : 028-002-01-4
CAS-No. : 7440-02-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

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 number

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

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Skin sensitisation	:	Category 1
Carcinogenicity	:	Category 2
Specific target organ toxicity - repeated exposure (Inhalation)	:	Category 1 (Respiratory Tract, Skin)
Short-term (acute) aquatic hazard	:	Category 3
Long-term (chronic) aquatic hazard	:	Category 3

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements :
H317 May cause an allergic skin reaction.
H351 Suspected of causing cancer.
H372 Causes damage to organs (Respiratory Tract, Skin) through prolonged or repeated exposure if inhaled.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe dust.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P272 Contaminated work clothing must not be allowed out of the workplace.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P302 + P352 IF ON SKIN: Wash with plenty of water.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P333 + P313 If skin irritation or rash occurs: Get

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medical advice/ attention.

Storage:

P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

CAS-No. : 7440-02-0

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
nickel (powder)	7440-02-0*	>= 80 - <= 100	TSC

* Indicates that the identifier is a CAS No.
TSC- the actual concentration or concentration range is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

General advice : Show this safety data sheet to the doctor in attendance.

If inhaled : After inhalation: fresh air. Call in physician.

In case of skin contact : In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact : After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed : After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

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

Protection of first-aiders : For personal protection see section 8.

Notes to physician : No data available

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SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Water Foam Carbon dioxide (CO2) Dry powder
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Combustible. Development of hazardous combustion gases or vapours possible in the event of fire.
Hazardous combustion products	:	Nickel/nickel oxides
Specific extinguishing methods	:	No data available
Further information	:	Suppress (knock down) gases/vapours/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-fighters	:	Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

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. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.

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Environmental precautions	:	Do not let product enter drains.
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 dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

Advice on safe handling	:	Work under hood. Do not inhale substance/mixture.
Further information on storage conditions	:	Tightly closed. Dry. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorised persons.
Storage class	:	6.1D, Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects
Recommended storage temperature	:	Recommended storage temperature see product label.
Further information on storage stability	:	Handle and store under inert gas.
Packaging material	:	Suitable material: Amber Glass Bottle/Jar

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
nickel (powder)	7440-02-0	TWA (Inhalable particulate matter)	1.5 mg/m3	ACGIH
		TWA	1 mg/m3 (Nickel)	OSHA Z-1
		TWA	0.015 mg/m3 (Nickel)	NIOSH REL

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Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
nickel (powder)	7440-02-0	Nickel (Nickel)	Urine	End of shift at end of workweek	5 µg/l	ACGIH BEI
		Nickel (Nickel)	Urine	End of shift at end of workweek	30 µg/l	ACGIH BEI

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when dusts 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.

Recommended Filter type: : Filter type P3

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Hand protection

Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0.11 mm
Protective index	:	Full contact
Manufacturer	:	KCL 741 Dermatril® L

Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0.11 mm
Protective index	:	Splash contact
Manufacturer	:	KCL 741 Dermatril® L

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Remarks	:	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 EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Eye protection	:	Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses
Skin and body protection	:	protective clothing
Hygiene measures	:	Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	powder
Color	:	No data available
Odor	:	No data available
Odor Threshold	:	No data available
pH	:	No data available
Melting point/ range	:	34.63 °F / 1.46 °C
Boiling point/boiling range	:	36.91 °F / 2.73 °C
Flash point	:	Not applicable
Evaporation rate	:	No data available
Flammability (solid, gas)	:	does not ignite Method: Test N.1: Test method for readily combustible solids Remarks: The product is not flammable.
Burning rate	:	No data available
Self-ignition	:	> 752 °F / > 400 °C Method: Regulation (EC) No. 440/2008, Annex, A.16

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		The substance or mixture is not classified as self heating.
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower flammability limit	:	No data available
Vapor pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	8.9 g/cm3 (77 °F / 25 °C) Method: lit.
Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	Not applicable for inorganic substances
Autoignition temperature	:	Not applicable
Decomposition temperature	:	No data available
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	Not classified as explosive.
Oxidizing properties	:	none
Molecular weight	:	58.69 g/mol
Particle characteristics Particle size	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	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.

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Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) .
Possibility of hazardous reactions	:	A risk of explosion and/or of toxic gas formation exists with the following substances: sulfur selenium halogens nitryl compounds Oxidizing agents performic acid Hydrazine hydrate perchlorates Alcohols organic solvent nitrates halogen-halogen compounds Hydrogen with Dioxane
Conditions to avoid	:	no information available
Incompatible materials	:	No data available
Hazardous decomposition products	:	In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 9,000 mg/kg
Remarks: (IUCLID)
Inhalation: No data available
Dermal: No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
May cause allergic skin reaction. Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Germ cell mutagenicity
No data available

Carcinogenicity
Suspected of causing cancer.

IARC: 2B - Group 2B: Possibly carcinogenic to humans (nickel (powder))

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1 - Group 1: Carcinogenic to humans (nickel (powder))

2B - Group 2B: Possibly carcinogenic to humans (nickel (powder))

IARC: 2B - Group 2B: Possibly carcinogenic to humans (nickel (powder))

1 - Group 1: Carcinogenic to humans (nickel (powder))

2B - Group 2B: Possibly carcinogenic to humans (nickel (powder))

NTP: RAHC - Reasonably anticipated to be a human carcinogen (nickel (powder))

RAHC - Reasonably anticipated to be a human carcinogen (nickel (powder))

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
Inhalation - Causes damage to organs through prolonged or repeated exposure.
- Respiratory Tract, Skin

Aspiration hazard
No data available

11.2 Additional Information

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

nickel (powder):

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): 15.3 mg/l End point: mortality Exposure time: 96 h Test Type: semi-static test Analytical monitoring: yes Remarks: (ECHA)

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Toxicity to daphnia and other aquatic invertebrates	:	LC50 (Ceriodaphnia dubia (water flea)): 0.074 mg/l End point: mortality Exposure time: 48 h Test Type: static test Method: US-EPA
Toxicity to algae/aquatic plants	:	IC50 (Scenedesmus capricornutum (fresh water algae)): 100 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: suspension
Toxicity to microorganisms	:	EC50 (Pseudomonas fluorescens): 250 mg/l Exposure time: 48 h Remarks: (Lit.)

Ecotoxicology Assessment

Acute aquatic toxicity	:	Harmful to aquatic life.
Chronic aquatic toxicity	:	Harmful to aquatic life with long lasting effects.

Persistence and degradability

Components:

nickel (powder):

Biodegradability	:	Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

Bioaccumulative potential

Components:

nickel (powder):

Partition coefficient: n-octanol/water	:	Remarks: Not applicable for inorganic substances

Mobility in soil

No data available

Other adverse effects

Product:

Ozone-Depletion Potential	:	Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

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Components:

nickel (powder):

Additional ecological information : Discharge into the environment must be avoided.

Endocrine disrupting properties

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : 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.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

Not regulated as a dangerous good

IMDG-Code

Not regulated as a dangerous good

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR

Not regulated as a dangerous good

Poison Inhalation Hazard : No

Special precautions for user

Remarks : Not classified as dangerous in the meaning of transport regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

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SARA 311/312 Hazards	:	Fire Hazard Acute Health Hazard Chronic Health Hazard
SARA 313	:	This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489).

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.
This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.
This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

nickel (powder)	7440-02-0	>= 90 - <= 100 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

nickel (powder)	7440-02-0	>= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know

nickel (powder)	7440-02-0

Maine Chemicals of High Concern

nickel (powder)	7440-02-0

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

California Prop. 65

WARNING: This product can expose you to chemicals including nickel (powder), which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov. **The components of this product are reported in the following inventories:**

US TSCA	:	All substances listed as active on the TSCA inventory

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TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16. OTHER INFORMATION

Relevant changes since previous version

5. Firefighting measures
8. Exposure controls/personal protection
10. Stability and reactivity
7. Handling and storage

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
ACGIH BEI	:	ACGIH - Biological Exposure Indices (BEI)
NIOSH REL	:	USA. NIOSH Recommended Exposure Limits
OSHA Z-1	:	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
ACGIH / TWA	:	8-hour, time-weighted average
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek
OSHA Z-1 / TWA	:	8-hour time weighted average

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent,

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Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. 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.
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Revision Date : 04/23/2026

US / EN

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• SAFETY DATA SHEET

Version 9.0
Revision Date 12/25/2025
Print Date 12/26/2025

SECTION 1. IDENTIFICATION

1.1 Product identifiers

Product name : Tetrachloroethylene

Product Number : 371696
Brand : Sigma-Aldrich
Index-No. : 602-028-00-4
CAS-No. : 127-18-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : After December 8, 2026 this chemical substance (as defined in TSCA section 3(2))/ product cannot be distributed in commerce to retailers for any use. After March 8, 2027, this chemical substance (as defined in TSCA section 3(2))/product is and can only be distributed in commerce or processed with a concentration of PCE equal to or greater than 0.1% by weight for the following purposes: (1) Processing as a reactant/intermediate; (2) Processing into formulation, mixture or reaction product; (3) Processing by repackaging; (4) Recycling; (5) Industrial and commercial use as solvent in open-top batch vapor degreasing; (6) Industrial and commercial use as solvent in closed-loop batch vapor degreasing; (7) Industrial and commercial use in maskant for chemical milling; (8) Industrial and commercial use as a processing aid in catalyst regeneration in petrochemical manufacturing; (9) Industrial and commercial use as a processing aid in sectors other than petrochemical manufacturing; (10) Industrial and commercial use as solvent for cold cleaning of tanker vessels; (11) Industrial and commercial use as energized electrical cleaner; (12) Industrial and commercial use in laboratory chemicals; (13) Industrial and commercial use in solvent-based adhesives and sealants; (14) Industrial and commercial use in dry cleaning in 3rd generation machines until December 20, 2027; (15) Industrial and commercial use in all dry cleaning and related spot cleaning until December 19, 2034; (16) Export; and (17) Disposal.

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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 number

Emergency Phone #	:	800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Hazards for the product as supplied

Skin irritation	:	Category 2
Eye irritation	:	Category 2A
Skin sensitisation	:	Category 1
Carcinogenicity	:	Category 2
Specific target organ toxicity - single exposure	:	Category 3 (Central nervous system)
Short-term (acute) aquatic hazard	:	Category 2
Long-term (chronic) aquatic hazard	:	Category 2

Other hazards

None known.

GHS label elements

Hazard pictograms :

Signal word	:	Warning
Hazard statements	:	H315 Causes skin irritation. H317 May cause an allergic skin reaction. H319 Causes serious eye irritation. H336 May cause drowsiness or dizziness.

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H351 Suspected of causing cancer.
H411 Toxic to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing mist or vapours.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P272 Contaminated work clothing must not be allowed out of the workplace.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.
P391 Collect spillage.

Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

CAS-No. : 127-18-4

Components

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Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
Tetrachlorethylene	127-18-4*	>= 80 - <= 100	TSC

* Indicates that the identifier is a CAS No.
TSC- the actual concentration or concentration range is withheld as a trade secret

SECTION 4. FIRST AID MEASURES

General advice	:	Show this safety data sheet to the doctor in attendance.
If inhaled	:	After inhalation: fresh air. Call in physician.
In case of skin contact	:	In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.
In case of eye contact	:	After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.
If swallowed	:	After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.
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
Protection of first-aiders	:	For personal protection see section 8.
Notes to physician	:	No data available

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Water Foam Carbon dioxide (CO2) Dry powder
Unsuitable extinguishing media	:	For this substance/mixture no limitations of extinguishing agents are given.
Specific hazards during fire fighting	:	Combustible.

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		Development of hazardous combustion gases or vapours possible in the event of fire.
Hazardous combustion products	:	Carbon oxides Hydrogen chloride gas
Specific extinguishing methods	:	No data available
Further information	:	Suppress (knock down) gases/vapours/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for fire-fighters	:	Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Advice for non-emergency personnel: Do not breathe vapours, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. Advice for emergency responders: For personal protection see section 8.
Environmental precautions	:	Do not let product enter drains.
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 with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

SECTION 7. HANDLING AND STORAGE

For precautions see section 2.2.

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Advice on safe handling	:	Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.
Further information on storage conditions	:	Tightly closed. Keep in a well-ventilated place. Keep locked up or in an area accessible only to qualified or authorised persons.
Storage class	:	6.1C, Combustible, acute toxic Cat.3 / toxic compounds or compounds which causing chronic effects
Recommended storage temperature	:	Recommended storage temperature see product label.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Tetrachlorethylene	127-18-4	TWA	25 ppm	ACGIH
		STEL	100 ppm	ACGIH
		TWA	100 ppm	OSHA Z-2
		CEIL	200 ppm	OSHA Z-2
		Peak	300 ppm (5 mins. in any 3 hrs.)	OSHA Z-2
		ECEL-TWA (Inhalation exposure)	0.14 ppm 0.98 mg/m3	TSCA ECEL

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
Tetrachlorethylene	127-18-4	Tetrachloroethylene	In end-exhaled air	Prior to shift (16 hours after exposure ceases)	3 parts per million	ACGIH BEI
		Tetrachloroethylene	In blood	Prior to shift (16 hours	0.5 mg/l	ACGIH BEI

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				after exposure ceases)		

Engineering measures : No data available

Personal protective equipment

Respiratory protection : required when 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.

Recommended Filter type: : Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

required when 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.

Filter type ABEK

Hand protection

Material	:	Nitrile rubber
Break through time	:	17 min
Glove thickness	:	0.11 mm
Protective index	:	Splash contact
Manufacturer	:	Dermatril® (KCL 740 / Aldrich Z677272, Size M)
Material	:	Viton®
Break through time	:	480 min
Glove thickness	:	0.7 mm
Protective index	:	Full contact
Manufacturer	:	KCL 890 Vitoject®
Remarks	:	This recommendation applies only to the product stated in the safety data sheet, supplied by us and

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		for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Eye protection	:	Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses
Skin and body protection	:	protective clothing
Hygiene measures	:	Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid (68 °F / 20 °C, 1,013 hPa)
Color	:	colourless
Odor	:	No data available
Odor Threshold	:	No data available
pH	:	No data available
Melting point/ range	:	-8 °F / -22 °C Method: lit.
Boiling point/boiling range	:	250 °F / 121 °C Method: lit.
Flash point	:	No data available
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Flammability (liquids)	:	The product is not flammable.
Burning rate	:	No data available
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit /	:	No data available

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Lower flammability limit		
Vapor pressure	:	25.3 hPa (77.0 °F / 25.0 °C) 17.3 hPa (68.0 °F / 20.0 °C)
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	1.623 g/cm3 (77 °F / 25 °C) Method: lit.
Solubility(ies) Water solubility	:	0.15 g/l (77 °F / 25 °C) pH: 7
Partition coefficient: n-octanol/water	:	log Pow: 2.53 (73 °F / 23 °C) pH: 7 Bioaccumulation is not expected.
Autoignition temperature	:	not combustible
Decomposition temperature	:	No data available
Viscosity Viscosity, dynamic	:	0.844 mPa.s (77 °F / 25 °C)
Viscosity, kinematic	:	No data available
Flow time	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available
Surface tension	:	32.1 mN/m, 68 °F / 20 °C
Molecular weight	:	165.83 g/mol
Particle characteristics Particle size	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No data available
Chemical stability	:	The product is chemically stable under standard ambient conditions (room temperature) .

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Possibility of hazardous reactions	:	Risk of explosion with: Alkali metals Aluminium sodium amide Barium nitrogen dioxide Oxygen with alkali hydroxides Exothermic reaction with: strong alkalis Alkaline earth metals strong alkalis Light metals Powdered metals Oxidizing agents Strong acids Strong bases nitrous gases Risk of ignition or formation of inflammable gases or vapours with: zinc oxide with Aluminium
Conditions to avoid	:	no information available
Incompatible materials	:	various plastics
Hazardous decomposition products	:	In the event of fire: see section 5

SECTION 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 3,420 mg/kg
(OECD Test Guideline 401)
Remarks: (ECHA)
Inhalation: No data available
Dermal: No data available
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h

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(Draize Test)
Remarks: (RTECS)

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: May cause sensitisation by skin contact.
(OECD Test Guideline 429)
Remarks: (ECHA)

Germ cell mutagenicity
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Remarks: (ECHA)
Test Type: Ames test
Test system: Salmonella typhimurium
Metabolic activation: without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Remarks: (ECHA)

Test Type: Micronucleus test
Species: Mouse

Application Route: Intraperitoneal
Method: OECD Test Guideline 474
Result: negative
Remarks: (ECHA)

Carcinogenicity
Suspected of causing cancer.

IARC:	2A - Group 2A: Probably carcinogenic to humans (Tetrachlorethylene)
NTP:	RAHC - Reasonably anticipated to be a human carcinogen (Tetrachlorethylene)
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
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Mouse - female - Oral - Lowest observed adverse effect level - 390 mg/kg

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RTECS: KX3850000
narcosis, Liver injury may occur., Kidney injury may occur.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Tetrachlorethylene:

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): 5 mg/l Exposure time: 96 h Test Type: flow-through test Analytical monitoring: yes Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 7.50 mg/l Exposure time: 48 h
Toxicity to algae/aquatic plants	:	ErC50 (Chlamydomonas reinhardtii (green algae)): 3.64 mg/l Exposure time: 72 h Analytical monitoring: yes Remarks: (ECHA)
Toxicity to fish (Chronic toxicity)	:	NOEC (Jordanella floridae): 1.99 mg/l Exposure time: 10 d Test Type: flow-through test Analytical monitoring: yes Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC (Daphnia magna (Water flea)): 0.51 mg/l Exposure time: 28 d Test Type: semi-static test Analytical monitoring: yes Remarks: (ECHA)

Persistence and degradability

Components:

Tetrachlorethylene:

Biodegradability	:	aerobic Inoculum: activated sludge Concentration: 100 mg/l Result: Not readily biodegradable. Biodegradation: 11 % Exposure time: 28 d Method: OECD Test Guideline 301C

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Bioaccumulative potential

Components:

Tetrachlorethylene:

Bioaccumulation	:	Species: Lepomis macrochirus (Bluegill) Bioconcentration factor (BCF): 49 Exposure time: 21 d Concentration: 0.00343 mg/l
Partition coefficient: n-octanol/water	:	log Pow: 2.53 (73 °F / 23 °C) pH: 7 Remarks: Bioaccumulation is not expected.

Mobility in soil

Components:

Tetrachlorethylene:

Stability in soil	:	Remarks: No data available

Other adverse effects

Product:

Ozone-Depletion Potential	:	Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	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.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1897
Proper shipping name	:	Tetrachloroethylene
Class	:	6.1
Packing group	:	III
Labels	:	Division 6.1 - Toxic substances

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Packing instruction (cargo aircraft)	:	663
Packing instruction (passenger aircraft)	:	655

IMDG-Code

UN number	:	UN 1897
Proper shipping name	:	TETRACHLOROETHYLENE
Class	:	6.1
Packing group	:	III
Labels	:	6.1
EmS Code	:	F-A, S-A
Marine pollutant	:	yes

Transport in bulk according to IMO instruments

Not applicable for product as supplied.

National Regulations

49 CFR Road

UN/ID/NA number	:	UN 1897
Proper shipping name	:	Tetrachloroethylene
Class	:	6.1
Packing group	:	III
Labels	:	Division 6.1 - Toxic substances
ERG Code	:	160
Marine pollutant	:	yes
Poison Inhalation Hazard	:	No

Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

SECTION 15. REGULATORY INFORMATION

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Tetrachlorethylene	127-18-4	100	100
Tetrachlorethylene	127-18-4	100	100 (D039)
Tetrachlorethylene	127-18-4	10	10 (F001)
Tetrachlorethylene	127-18-4	10	10 (F002)

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

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SARA 311/312 Hazards	:	Acute Health Hazard Chronic Health Hazard
SARA 313	:	The following components are subject to reporting levels established by SARA Title III, Section 313: Tetrachlorethylene 127-18-4 >= 90 - <= 100 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

Tetrachlorethylene 127-18-4 >= 90 - <= 100 %

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).
The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

Tetrachlorethylene 127-18-4 >= 90 - <= 100 %

Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.
This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.
This product contains the following toxic pollutants listed under the U.S. Clean Water Act Section 307

Tetrachlorethylene 127-18-4 >= 90 - <= 100 %

This product contains the following priority pollutants related to the U.S. Clean Water Act:

Tetrachlorethylene 127-18-4 >= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

Tetrachlorethylene 127-18-4

Pennsylvania Right To Know

Tetrachlorethylene 127-18-4

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Tetrachlorethylene 127-18-4

Washington Chemicals of High Concern

Tetrachlorethylene 127-18-4

California Prop. 65

WARNING: This product can expose you to chemicals including Tetrachlorethylene, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

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The components of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

After December 8, 2026 this chemical substance (as defined in TSCA section 3(2))/ product cannot be distributed in commerce to retailers for any use. After March 8, 2027, this chemical substance (as defined in TSCA section 3(2))/product is and can only be distributed in commerce or processed with a concentration of PCE equal to or greater than 0.1% by weight for the following purposes: (1) Processing as a reactant/intermediate; (2) Processing into formulation, mixture or reaction product; (3) Processing by repackaging; (4) Recycling; (5) Industrial and commercial use as solvent in open-top batch vapor degreasing; (6) Industrial and commercial use as solvent in closed-loop batch vapor degreasing; (7) Industrial and commercial use in maskant for chemical milling; (8) Industrial and commercial use as a processing aid in catalyst regeneration in petrochemical manufacturing; (9) Industrial and commercial use as a processing aid in sectors other than petrochemical manufacturing; (10) Industrial and commercial use as solvent for cold cleaning of tanker vessels; (11) Industrial and commercial use as energized electrical cleaner; (12) Industrial and commercial use in laboratory chemicals; (13) Industrial and commercial use in solvent-based adhesives and sealants; (14) Industrial and commercial use in dry cleaning in 3rd generation machines until December 20, 2027; (15) Industrial and commercial use in all dry cleaning and related spot cleaning until December 19, 2034; (16) Export; and (17) Disposal.

The following substance(s) is/are subject to TSCA 12(b) export notification requirements:
Tetrachlorethylene 127-18-4

SECTION 16. OTHER INFORMATION

Relevant changes since previous version

8. Exposure controls/personal protection

Full text of other abbreviations

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
ACGIH BEI	:	ACGIH - Biological Exposure Indices (BEI)
OSHA Z-2	:	USA. Occupational Exposure Limits (OSHA) - Table Z-2
TSCA ECEL	:	TSCA Existing Chemical Exposure Limit
ACGIH / TWA	:	8-hour, time-weighted average
ACGIH / STEL	:	Short-term exposure limit
OSHA Z-2 / TWA	:	8-hour time weighted average
OSHA Z-2 / CEIL	:	Acceptable ceiling concentration
OSHA Z-2 / Peak	:	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift
TSCA ECEL / ECEL-TWA	:	Existing Chemical Exposure List (TWA)

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN -

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Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonised System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. 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.
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Utilities and Subsurface Clearance Checklist

S3AM-303-FM4

Instructions

1. **This form must be used to document the identification of all underground and overhead utilities and to carefully plan work locations to avoid any potential for inadvertent contact with them. See Ground Disturbance – Americas S3AM-303-PR2 for more information.**
2. **The form must be completed, reviewed, and signed by the Project Manager.**
3. **Once completed, this form must be retained in the project files.**

Details					
Location	....	**Project #**	....	**Date & Time**	....
Manager	....	**Contractor (if applicable)**	....	**Weather**	....
Client	....	**Inspector**	....		
Notes	....				

Part 1 and Part 2 must be completed prior to any intrusive subsurface work. DO NOT DISTURB GROUND if a "No" answer to any of the Part 1 questions has not been initialed as authorized by the AECOM Manager.

For any exceptions to any of the requirements of the utility clearance process, SH&E Management System Variance Request – Americas S3AM-215-FM2 must be completed and approved.

Part 1

a.	Permits and Access Agreements	Yes	No	N/A
i.	Have all appropriate permits and agreements been identified and obtained (e.g., client, drilling, encroachment, working near railroads, etc.)?	☐	☐	☐
ii.	Have all client requirements been identified and obtained?	☐	☐	☐
iii.	If working off site is (are) site access agreement(s) executed?	☐	☐	☐

b.	Identification and Mapping of Utility and Subsurface Structures	Yes	No	N/A
i.	Is a site plan showing proposed subsurface locations and utility locations attached to this check list?	☐	☐	☐
ii.	Have above-/below-ground utilities and subsurface installations been investigated (Part 2 of this form)?	☐	☐	☐
iii.	Have all federal/state/provincial/territorial and other "One Call" providers marked their facilities or otherwise notified AECOM that they do not have any facilities near the proposed subsurface/intrusive locations?	☐	☐	☐
iv.	Have you identified what utilities are *not* included in the "One Call" provider system?	☐	☐	☐
v.	As noted in the exception at the bottom of Section V of this checklist, has a utility locating contractor performed geophysical and/or other surveys of the proposed subsurface/intrusive locations?	☐	☐	☐

c.	Site Walk	Yes	No	N/A
Has a site walk been performed that includes the following:		☐	☐	☐

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c.	Site Walk	Yes	No	N/A
i.	Reviewing all planned intrusive locations?	☐	☐	☐
ii.	Adjusting locations away from subsurface utilities and installations?	☐	☐	☐
iii.	Determining the appropriate utility clearance activities for each location?	☐	☐	☐
iv.	Determining the presence and location of overhead utilities and obstructions?	☐	☐	☐
v.	Walking around perimeter of the site to observe physical hazards?	☐	☐	☐
vi.	Visually surveying approximately 50 feet (15.2 meters) from the perimeter of the site to observe physical hazards and a 50-foot (15.2-meter) radius from each proposed subsurface location?	☐	☐	☐
vii.	Visually verifying that each of the proposed locations does not lie on a line connecting two similar manhole covers (e.g., sanitary sewer or storm drain)?	☐	☐	☐
viii.	Visually verifying that the ground in the vicinity of each of the proposed subsurface locations has not subsided, been excavated and patched, gives the appearance it may be covering a former trench (e.g., linear cracks, sagging curbs, linear re-pavements, etc.), and does not lie on a line with any water, gas, electrical meters, utility cleanouts, or other utility boxes in the surrounding areas?	☐	☐	☐

d.	Proposed Subsurface Investigation Locations	Yes	No	N/A
i.	Are all of the proposed subsurface locations at least 5 feet (1.5 meters) from any identified subsurface utility?	☐	☐	☐
ii.	Are all of the proposed subsurface locations at least 7 feet (2.1 meters) from the pad surrounding any underground storage tanks (USTs) shown on the Site Plan?	☐	☐	☐

Note: These setback distances are a minimum; government regulations and utility requirements may dictate a greater setback distance

e.	Utility Clearance Investigation Location Confirmation*	Yes	No	N/A
i.	Have the hand clearance/tolerance zones of subsurface locations been observed and utilities exposed through the use of non-destructive techniques as follows? Hand/non-destructive technique clearance should be extended if locations of deep utilities and structures are not known. In non-urban areas, hand clearing should be conducted if possible and according to local requirements.	☐	☐	☐
ii.	For soil borings/monitoring wells, excavated to a minimum of 5 feet (1.5 meters) below ground surface using non-mechanical methods?	☐	☐	☐

Comments:

....

Documentation supplied by One Call or private utility and installation locators, including email or written field confirmation/maps of mark-out requests and status must accompany this form. If this form is supporting multiple ground disturbance activities, a copy of this completed form should be provided to each activity.

Part 2					
Public Utility Locate (One Call)		**Prior Locate Ticket#**	....		
Date Called	.....	**Called By**	....	**Valid Until**	....
Ticket Number	....	**Area Requested to Be Cleared**		....	

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Part 2			
Private Utility Locate		**Prior Locate Ticket#**	….
Company Performing Locate	….	**Date Completed**	…..
Area(s) Requested to Be Cleared (including distance around marked locations)	….		
Method(s) Used (e.g., GPR, EM)	….		
Confirm Area(s) Cleared	….		

One Call Utilities					
Utility	**Notified by**	**Comments**	**Field Observation – Marked (mains & services)**		
			Yes	**No**	**Above**
Electric (Red)	☐ One Call ☐ Other	….	☐	☐	☐
Gas/Petroleum Pipeline (Yellow)	☐ One Call ☐ Other	….	☐	☐	NA
Sewer/Drainage (Green)	☐ One Call ☐ Other	….	☐	☐	NA
Water (Blue)	☐ One Call ☐ Other	….	☐	☐	NA
Communications (Orange)	☐ One Call ☐ Other	….	☐	☐	☐
Other ….	☐ One Call ☐ Other	….	☐	☐	☐
Were all circuits on during subsurface checks if the checks were for identifying energized lines (e.g., circuits on timers or light sensing switches)?			☐	☐	NA

Utilities Not Identified by One Call (Includes both Public and Private along with Regional and Site Utilities)						
Utility (Colors may vary)	**Owner / Contact / Phone #**	**Notified**		**Field Observation - Marked**		
		Yes	**No**	**Yes**	**No**	**Above**
Communications: (Orange) TV, computer, phone, cell towers, site communication, cameras, security, etc.	….	☐	☐	☐	☐	☐
Electricity: (Red) Mains / Supplies / Interior / Exterior (signs, fuel pumps, low voltage security perimeters, gates, property light posts, equipment, substations, etc.)	….	☐	☐	☐	☐	☐
Gas: (Yellow) Mains / Supplies / Equipment / Pipelines (Natural, Process, Oil, Crude, Refined (Gas, Diesel, Jet), etc.)	….	☐	☐	☐	☐	☐
Steam: (Yellow)	….	☐	☐	☐	☐	☐

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Utilities Not Identified by One Call (Includes both Public and Private along with Regional and Site Utilities)						
Utility (Colors may vary)	Owner / Contact / Phone #	Notified		Field Observation - Marked		
		Yes	No	Yes	No	Above
Structures: Possible horizontally installed facilities, vaults, basements, tunnels, sub-grade structures, foundations, overhead obstructions, underground parking, etc.	....	☐	☐	☐	☐	☐
UST Systems (Tanks / piping / electric)	....	☐	☐	☐	☐	NA
Sewer: (Green) Sanitary, storm, combined, septic, drainage (parking, buildings, fields), irrigation	....	☐	☐	☐	☐	NA
Water: (Blue) Process, Plant, potable, well, cooling, return/makeup, fire, sprinkler, landscape irrigation, reclaim (Purple) other	....	☐	☐	☐	☐	☐
Other: Abandoned lines, invisible dog fences, shopping cart perimeter monitoring, traffic lights	....	☐	☐	☐	☐	☐

Project Manager Review and Approval

....		....
Project Manager Name	**Signature**	**Date/Time**

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Weather Plan

S3AM-315-FM2

Instructions

1. **This form or equivalent must be completed in accordance with Work On, In, or Near Water – Americas S3AM-315-PR2.**
2. **Complete this weather plan if work will potentially be subjected to or impacted by extreme weather including a hurricane or typhoon, thunderstorms, winds above 35 knots, seas and swell above 6 feet (2 meters), current above 3 knots, or any other adverse weather phenomenon that will impact operations or increase risk.**
3. **The intent of the weather plan is to facilitate advance planning and set criteria at which certain actions must be taken.**
4. **The criteria suggested below are only guidelines. In some cases, the length of time and activities may need to be much longer than 72 hours in advance of a weather event. Adjust the plan as appropriate to the work activity and limitations of personnel transport, vessel transit to safe anchorage or mooring, and any other relevant factors. Include the Weather Plan within the SH&E Plan.**
5. **Once completed, this float plan must be retained in the project files.**

Phase	Criteria	Action
Phase 1	72 Hours in advance of weather event	*Example Action: Decision to implement Down Weather Procedure. Stop all productive work. Prepare personnel for transfer. Prepare equipment and materials for heavy weather.*
Phase 2	48 Hours in advance of weather event	*Example Action: Prepare for vessel movement to safe area. Evacuate non-essential personnel. Make contingencies for securing vessels with wire rope or other securing means as needed.*
Phase 3	24 Hours in advance of weather event	*Example Action: Move vessels to pre-determined safe anchorage or mooring. Reduce staff to essential. Assure all communications and navigation aids are in place.*
Phase 4	12 Hours in advance of weather event	*Example Action: All preparatory actions verified complete. All personnel accounted for and safe. Communicate with AECOM leadership and local rescue authorities as appropriate.*
Phase 5	During weather event	*Example Action: Monitor. Assure personnel remain in safe locations. Monitor vessel status. Maintain communication with vessel, rescue authorities and AECOM management as appropriate.*
Recovery	After weather event passes	*Example Action: Assure all personnel are safe. Communicate return to work procedures. Conduct assessment of vessel(s). Make preparation to move back to working location and resume work activities.*

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Appendix C Field Forms

1. Task Hazard Assessment – Americas
2. Daily Safety Meeting – Americas
3. Heat Stress Monitoring Log – Americas
4. Vehicle Inspection Checklist – Americas
5. Off-Highway Vehicle Inspection – Americas
6. Drill Site Safety Inspection Checklist – Americas

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Task Hazard Assessment

S3AM-209-FM6

Instructions

1. **This form or other applicable region- or business line-specific form is to be completed in accordance with SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.**
2. **Task Hazard Assessments (THA)s are required for any field work involving AECOM activities outside of the office and must be used onsite to review site hazards and confirm necessary controls are in place.**
3. **The THA must be reviewed in its entirety and modified at the work site (as needed) immediately prior to commencement of work to account for actual conditions and any changes (weather, scope of work, simultaneous operations, etc.). All necessary revisions must be written on the THA.**
4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas.**
5. **The completed form must be retained in the project files.**

Project Name and Number		**Overall Risk (Highest Post-Mitigation Risk)**	MEDIUM
Task Name	Air Knifing	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

Required PPE	☐ Hard Hat	☐ Eyewear (with side shields)	☐ High-Visibility Vest	☐ Ankle Height Footwear	☐ Gloves	☐ Hearing Protection
	Specify type: ☐ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☐ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☐ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☐ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Identify/Lockout Utilities	Electrocution/contact with energized electrical lines	H	Locate all sources of electricity to site parking lights, air compressor, vacuum, car wash, and ID sign and if possible de-energize lines by using locks and tags. • 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 • If lockout/tagout procedures are used, notify all affected employees on-site of the de-energized condition. Verify all public and private utility mark outs.	L
On-Site Edits:				
Position Rig	Injury from or damage to overhead utilities from direct contact with or proximity to (arcing)	H	Check area for hazards. • While moving the rig on site, keep a minimum 4 foot clearance under any electrical lines. • While planning the working position of the rig, keep a minimum 10 foot clearance away from any electrical lines. • Use a spotter when backing.	M
	Rig stuck in soft/slippery ground		Choose the most level path for travel with the rig. • If needed, consider the use of wood, sand, or crushed stone to create a stable working/traveling platform.	
	Intrusion by 3rd parties		Observe the site pedestrian and vehicular traffic patterns. Use cones, flags, and caution tape to establish traffic control and exclusion zones.	
	Stabilize Vehicles		Chock wheels on all vehicles and trailers.	
On-Site Edits:				

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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)*
Remove concrete or asphalt by use of jackhammer to open/ cut concrete/asphalt at location	Vibrational or contact injuries and excessive noise	H	Wear leather or vibration-absorbing gloves, safety glasses, face shield, hearing protection, and a hard hat. • Use shovels to push debris out of way. • Follow manufacturer's operating procedures for equipment. • Have a stable stance; feet shoulder width apart, hold jackhammer lightly and balanced. • Do not wear excessively loose, baggy clothing or jewelry. • Take a 10-minute break every hour of operation during operation of jackhammer to prevent vibration/repetitive motion injuries.	L
	Fire/explosion from sparks igniting a fuel/vapor source		If sparks are generated within 35 feet of a vapor source (i.e., an operating pump island) a Hot Work permit must be furnished and air monitoring must take place throughout the cutting procedure if the possibility of flammable vapors exists.	
	Struck-by injury from disconnected pressurized air lines/hoses		All hose connections must be secure. All lines should be inspected prior to use. Locking pins and whip checks must be used for all connections that could fail or become disconnected causing the hose to "whip."	
On-Site Edits:				
Air knife operation ***Note:*** *If any evidence of pea stone is observed during any subsurface activity,* ***STOP WORK*** *and notify the project manager immediately.*	Bodily injury or hearing damage from air compressor and associated air lines.	H	Safety glasses, hearing protection, and work gloves must be worn at all times when compressor is running. • Keep hands and clothing away from rotating machinery. • All hose connections must be secure. All lines should be inspected prior to use. Locking pins and whip checks must be used for all connections that could fail or become disconnected causing the hose to "whip." • Ensure hopper door is securely fastened before work begins. • Ensure all personnel on site know how to shut down machine in case of an emergency. • If dust is generated by operation, use water spray to control. *Note: Staff must ensure that prior to turning on the air compressor that it is confirmed that the air knife is manned and that the air valve is closed.*	M

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	Personal injury and property damage from contact with high pressure jet and associated flying debris		Do not spray persons with high-pressure jet. • Ensure air lance is equipped with a metal guard attachment, near the nozzle, that is capable of shielding the operator from airborne debris exiting the excavation. • A face shield and safety glasses shall be worn in addition to the Level D PPE within a 10 foot area where high-pressure jet is being utilized. Use caution when using high-pressure jet assembly around known underground utilities. • Do not direct high-pressure jet at one point for long periods of time; continually rotate high-pressure spray assembly. • Do not use unit indoors. • Pull the trigger while turning off the machine to make sure piping is not under pressure. • Inform all personnel of restricted area and do not permit unauthorized individuals (i.e., those not properly trained [40-hour OSHA training, etc.] or wearing appropriate PPE) access to the exclusion zone. • If in the vicinity of known pedestrian traffic, use a spotter to alert crew to stop operations to allow pedestrian to pass.	
	Exposure to or ignition of elevated levels of gasoline vapors		If there is any gasoline odor or if air knifing activities are occurring in an impacted area, monitoring with a PID and LEL meter is required. Action levels are defined in the HASP.	
	Equipment damage/failure due to cold temperatures		When temperatures drop below 20˚F or when the water used to conduct subsurface clearance freezes, subsurface clearance should stop until warmer temperatures occur or the safe operation of the machinery is no longer impacted.	
	Injury from or damage to overhead utilities from direct contact with or proximity to (arcing)		Maintain a distance of at least 10 feet from energized overhead power line. For other overhead lines such as phone or cable lines, if there is a chance of contacting and/or damaging the lines, the appropriate service company should be contacted so that the lines can be relocated or protected.	
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Vacuum operation	Personal injury (burns, pinch points, cuts, hearing damage) from vacuum blower		Keep hands, clothing, and equipment an arms length away from rotating machinery, inlet and discharge openings. • Avoid contact with blower casing and associated piping; may cause major skin burns on contact. • Ensure guards are in place on external moving parts. • Develop suction line vacuum break mechanism in the event of a vacuum emergency (object caught by the suction hose). • Wear hearing protection when unit is operational	
	Fire/explosion from ignition of elevated vapors		Air monitoring must take place on ungrounded Vac-Trons • If LEL levels of breathing zone or working zone (air which is traveling through the Vac-Tron) air exceeds 10%, **STOP WORK**. • Vac-Tron is not to be used to vacuum free-phase petroleum products or soils saturated with petroleum products	
	Injury from or damage to overhead utilities from direct contact with or proximity to (arcing		Maintain a distance of at least 10 feet from energized overhead power line. For other overhead lines such as phone or cable lines, if there is a chance of contacting and/or damaging the lines, the appropriate service company should be contacted so that the lines can be relocated or protected.	
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Additional Notes				

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All Employees

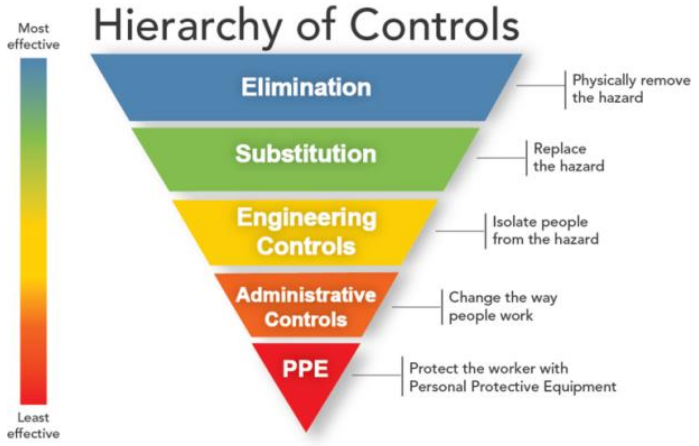
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

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***

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
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1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
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5 to 9 (Medium)	Risk requires approval by Supervisor or equivalent
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

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
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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

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Americas

Task Hazard Assessment

S3AM-209-FM6

Instructions

1. **This form or other applicable region- or business line-specific form is to be completed in accordance with SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.**
2. **Task Hazard Assessments (THA)s are required for any field work involving AECOM activities outside of the office and must be used onsite to review site hazards and confirm necessary controls are in place.**
3. **The THA must be reviewed in its entirety and modified at the work site (as needed) immediately prior to commencement of work to account for actual conditions and any changes (weather, scope of work, simultaneous operations, etc.). All necessary revisions must be written on the THA.**
4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas.**
5. **The completed form must be retained in the project files.**

Project Name and Number		**Overall Risk (Highest Post-Mitigation Risk)**	HIGH
Task Name	Drilling - Well Installation / Soil Sampling	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

Required PPE	☐ Hard Hat	☐ Eyewear (with side shields)	☐ High-Visibility Vest	☐ Ankle Height Footwear	☐ Gloves	☐ Hearing Protection
	Specify type: ☐ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☐ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☐ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☐ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

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Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Contact One-Call, private utility contractor, and/or site personnel to locate and mark underground utilities.	*Failure to have underground utilities identified could result in explosion, electrocution, injury, death, property damage.*	M	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	L
On-Site Edits:				
Set up work zone	Struck by vehicle or equipment traffic	H	Verify that drilling contractor inspects equipment daily using S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection or equivalent. Verify that kill switch on rig is tested and operational. Establish work zone using traffic control devices, signs, cones, etc. in advance of initiating monitoring well abandonment activities. Restrict access to observers and passersby.	L
	Sprain or broken bones due to slip, trip or fall		Maintain required housekeeping in work area, do not carry equipment where visibility of ground is impaired, remove or mark all trip hazards in work area.	
	Contact with overhead utilities.		2d. Keep a minimum of 15 feet from overhead power lines (20 ft. if 230-285 KV, 25 ft. if 285-345 KV, 35 ft. if 345-500 KV) Check HASP to ensure client/site does not have stricter requirements. Mast shall be down when rig is in motion.	
	Hydraulic failure causing release to the environment.		Place secondary containment on ground under rig. Ensure that secondary containment is setup with 'berms/barriers' or containment is securely clipped onto the rig tracks/wheels to protect from any fluid leaking off the plastic.	
On-Site Edits:				

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Commence drilling	Pinch points	H	Never place hands, fingers, feet under the bottom of an auger flight, or other location where these heavy items could be set down or could fall suddenly.	H
	Entanglement		Ensure rotating parts are properly guarded. Remove loose clothing and jewelry that could become entangled in moving parts. Use a long handled shovel to remove cuttings from the auger/rods.	
	Noise		Wear hearing protection while equipment is in use.	
	Back strain/ overexertion when unloading equipment		Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	
	Flying/shattering objects		Have bystanders maintain a 5 foot distance from the operation at all times. Wear all required	
	Hand positioning/pinch points		Wear leather or thick puncture-resistant gloves, communication between driller, helpers, and logger. All pinch point hazards should be labeled on rig with warnings.	
On-Site Edits:				
Pulling out core barrel/sampler and extruding core/sample into bag	Injury due to struck by or crush injuries	H	Keep all limbs out of line of fire. Ensure all guards are in place any time the drill rig is in operation. Only the authorized personal are to be in the immediate vicinity of the Drill Rig. Wear cut/impact resistant gloves.	M
	Cut/laceration on sharp edges or core barrel/sampler		5b. Inspect core barrel/sampler for sharp edges and remove. Wear cut/impact resistant gloves.	
	Pinch points using hammer to hammer side of core barrel/sampler.		Never place hands, fingers, feet under the bottom of an auger flight, or other location where these heavy items could be set down or could fall suddenly. Ensure rotating parts are properly guarded. Remove loose clothing and jewelry that could become entangled in moving parts. Use a long handled shovel to remove cuttings from the auger/rods.	
On-Site Edits:				

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Well Casing Assembly and Installation	Muscle strain.	M	Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	L
	Slip, trip, and fall (STF) hazards from uneven		Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to work and remove or isolate STF hazards.	
	Injury from improper tool use.		Do not use tools for unintended purposes (such as a saw to open bags of bentonite instead of an approved cutting tool).	
	Dust inhalation.		Wear a dust mask and minimize dust when pouring powdered bentonite, concrete, or cement.	
	Cutting PVC, cuts, lacerations		Use PVC cutter for cutting PVC. Wear cut-resistant gloves (Level 2), keep fingers and other body parts away from cutting tool blade.	
	Exposure to airborne chemicals or explosive atmosphere		Conduct air monitoring with PID and 4-gas in background areas and breathing zone of all workers, Stop work if PID or LEL indicates action level, Wear respirator with organic vapor cartridge if VOCs cannot be controlled.	
	Crushed by, pinch point on drill rig		Keep body parts away from moving parts on drill rig.	
On-Site Edits:				

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Installation of sand filter pack/bentonite	Injury from cutting bags open	M	Use a safety knife. No fixed-blade knifes allowed on site. Cut away from the body. Wear minimum Level 2 cut-resistant gloves	L
	Eye and respiratory injury due to dust and other airborne particles		Refer to the SDS for use information. Pour from the upwind side of the well construction activity. Wear long sleeved shirt, long pants, gloves, and safety glasses.	
	Back or muscle strain due to improper load or lifting techniques		Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body.	
On-Site Edits:				
Grouting	Exposure to cement dust and mixed cement, skin, eye, and inhalation	H	Exposure to cement dust and mixed cement, skin, eye, and inhalation	L
	Injury from entanglement in drive shaft or mixing paddles		Do not reach into the mixing tank during operation. Do not wear loose clothing or use tools that could become entangled in drive shaft or mixing paddles. Turn the unit off before attempting to service the mixer or clear debris.	
	Splashes and spills		Wear face shield to guard against splashes. Add water or other liquid additives in a controlled manner to avoid splashes. Do not exceed the capacity of the mixing tank	
	Muscle strain		Stage bags of dry materials as close to mixer as possible. Use a buddy to help move heavy bags. If possible, lower the height of mixer to minimize lifting.	
On-Site Edits:				

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Excavating Well Pad Area	Underground Utility Strike	H	Ensure area of well pad was cleared during underground utility clearance procedure for well.	M
	Back or muscle strain		Keep shovel loads and twisting motions to a minimum. Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body.	
	Struck by shovel		When shoveling, know area of shovel movement is clear from people or objects. Do not use shovel in the direction of people and objects. If in area of shoveling, do not approach shoveled area unless they acknowledge you and stop working.	
On-Site Edits:				
Installing Well Pad Frame	Cutting Wood Frame	M	Wear cut-resistant gloves (Level 2), keep fingers and other body parts away from blades, watch for jumping of saw, work in area where other employees will not enter	L
	Injury from assembling well frame		Wear cut resistant gloves at all times and watch hand placement to avoid sharp edges and pinch points. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools	
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Pouring and Troweling Concrete Pad	Exposure to cement dust and mixed cement, skin, eye, and inhalation irritation.	M	Refer to the SDS for use information. Wear long sleeved shirt, long pants, gloves, and safety glasses. Wear a P, N, or R-95 dust respirator when dealing with dry cement (moving bags, pouring, mixing, and putting bags in trash).	L
	Back or muscle strain		Keep shovel loads and twisting motions to a minimum. Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body.	
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Additional Notes

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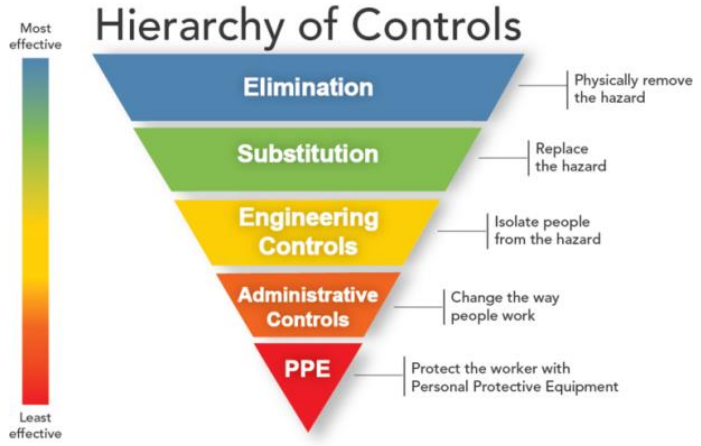

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Americas

Task Hazard Assessment

S3AM-209-FM6

Instructions

1. **This form or other applicable region- or business line-specific form is to be completed in accordance with SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.**
2. **Task Hazard Assessments (THA)s are required for any field work involving AECOM activities outside of the office and must be used onsite to review site hazards and confirm necessary controls are in place.**
3. **The THA must be reviewed in its entirety and modified at the work site (as needed) immediately prior to commencement of work to account for actual conditions and any changes (weather, scope of work, simultaneous operations, etc.). All necessary revisions must be written on the THA.**
4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas.**
5. **The completed form must be retained in the project files.**

Project Name and Number		**Overall Risk (Highest Post-Mitigation Risk)**	MEDIUM
Task Name	Oversight of Drilling Activities	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

Required PPE	☐ Hard Hat	☐ Eyewear (with side shields)	☐ High-Visibility Vest	☐ Ankle Height Footwear	☐ Gloves	☐ Hearing Protection
	Specify type: ☐ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☐ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☐ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☐ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Mobilization	Striking unidentified underground utilities	H	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.	L
	Striking overhead utilities		Follow the requirements of S3AM-322-PR1 Overhead Lines. Verify adequate clearance of all drilling locations prior to setting up at drilling location.	
On-Site Edits:				
Setting up at drilling location	Biological hazards causing bites, stings or other injury	H	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.	L
	Struck by traffic causing serious bodily injury		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.	
	Unstable Rig platform causing tip/fall with crushing injuries		Verify with contractor that rig is set up level and properly chocked and blocked.	
On-Site Edits:				

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Oversight of rig inspection	Mechanical failure of equipment	H	Verify that drilling contractor inspects equipment daily using S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection or equivalent.	L
	Emergency shut off disabled		Verify that kill switch on rig is tested and operational	
On-Site Edits:				
Drilling Oversight	Flying debris, caught by/ struck by injuries	H	Keep a safe distance away during rig operation. Always stand outside of the tip/fall radius of the mast, recommended safe distance is to be no less than 30 feet away from the rig, or the mast height plus 5 feet. Do not talk on cell phone or be distracted by paperwork when in immediate proximity to rig. Stay a safe distance (minimum 5') from outriggers. Do not place or store any equipment on the rig. Verify that all personnel follow S3NA_321_PR1 Drilling, Boring, Direct Push Probing. Wear PPE including hard hats, steel-toe safety boots, safety glasses, and hearing protection.	M
	Caught in/by equipment		Keep hands, feet and other body parts shall be kept a minimum of 5' away from moving parts. When augers are rotating, stay clear of the rotating auger and other rotating/moving components of the drill rig, i.e. outriggers. Do not approach operator without making eye contact and getting approval. Watch for loose clothing (hooded sweatshirts, baggy clothing, loose shoelaces).	
	Exposure to contaminants causing injury or illness		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.	
	Noise-induced hearing loss from loud drilling operations		Setup at least 30' away from noisy operations. Don't be near the rig when hammering. Measure dB levels with a noise meter. Wear hearing protection.	
On-Site Edits:				

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On-Site Edits:				
Additional Notes				

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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.

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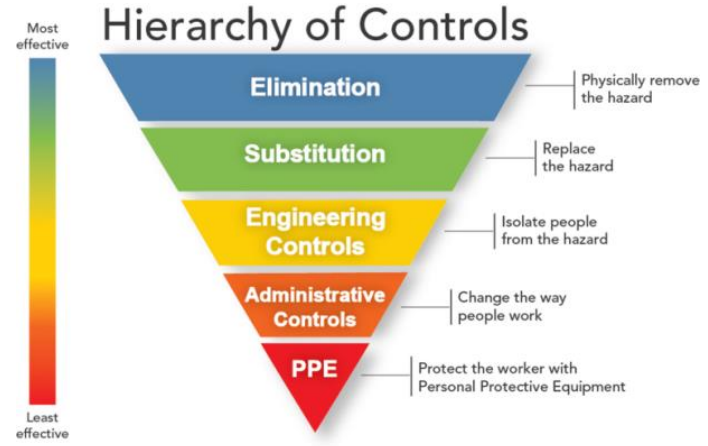
- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

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***

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 Supervisor or equivalent
10 to 25 (High)	Risk requires the approval of the Project Manager & SH&E Director

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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

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Americas

Task Hazard Assessment

S3AM-209-FM6

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Project Name and Number		**Overall Risk (Highest Post-Mitigation Risk)**	MEDIUM
Task Name	Soil Sampling with Hand Auger	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

Required PPE	☐ Hard Hat	☐ Eyewear (with side shields)	☐ High-Visibility Vest	☐ Ankle Height Footwear	☐ Gloves	☐ Hearing Protection
	Specify type: ☐ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☐ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☐ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☐ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Setup equipment	Cuts or hand injuries from pinch points	L	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	L
	Back strain/ overexertion when unloading equipment		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	
On-Site Edits:				
Advancing hand auger	Contacting utilities causing serious personal injury or death.	H	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.	M
	Back strain or pulled muscle from rotating hand auger.		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.	
	Injury from slip, trip, fall		Clear the work area of trip hazards. Walk around bore hole, never over it and cover hole with delineator when unattended.	
	Injury to eyes from flying debris.		If it is windy, stand upwind and switch to goggles to prevent dirt entering eye	
On-Site Edits:				

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Collecting soil samples	Contact with contaminated soil	M	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	L
	Cut from handling auger, sampling tools, jars		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.	
	Muscle strain in back or legs from bending over or squatting		Evaluate work surface height (see if chair/ table needed) and sample jar placement to eliminate ergonomic issues. Avoid squatting and bending	
On-Site Edits:				
Adding extensions to auger	Cuts or hand injuries from pinch points	H	Avoid placing hands near connection points of extensions and avoid the sharp edges of the auger cup. Wear cut resistant gloves at all times	L
	Striking another person		Check that the swing radius of the auger is clear before moving it	
	Contacting overhead structure		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	
On-Site Edits:				

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Breakdown and decontaminate equipment	Contact with contaminants and cut hazards	M	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.	L
	Breaking a sample container resulting in cut, or contact with contents/preservatives		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.	
	Striking another person		Before disassembling auger, verify that no one is in the swing radius	
On-Site Edits:				
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Additional Notes				

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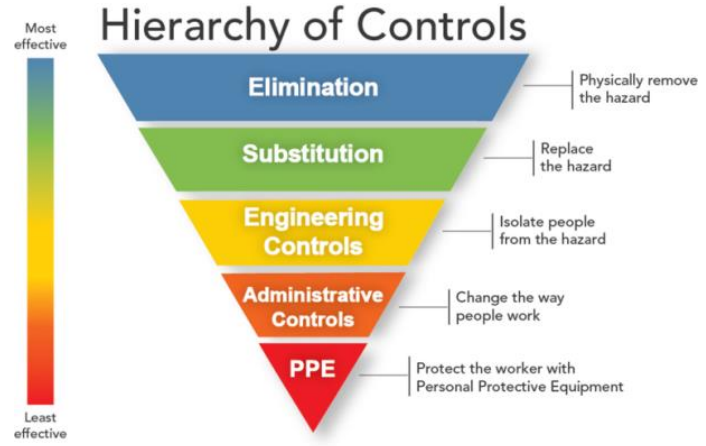

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Project Name and Number				**Overall Risk (Highest Post-Mitigation Risk)**		MEDIUM
Task Name	Portable Generator Operation			**Date**		Click or tap to enter a date.
Work Location	Click or tap here to enter text.			**Client**	Click or tap here to enter text.	
Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.			
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	Other:	Click or tap here to enter text.				

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Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Spill Kit Fire Extinguisher Eye wash and rinse water

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Selecting proper generator and electrical connections	Inadequate power for needs Overheating/fire of electrical cords Lack of sustainability causing fire hazards	**M**	Verify that the generator will provide sufficient wattage to safely operate the equipment you need. Select a UL rated 3 pronged heavy- duty outdoor construction rated extension cord with proper wire gauge to handle the load. When long term power is needed, evaluate alternative sources for sustainability.	**L**
On-Site Edits:				
Familiarize yourself with generator hazards and prevention measures	Not recognizing the potential hazards associated with a generator (fires, sprains/strains, electric shock, etc.) Fires and mechanical failure from inadequate maintenance	**H**	Read Owners Manual! Verify ongoing inspection and scheduled maintenance for owned and leased equipment. The maintenance schedule should be presented in the Owner's Manual but routinely should include oil and spark plug change, air filter replacement, ensuring the battery is properly charged and that battery connections are cleaned, the equipment is started every 30 days or so, and that it is drained of fuel when not in use.	**L**
On-Site Edits:				

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Operating the generator and turn-off	Carbon monoxide poisoning & entrainment of Carbon monoxide gas into adjacent buildings/structures	**H**	NEVER OPERATE A GENERATOR INDOORS. Direct generator exhaust away from personnel and work area. Know the symptoms of Carbon Monoxide poisoning including headache, nausea, dizziness, fatigue and shortness of breath. Leave area immediately if symptoms are experienced. Set generator away from doors, windows, and potential entrainments sources such as air intakes, HVAC systems, etc.	**L**
	Fire, explosion, skin contact with fuel while refueling		Refuel only when engine is off and cool, use proper containers, wear gloves, avoid spills	
	Heat, vibration, fuel vapors, noise		Maintain safe distance, monitor for overheating, wear PPE (hearing protection, gloves), avoid enclosed spaces	
	Electrical backfeed, hot surfaces		Turn off connected equipment first, then shut down generator; allow cooling before handling. Do not start a generator when it is raining or when you are wet. Verify that generator is equipped with a GFCI. Inspect all equipment to be attached to the generator including tools & electrical cords prior to attaching to the generator	
	Exertion/strain/sprain from pull starting		Pull cord start generators can be difficult to start, especially if cord is old or gummy. Make sure pull cord is in good condition upon inspection. Get an electric – start generator if possible.	
On-Site Edits:				
Load and unload generator	Sprains, strains, exertion, pinch points	**M**	Stretch and flex before attempting to load or unload. Know the weight of the generator and your personal ability. Use assistance. Be aware of hand placement.	**L**
	Burns to hands from hot parts		Always allow a generator to cool completely before attempting to load/unload.	
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Fuel generator	Fires from fueling	**M**	Allow generator to cool for a minimum of 30 minutes after operation before refueling. Keep a portable ABC fire extinguisher in the fueling area. No open flames allowed within 50' of fueling operations.	**L**
	Fuel spills		Store fuel in an ANSI approved container of no more than 5 gallons Have a spill kit available in case of spills. Fuel and store fuel in a secondary containment.	
	Splash of fuel to eyes/face		Wear safety glasses when fueling. Have eyewash and clean rinse water available in case of splash.	
On-Site Edits:				

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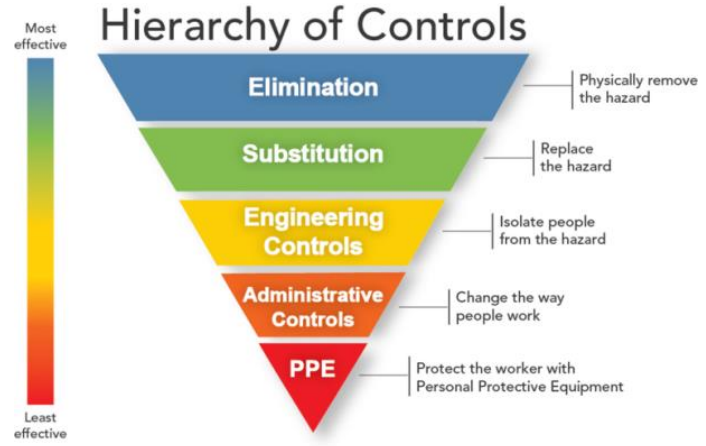

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1 - Improbable	5	4	3	2	1

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 Supervisor or equivalent
10 to 25 (High)	Risk requires the approval of the Project Manager & SH&E Director

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.

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

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Americas

Task Hazard Assessment

S3AM-209-FM6

Instructions

1. **This form or other applicable region- or business line-specific form is to be completed in accordance with SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.**
2. **Task Hazard Assessments (THA)s are required for any field work involving AECOM activities outside of the office and must be used onsite to review site hazards and confirm necessary controls are in place.**
3. **The THA must be reviewed in its entirety and modified at the work site (as needed) immediately prior to commencement of work to account for actual conditions and any changes (weather, scope of work, simultaneous operations, etc.). All necessary revisions must be written on the THA.**
4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas.**
5. **The completed form must be retained in the project files.**

Project Name and Number	Click or tap here to enter text.	**Overall Risk (Highest Post-Mitigation Risk)**	LOW
Task Name	**Monitoring Well Abandonment**	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

Required PPE	☐ Hard Hat	☐ Eyewear (with side shields)	☐ High-Visibility Vest	☐ Ankle Height Footwear	☐ Gloves	☐ Hearing Protection
	Specify type: ☐ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☐ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☐ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☐ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Contact One-Call, private utility contractor, and/or site personnel to locate and mark underground utilities.	*Failure to have underground utilities identified could result in explosion, electrocution, injury, death, property damage.*	M	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	L
On-Site Edits:				

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Remove concrete pad (if required)	Improper tools for task.	M	Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure.	L
	Injury from tool use & lifting		Look around and behind you before starting. • Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure. • Do not swing or apply tool (sledge hammer, shovel, digging bar) until area is free of bystanders. • Do not use extreme force. Use controlled motions and avoid having prying tool "break free". • Don all required PPE – Cut/impact resistant gloves, safety classes, face shield. • Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body.	
	Airborne debris		Observers should maintain adequate distance (25 feet) when breaking up concrete pad. Wear safety glasses.	
	Noise		Wear hearing protection while equipment is in use.	
On-Site Edits:				

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Position drill rig over pre-cleared borehole in position to tower up mast (when over drilling)	Struck-by, crushed-by, caught-by drill rig.	H	Communicate path of movement to all project personnel. Establish and use agreed upon hand signals during spotting activities. Always use a spotter(s) to direct movement of drill rig and watch for vehicle and pedestrian traffic.	M
	Contact with overhead utilities.		Keep a minimum of 15 feet from overhead power lines (20 ft. if 230-285 KV, 25 ft. if 285-345 KV, 35 ft. if 345-500 KV) Check HASP to ensure client/site does not have stricter requirements.	
	Slip, trip, and fall (STF) hazards from uneven terrain, slick surfaces		Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to drilling and remove or isolate STF hazards.	
	Hydraulic failure causing injection injury or release to the environment.		Place secondary containment on ground under rig. Ensure that secondary containment is setup with 'berms/barriers' or containment is securely clipped onto the rig tracks/wheels to protect from any fluid leaking off the plastic. Inspect hydraulic lines. Look for leaks with piece of wood or cardboard – never a body part.	
On-Site Edits:				
Over drill well (when required)	Pinch points	M	Never place hands, fingers, feet under the bottom of an auger flight, or other location where these heavy items could be set down or could fall suddenly.	L
	Entanglement causing severe injury/amputation		Ensure rotating parts are properly guarded. Remove loose clothing and jewelry that could become entangled in moving parts. Use a long handled shovel to remove cuttings from the auger.	
	Hearing loss from noise		Wear hearing protection while equipment is in use.	
	Back strain/ overexertion when unloading equipment		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.	
On-Site Edits:				

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7. Perforate Casing to Total Depth (when required)	Cuts or contusions to hands, fingers or other body parts due to contact with drill rig hammering	M	Keep fingers and other body parts away from hammer, watch for jumping/shifting of the rig, work in area where other employees will not enter. Wear cut-resistant gloves.	L
	Hand injury manipulating rods for perforation process		7b. Watch hand placement to avoid sharp edges and pinch points. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools. Wear impact resistant gloves at all times	
On-Site Edits:				
Fill well with bentonite chips or granules (when required)	Respiratory or skin/eye illness from contact with bentonite	M	Avoid creating and breathing dust. Pour from upwind side of well. Open bag and pour bentonite chips slowly in well ventilated area. Wear goggles/spoggles and leather gloves when adding bentonite to well	L
	Slips, trips, and falls due to hydrated bentonite		Maintain clean work area by minimizing bentonite spillage to ground. Immediately clean up any spilled material.	
On-Site Edits:				

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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)*
Mixing and pumping grout	Injury to back or strain from lifting and mixing, moving equipment (wheel barrel), cuts/lacerations.	M	Use buddy system when lifting materials >50 pounds. Use proper lifting techniques (lift with your legs and arms, not back). Do not reach or twist when lifting. Make sure you have a clear path to where you are going before you carry heavy objects over distance.	L
	Inhalation of airborne particulates		Stay upwind and wear dust mask while mixing grout.	
	Pressurized hose or tremie pipe failure		Inspect hose connections for wear and damage prior to pressurization and pumping grout. Inspect tremie pipe at connections and verify that there are no obstructions in tremie pipe prior to pumping grout. Use whip -checks on all pressurized lines.	
On-Site Edits:				
Site restoration	Ergonomic Injury from lifting heavy bagged materials	M	Inspect bags prior to lifting and carrying heavy bags of topsoil, concrete, or asphalt patch material. Stretch before working. Bend at knees and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds	L
	Injury or property damage from stepping or driving into open holes or fresh fill areas		Restore areas as soon as practical to avoid leaving open holes. Use traffic control devices, as needed, to prevent vehicles or pedestrians from contact with open holes or newly restored areas	
	Contact with patch materials and dust		Avoid creating and breathing dust. Pour from upwind side of hole. Open bag and pour slowly in well ventilated area. Wear goggles/spoggles and leather gloves when handling materials	
On-Site Edits:				

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Additional Notes				

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All Employees

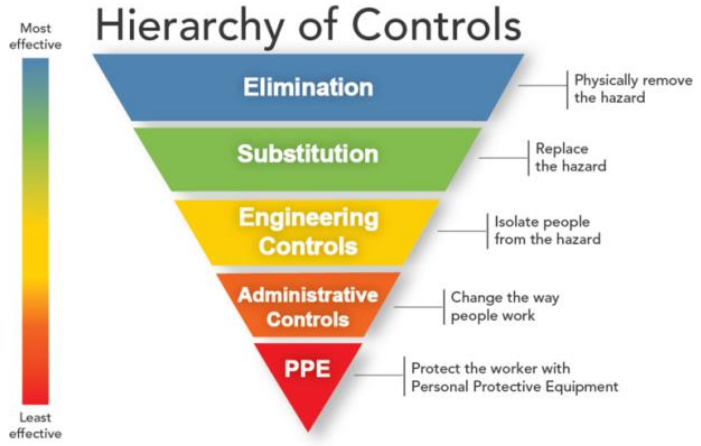
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

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***

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
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Risk Rating (Probability x Severity)	Risk Acceptance Authority
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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
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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
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Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

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Americas

Task Hazard Assessment

S3AM-209-FM6

Instructions

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Project Name and Number	Click or tap here to enter text.	**Overall Risk (Highest Post-Mitigation Risk)**	HIGH
Task Name	Investigation Derived Waste Management	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans: Click or tap here to enter text.

Required PPE	☐ Hard Hat	☐ Eyewear (with side shields)	☐ High-Visibility Vest	☐ Ankle Height Footwear	☐ Gloves	☐ Hearing Protection
	Specify type: ☐ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☐ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☐ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☐ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Prepare work area	Trips & falls	M	Clear any trip/fall hazards from work area. Scan ground prior to moving or walking	L
	Tools and emergency equipment not present		Obtain tools and emergency equipment and stage adjacent to work area	
On-Site Edits:				
Remove drum lid	Pinch points at drum ring	M	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)	L
	Sharp edges on drum ring or rim		Evaluate rim and ring for sharp edges, avoid handling as much as possible. Wear cut resistant gloves	
On-Site Edits:				

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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)*
Load soil into drums	Exertion/sprains/strains	M	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.	L
	Exposure to contaminants		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.	
	Slips/trips/falls		Be alert for uneven and slippery terrain. Keep tools and equipment away from walking paths.	
	Sharp edges on drum rim		Inspect rim for sharp and rough edges, avoid leaning into drum or placing hands onto rim edge Wear cut-resistant gloves	
On-Site Edits:				

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Replacing drum ring	Pinch Points	M	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)	L
On-Site Edits:				
Moving/relocating drums	Exertion	M	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.	L
	Trips and Falls		Clear any trip/fall hazards from work area. Scan ground prior to moving or walking	
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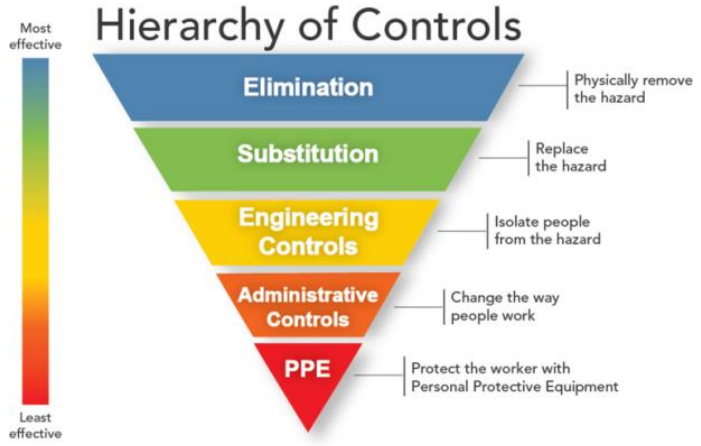

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Americas

Task Hazard Assessment

S3AM-209-FM6

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Project Name and Number	Click or tap here to enter text.	**Overall Risk (Highest Post-Mitigation Risk)**	Choose an item.
Task Name	Monitoring Well Construction/Abandonment and development	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

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	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Hand tools, Bentonite chips, pump, First Aid Kit, Gas meter, Spill Kit, Decon Supplies, Fire Extinguisher, Traffic cones or other suitable barrier, manhole lifting device, tubing, decibel-meter, surge block, jackhammer, wheel chocks.

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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)*
Position equipment over proposed monitoring well location	Back strain or striking other individuals when moving gas powered auger.	**H**	Communicate path of movement to all project personnel. Establish and use agreed upon hand signals during spotting activities. Use proper lifting and turning techniques.	**L**
	Slip, trip, and fall (STF) hazards from uneven or slippery ground		Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to drilling and remove or isolate STF hazards.	
	Struck-by, crushed-by, caught-by drill rig.		Communicate path of movement to all project personnel. Establish and use agreed upon hand signals during spotting activities. Always use a spotter(s) to direct movement of drill rig and watch for vehicle and pedestrian traffic. Additional spotter(s) will be used in high traffic areas and in areas with blind spots where traffic is difficult to observe.	
	Contact with overhead utilities.		Keep a minimum of 15 feet from overhead power lines (20 ft. if 230-285 KV, 25 ft. if 285-345 KV, 35 ft. if 345-500 KV) Check HASP to ensure client/site does not have stricter requirements.	
	Hydraulic failure causing release to the environment.		Place secondary containment on ground under rig. Ensure that secondary containment is setup with 'berms/barriers' or containment is securely clipped onto the rig tracks/wheels to protect from any fluid leaking off the plastic.	
On-Site Edits:				

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Contact One-Call, private utility contractor, and/or site personnel to locate and mark underground utilities.	Striking unidentified underground utilities could result in explosion, electrocution, injury, death, property damage.	H	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.	L
	Entanglement in rotating parts causing severe injury or death.		Ensure rotating parts are properly guarded. Remove loose clothing and jewelry that could become entangled in moving parts. Use a long handled shovel to remove cuttings from the auger.	
	Noise induced hearing loss from engine.		Measure noise levels with decibel meter or app. Stand 20' away if not involved in the auger operation. Wear hearing protection while equipment is in use.	
	Back strain/ overexertion when unloading equipment		Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	
On-Site Edits:				
Commence drilling/augering	Pinch points with auger causing pinch or crush injuries	M	Perform documented review of the manufacturer's safe operating manual. Never place hands, fingers, feet under the bottom of an auger flight, or other location where these heavy items could be set down or could fall suddenly.	L
	Entanglement in rotating parts causing severe injury or death.		Ensure rotating parts are properly guarded. Remove loose clothing and jewelry that could become entangled in moving parts. Use a long handled shovel to remove cuttings from the auger.	
	Noise induced hearing loss from engine.		Measure noise levels with decibel meter or app. Stand 20' away if not involved in the auger operation. Wear hearing protection while equipment is in use.	
	Back strain/ overexertion when unloading equipment		Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	
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Monitoring well assembly and installation	Muscle strain from improper lifting of heavy materials	**M**	Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	**L**
	Slip, trip, and fall (STF) hazards from uneven or slippery ground		Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to work and remove or isolate STF hazards.	
	Cut/laceration njury from improper tool use.		Do not use tools for unintended purposes (such as a saw to open bags of bentonite instead of an approved cutting tool).	
	Dust inhalation.		Stay upwind whilst pouring materials. Wear a dust mask and minimize dust when pouring powdered bentonite, concrete, or cement.	
	Cutting PVC, cuts, lacerations		Use PVC cutter for cutting PVC, keep fingers and other body parts away from cutting tool blade. Observe blade line of fire. Wear cut-resistant gloves (Level 2)	
On-Site Edits:				
Installation of sand filter pack/bentonite	Injury from cutting bags open	M	Use a safety knife. No fixed-blade knifes allowed on site.. Cut away from the body. Wear minimum Level 2 cut-resistant gloves	L
	Eye and respiratory injury due to dust and other airborne particles		Refer to the SDS for use information. Pour from the upwind side of the well construction activity. Wear long sleeved shirt, long pants, gloves, and safety glasses.	
	Back or muscle strain due to improper load or lifting techniques		Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body.	
On-Site Edits:				

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Inspect Wells (Open and close)	Pinch Points between cover and ground, abrasion while opening lid with ratchet.	L	Use tools to remove the covers. Remove/replace manhole covers so that they do not pinch fingers. Wear leather gloves for this task.	L
	Back Strain		Utilize proper lifting procedure when removing covers – Bend at the knees and lift with your legs rather than bending/lifting with your back. If heavy, use the help of a coworker.	
On-Site Edits:				
Attach pump/surge to tubing and lower in well.	Pinch points between pump and well casing	M	Note and avoid pinch points between pump and well casing. Wear coated nitrile gloves, or leather gloves when handling tubing.	L
	Overhead hazards causing injury to body/hands		Note and avoid overhead hazards. STOP WORK if any utility lines could be contacted.	
	Back strain from lowering pump/surge block into well		If well is at deeper depth to be performed comfortably by one person it may be necessary to use two people to lower the pump. Use a rope attached to the pump to lower, not the tubing.	
	Repetitive Motion injury from moving surging up and down.		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.	
On-Site Edits:				

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Bail or pump water from well (incl. removing pump/tubing from well)	Repetitive motion bailing/pumping well.	M	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.	L
	Exposure from splashes during bailing/pumping activities.		Wear additional PPE (Tyvek) if deemed necessary, pace bailing actions. Wear eye protection, long pants, nitrile gloves, and steel-toed boots.	
	Spill or release of impacted water.		Have spill pillows/socks available to contain any release or impacted water spill.	
	Slip, trip, fall.		Wear appropriate PPE (eye protection, long pants, leather gloves, long sleeves, steel-toed boots.	
	Back strain.		Use proper lifting technique (lift with the knees) while handling purge water containers/buckets. Secure bucket lids to prevent splashes/spills.	
	Exposure to contaminants.		When removing tubing use nitrile gloves and paper towels (if necessary to wipe down tubing) as removed. Wipe tubing in downward motion.	
	Overhead/Horizontal hazards.		Remove and coil tubing as removed or lay-out on ground surface. Ensure that tubing on ground surface does not hinder any nearby operations.	
	Back strain.		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.	
On-Site Edits:				
Decontamination - Soak/spray durable equipment to prevent cross-contamination between multiple well locations; properly store disposable equipment	Exposure to decontamination chemicals	L	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.	L
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Well Abandonment - Unload equipment	Cuts or hand injuries from share edges of cutting tools	M	Inspect equipment for damage and sharp edges, replace all broken or damaged equipment. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools. Wear cut resistant gloves at all times and watch hand placement to avoid sharp edges and pinch points	L
	Back strain/ overexertion when unloading equipment		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.	
On-Site Edits:				
Well Abandonment - Set up work zone	Broken bones due to contact with vehicle or equipment traffic	M	Establish work zone using traffic control devices, signs, cones, etc. in advance of initiating monitoring well abandonment activities. Restrict access to observers and passersby. Don hi-visible vest.	L
	Sprains, strains or broken ankles or legs due to slip, trip or fall		Maintain housekeeping in work area, do not carry equipment where visibility of ground is impaired, remove or mark all trip hazards in work area. Plan travel path to avoid changes in surface.	
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Well Abandonment - Mix grout	Injury to back or strain from lifting and mixing and moving equipment	M	Lift with legs and not back. Do not reach or twist when lifting. Make sure you have a clear path to where you are going before you carry heavy objects over distance	L
	Inhalation of airborne particulates		Stay upwind and wear dust mask while mixing grout. Pour grout slowly.	
	Hand injury from tools used to open bags		Use scissors or safety cutters to open grout bags. Fixed open blade knives are not allowed to be used. Cut away from yourself and others. Inspect tools prior to use. Use cut-resistant gloves.	
	Eye or skin irritation from contact with grout		Use tools to mix grout. Add water slowly to avoid splashing. Wear safety glasses and chemical-resistant gloves.	
On-Site Edits:				
Well Abandonment - Fill well annulus or perforated well with grout	Eye or skin irritation from contact with grout	L	Avoid contact with grout. Wear safety glasses and chemical-resistant gloves.	L
	Contact injury from pressurized hose or tremie pipe failure		Inspect hose connections for wear and damage prior to pressurization and pumping grout. Inspect tremie pipe at connections and verify that there are no obstructions in tremie pipe prior to pumping grout. Wear safety glasses and chemical resistant gloves.	
	Slips, trips, and falls due to obstructions and slippery work area conditions		Maintain clean work area free from trip hazards, such as hoses intersecting walking paths. Clean up any splashed or spilled grout immediately.	
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Well Abandonment - Debris handling and disposal	Cuts and abrasions and pinch points during debris handling	M	Note pinch points and sharp edges on concrete, well vaults, protective casings, metal skirts, and bollard debris and avoid. Don leather gloves	L
	Ergonomic Injury from lifting heavy objects		Stretch before working. Bend at knees and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds	
On-Site Edits:				
Well Abandonment - Position drill rig over pre-cleared borehole in position to tower up mast	Struck-by, crushed-by, caught-by drill rig.	H	Communicate path of movement to all project personnel. Establish and use agreed upon hand signals during spotting activities. Always use a spotter(s) to direct movement of drill rig and watch for vehicle and pedestrian traffic. Additional spotter(s) will be used in high traffic areas and in areas with blind spots where traffic is difficult to observe.	L
	Contact with overhead utilities.		Keep a minimum of 15 feet from overhead power lines (20 ft. if 230-285 KV, 25 ft. if 285-345 KV, 35 ft. if 345-500 KV) Check HASP to ensure client/site does not have stricter requirements.	
	Slip, trip, and fall (STF) hazards from uneven terrain, slick surfaces		Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to drilling and remove or isolate STF hazards.	
	Hydraulic failure causing injection injury or release to the environment.		Place secondary containment on ground under rig. Ensure that secondary containment is setup with 'berms/barriers' or containment is securely clipped onto the rig tracks/wheels to protect from any fluid leaking off the plastic. Inspect hydraulic lines. Look for leaks with piece of wood or cardboard – never a body part.	
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Well Abandonment - Over drill well	Pinch points	H	Never place hands, fingers, feet under the bottom of an auger flight, or other location where these heavy items could be set down or could fall suddenly.	L
	Entanglement causing severe injury/amputation		Ensure rotating parts are properly guarded. Remove loose clothing and jewelry that could become entangled in moving parts. Use a long handled shovel to remove cuttings from the auger.	
	Hearing loss from noise		Wear hearing protection while equipment is in use.	
	Back strain/ overexertion when unloading equipment		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.	
	Cuts or contusions to hands, fingers or other body parts due to contact with drill rig hammering		Keep fingers and other body parts away from hammer, watch for jumping/shifting of the rig, work in area where other employees will not enter. Wear cut-resistant gloves.	
	Hand injury manipulating rods for perforation process		Watch hand placement to avoid sharp edges and pinch points. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools. Wear impact resistant gloves at all times	
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Well Abandonment - Remove well pad & manway	Injury from tool use	M	Look around and behind you before starting. Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure. Do not swing or apply tools (sledge hammer, shovel, digging bar) until the area is free of bystanders. Do not use extreme force. Use controlled motions and avoid having prying tools "break free. Don all required PPE.	L
	Slips, trips, and fall injuries		Practice good housekeeping and frequently clear concrete debris. Keep unused tools off the ground. Do not carry debris long distances for disposal; if possible, park support vehicles in close proximity to well.	
	Eye or body injury from flying debris		Observers should maintain 25' distance when breaking up concrete pad. Wear safety glasses	
	Injury to body due to underground Utility Strike		Ensure area of well pad was cleared during underground utility clearance procedure as well as overhead hazards with the drill rig. Verify utilities and the need for any LOTO requirements.	
	Sprains or strains to back or shoulders during jack hammer use		Take breaks from utilizing jackhammer or other hand tools to break out manway. Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body. Don leather gloves, safety glasses, hard hat and hearing protection.	
	Cuts or contusions to face due to contact with debris		When jackhammering, ensure area of debris throw is clear from people or objects. If in area of shoveling, do not approach technician using jackhammer unless they acknowledge you and stop working. Don leather gloves, safety glasses, hard hat and hearing protection.	
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Backfilling & surface restoration	Exposure to cement dust and mixed cement and asphalt (eye, and inhalation irritation)	M	Refer to the SDS for use information. Mix upwind. Wear long sleeved shirt, long pants, gloves, and safety glasses. Wear a P, N, or R-95 dust respirator when dealing with dry cement (moving bags, pouring, mixing, and putting bags in trash).	L
	Back or muscle strain due to over exertion		Keep shovel loads and twisting motions to a minimum. Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use required lifting techniques, lift with legs, keep back straight, and carry object close to body. Don leather gloves.	
	Ergonomic Injury from lifting heavy bagged materials		Inspect bags prior to lifting and carrying heavy bags of topsoil, concrete, or asphalt patch material. Stretch before working. Bend at knees and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	
	Injury or property damage from stepping or driving into open holes or fresh fill areas.		Restore areas as soon as practical to avoid leaving open holes. Use traffic control devices, as needed, to prevent vehicles or pedestrians from contact with open holes or newly restored areas.	
	Contact with patch materials and dust.		Avoid creating and breathing dust. Pour from upwind side of hole. Open bag and pour slowly in well ventilated area. Wear goggles/spoggles and leather gloves when handling materials.	
On-Site Edits:				
Fill well with bentonite chips or granules	Respiratory or skin/eye illness from contact with bentonite	M	Avoid creating and breathing dust. Pour from upwind side of well. Open bag and pour bentonite chips slowly in well ventilated area. Wear goggles/spoggles and leather gloves when adding bentonite to well	L
	Slips, trips, and falls due to hydrated bentonite		Maintain clean work area by minimizing bentonite spillage to ground. Immediately clean up any spilled material.	
	Cuts and abrasions and pinch points during debris handling		Note pinch points and sharp edges on concrete, well vaults, protective casings, metal skirts, and bollard debris and avoid. Don leather gloves.	
	Ergonomic Injury from lifting heavy objects		Stretch before working. Bend at knees and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	
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Well Pad Construction or replacement - Set up air compressor and equipment		Overturn the air compressor	H	Check to see that ground is stable and level enough to support the air compressor.	M
		Vehicle collision, Unexpected vehicle or equipment movement		Stand clear of moving vehicles, use spotter to direct driver. Communicate with others working in area when moving air compressor to prevent striking others. Properly hitch air compressor to vehicle before relocating. Once air compressor is in position, **place wheel chocks behind wheels to prevent unexpected movement**.	
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Remove concrete pad with jack hammer and hand tools	Injury from moving heavy loads	M	Use a buddy to move jack hammer.	L
	Slips, trips, and falls		Practice good housekeeping; keep air compressor hoses out of walking paths and frequently clearing concrete debris.	
	Struck by airborne debris		Jack hammer operator must use face shield to protect face from debris while operating equipment. Observers must stand outside established work zone. Wear safety glasses and hard hats to protect against airborne debris from jack hammer or hand tool use.	
	Struck by hand tools		Look around and behind you before swinging sledge hammer to avoid striking others.	
	Release of stored energy in digging bar resulting in fall or struck by injury (bar or concrete pad)		Avoid placing excessive pressure on digging bar when prying out concrete pad (bending the bar) as this could suddenly release stored energy.	
	Dust inhalation		Maintain upwind positioning while operating jack hammer. If excessive dust, wear particulate dust mask to avoid breathing dust.	
	Exposure to noise		Operator and observers must wear hearing protection during jack hammer operations.	
	Burns		Beware of hot surfaces inside compressor housing. Wear leather gloves when touching compressor components.	
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Mix concrete	Injury to back or strain from lifting and mixing, moving equipment (wheel barrel), cuts/lacerations	M	Use buddy system when lifting materials >50 pounds. Use proper lifting techniques (lift with your legs and arms, not back). Do not reach or twist when lifting. Make sure you have a clear path to where you are going before you carry heavy objects over distance.	L
	Exposure to cement dust and mixed cement, skin, eye, and inhalation irritation.		Stay upwind and wear dust mask while mixing concrete. Refer to the SDS for use information. Wear long sleeved shirt, long pants, gloves, and safety glasses. Wear a P, N, or R-95 dust respirator when dealing with dry cement (moving bags, pouring, mixing, and putting bags in trash).	
	Hand injury		Use proper tools to open concrete bags and mix concrete. Inspect tools prior to use. Wear leather gloves.	
On-Site Edits:				
Pour concrete pad	Muscle strain	M	Use two people to move heavy well materials to avoid muscle strain or back injury. Keep shovel loads and twisting motions to a minimum. Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body.	L
	Slips, trips, and falls		Maintain a clear path when moving well materials from the support vehicle to the drill rig.	
	Injury from improper tool use		Do not use tools for unintended purposes (such as a saw to open bags of concrete instead of an approved cutting tool).	
	Dust inhalation		Wear a dust mask and minimize dust movement when pouring powdered concrete.	
On-Site Edits:				
Mark position of completed well pad and isolate from traffic	Exposure to vehicles	M	Mark wet concrete well pads with cones or other barricades to alert passersby and vehicles to avoid striking newly completed well pad.	L
On-Site Edits:				

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Debris handling and disposal	Cuts and abrasions and pinch points during debris handling	M	Wear leather gloves when handling debris. Be aware of pinch points and rough and sharp edges on concrete.	L
	Injury from lifting heavy objects		Use more than one person to lift/move heavy (>50 lbs.) debris.	
	Injury from improper tool use		Do not use tools for unintended purposes (such as a saw to open bags of concrete instead of an approved cutting tool).	
	Dust inhalation		Wear a dust mask and minimize dust movement when pouring powdered concrete.	
On-Site Edits:				
On-Site Edits:				

Additional Notes

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All Employees

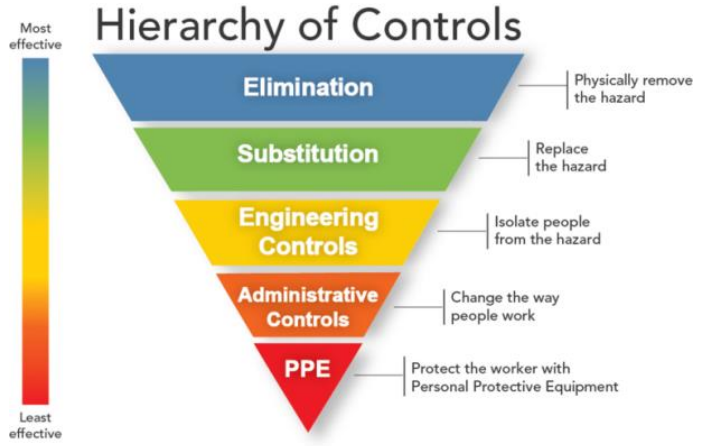
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

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***

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
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Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
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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
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Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
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Americas

Task Hazard Assessment

S3AM-209-FM6

Instructions

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Project Name and Number	Click or tap here to enter text.	**Overall Risk (Highest Post-Mitigation Risk)**	LOW
Task Name	Monitoring Well Sampling	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

Required PPE	☒ Hard Hat	☒ Eyewear (with side shields)	☒ High-Visibility Vest	☒ Ankle Height Footwear	☒ Gloves	☐ Hearing Protection
	Specify type: ☒ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☒ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☒ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☒ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☒ Nitrile ☒ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☒ Other - Specify: Leather	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Knee Pads				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Visually clear proposed sampling locations	Exposure to biologic hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reaction, rabies	H	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	L
	Damage to equipment or vehicles due to surface / subsurface obstructions		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.	
On-Site Edits:				
Opening and closing well casings / flush-mount covers and well plug lock	Cuts / lacerations / crushing, bruises	M	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, don knee pads.	L
	Back strain		Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	
	Vapor exposure resulting in inhalation hazards or illness		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.	
On-Site Edits:				

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Gauge water level of well	Aches and strains from repetitive motion	**L**	Do not use awkward positioning. Keep back straight, take regular rest/stretch breaks. Change position regularly.	**L**
	Exposure to chemical hazards in groundwater resulting in skin irritation or illness		Use smooth movements to avoid splashes. Don nitrile gloves over cut resistant gloves and safety glasses with side shields. Check gloves for damages/ rips.	
	Cross contamination of equipment		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.	
	Trips / falls from entanglement in measuring tape		Check for location of measuring tape before walking or moving around.	
On-Site Edits:				
Insert sampling device (bailer, tubing, hydrosleeve) into well	Cuts/lacerations/crushing, bruises	M	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.	L
	Pressurized systems		Bleed pressure off when making connections and disconnections from pump regulator assembly. Check pressures – operate within proper range. Cylinder should be transported upright, secured, with regulator removed.	
On-Site Edits:				

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Sample well	Exposure to chemical hazards in groundwater resulting in splash or inhalation hazard or illness	L	Stay upwind to avoid vapor exposure. Retrieve sampling device at a steady controlled rate to avoid splashing. Wear safety glasses and nitrile gloves.	L
	Cuts/lacerations/bruises to knee (flush mount)		Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch	
On-Site Edits:				
Gather sampling equipment and tools, place in work vehicle	Cuts/lacerations/crushing/bruises from gathering or dropping equipment	L	Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing.	L
	Aches and strains from improper lifting		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)	
On-Site Edits:				

Additional Notes

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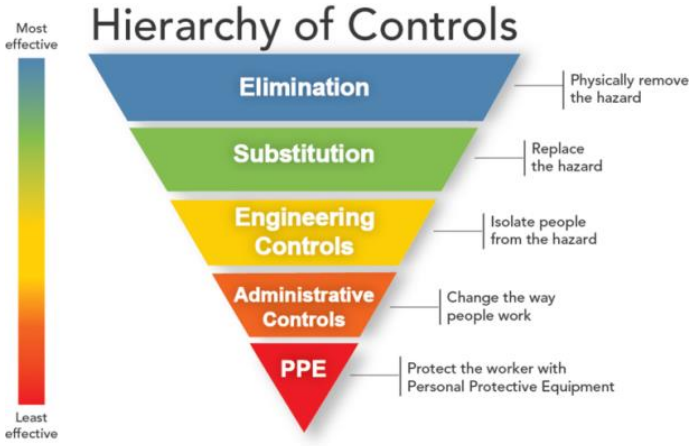
- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
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Americas

Task Hazard Assessment

S3AM-209-FM6

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Project Name and Number	Click or tap here to enter text.	**Overall Risk (Highest Post-Mitigation Risk)**	Choose an item.
Task Name	Soil Sampling	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

Required PPE	☒ Hard Hat	☒ Eyewear (with side shields)	☒ High-Visibility Vest	☒ Ankle Height Footwear	☒ Gloves	☐ Hearing Protection
	Specify type: ☒ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☒ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☒ Class 2 ☐ Class 3	Choose 1 or more as required: ☒ Work boots ☒ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☒ Nitrile ☒ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☒ Other - Specify: Leather	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
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Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Setup equipment	Cuts or hand injuries from pinch points	**L**	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	L
	Back strain/ overexertion when unloading equipment		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	
On-Site Edits:				

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Collecting soil samples (with trowel, hand auger, dynamic cone penetrometer (DCP)	Contacting utilities causing serious personal injury or death.	H	Ensure subsurface clearance protocol and permit requirements are being followed before beginning work. Advance sampling tool slowly and if refusal is met, remove the tool from the soil and inspect the cause of refusal. If a utility, pea gravel, or non-native fill material is encountered, **STOP WORK** and call the PM.	L
	Back strain or pulled muscle from rotating hand auger.		Do not yank on the auger or DPT 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.	
	Muscle strain in back or legs from bending over or squatting		Evaluate work surface height (see if chair/ table needed) and sample jar placement to eliminate ergonomic issues. Avoid squatting and bending	
	Contact with contaminated soil.		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	
	Contacting overhead structure		Before raising the auger or DCP vertically, verify that no overhead lines or structures are present **STOP WORK** and move if electrical lines are in the area	
	Cut from handling auger, sampling tools, jars		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.	
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Breakdown and decontaminate equipment	Contact with contaminants and cut hazards	M	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.	L
	Breaking a sample container resulting in cut, or contact with contents/preservatives		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.	
	Striking another person		Before disassembling auger, verify that no one is in the swing radius.	
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Additional Notes				

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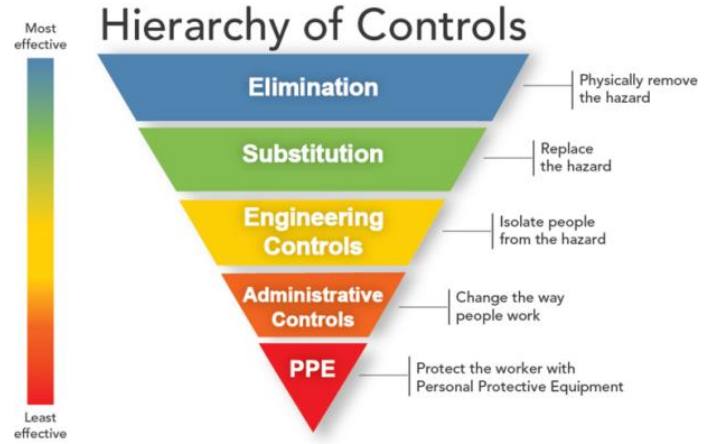

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Task Hazard Assessment

S3AM-209-FM6

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Project Name and Number	Click or tap here to enter text.	**Overall Risk (Highest Post-Mitigation Risk)**	LOW
Task Name	Work Area Air Monitoring – HAZWOPER Site	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

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	Other:	Click or tap here to enter text.				

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Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Photo Ionization Detector Standard Gases Regulator and Tubing Calibration Bags, if applicable

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Initial Instrument Inspection • Calibration record / certification provided with unit • Instrument fully charged • Charging cables present • Standard (i.e. Calibration /Bump Check) Gas present with enough volume • Regulator for gas cylinder present	Calibration/Bump Check Gas not present or insufficient volume for the work Instrument not fully charged and/or charge cables missing Fingers caught in pinch points created by the instrument case	M	STOP WORK – Obtain additional standard gas before activities requiring air monitoring can start. STOP WORK – Obtain charging cables and/or fully charge the instrument before activities requiring air monitoring can start Fully open instrument case and lay it flat on a stable surface before removing the instrument, standard gas, regulator, charging cables and other component; Avoid pinch points created by the lid	L
On-Site Edits:				
Instrument 2-Point Calibration / Bump Check using Ambient Air and Standard Gas • **INITIAL – Prior to start of monitoring** • **VERIFICATION – Following unanticipated spike in readings or suspect reading** • **POST – Upon completion of activities for the day**	Inhalation of standard gas resulting in potential chemical exposure Instrument response to standard gas outside acceptable range indicating an instrument malfunction Dropped/falling gas cylinder resulting in injury Sudden and unexpected release of gas from cylinder or regulator	H	Perform instrument calibration/bump check in a well-ventilated area; Verify regulator valve is closed before attaching to gas cylinder; Zero instrument in the support zone and upwind of the exclusion zone; Inspect the instrument for blocked intakes prior to use; Verify adequate air and standard gas flow to the instrument; Conduct calibration/bump checks per the manufacturer's instructions; If instrument response remains outside acceptable range, STOP WORK – Obtain a replacement instrument before activities requiring air monitoring can start or resume. Secure large gas cylinders a wall; secure small gas cylinders from rolling on a stable working surface; Wear safety-toe boots. Inspect the gas cylinder to confirm it is in good working condition; Verify regulator valve is closed before attaching to gas cylinder; Keep the discharge end of the cylinder pointed away from your body; Wear site minimum PPE listed above.	L
On-Site Edits:				

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Walking Site/Monitoring for Airborne Contaminants	Exposure to airborne contaminants above regulatory exposure limits Falls into excavations/trenches Slips, trips and falls to same level due Repetitive motion or over-reaching resulting in musculoskeletal injuries Struck by operating excavation equipment and/or vehicles	H	Monitor your way into the Exclusion Zone (EZ) working from the Support Zone (SZ) through the Contamination Reduction Zone (CRZ); Allow enough time for the instrument to draw air in and register a response *(Note: Critical if using tubing or probe extension to monitor at different levels)*; Be familiar with action levels established for the site and respond to action levels as outlined in the HASP, including Stopping Work and/or upgrading to a higher level of PPE. Maintain a minimum of 6 feet away from the edge of excavations/trenches that are 4 feet or greater in depth; Remain stationary/still while obtaining and recording readings Remain stationary/still while obtaining and recording readings; Plan your path to minimize travel in congested areas and on sloped, wet/slick and uneven surfaces; Practice good housekeeping. Minimize twisting and bending; When you must bend, bend at your knees and keep your back straight; Use probe extensions or tubing to reach monitoring locations at a higher or lower level; Minimize the amount of instrumentation that you are carrying at one time; Be aware of your surroundings; Make eye contact with equipment operators and get their acknowledgement before entering the equipment's swing radius and/or blind spots; Do not linger behind equipment or vehicles and within their blind spots; Wear a high visibility vest or clothing.	L
On-Site Edits:				

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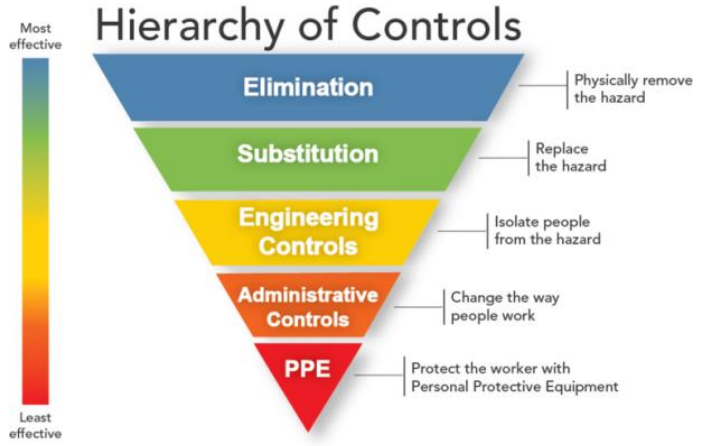
Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***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***

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 Supervisor or equivalent
10 to 25 (High)	Risk requires the approval of the Project Manager & SH&E Director

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.

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

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Task Hazard Assessment

S3AM-209-FM6

Instructions

1. **This form or other applicable region- or business line-specific form is to be completed in accordance with SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.**
2. **Task Hazard Assessments (THA)s are required for any field work involving AECOM activities outside of the office and must be used onsite to review site hazards and confirm necessary controls are in place.**
3. **The THA must be reviewed in its entirety and modified at the work site (as needed) immediately prior to commencement of work to account for actual conditions and any changes (weather, scope of work, simultaneous operations, etc.). All necessary revisions must be written on the THA.**
4. **Acknowledgement of THAs must be recorded via electronic or physical signature as part of the Daily Safety Meeting – refer to Daily Safety Meeting – Americas.**
5. **The completed form must be retained in the project files.**

Project Name and Number	Click or tap here to enter text.	**Overall Risk (Highest Post-Mitigation Risk)**	LOW
Task Name	Site Walk - General	**Date**	Click or tap to enter a date.
Work Location	Click or tap here to enter text.	**Client**	Click or tap here to enter text.

Does this include High Hazard Tasks (HHTs)? (Refer to Table 1 of SH&E Risk Assessment and Planning – Americas S3AM-216-PR2.)	☐ No	☐ Yes – Specify HHT procedure number(s) and any permits/plans:	Click or tap here to enter text.

Required PPE	☐ Hard Hat	☐ Eyewear (with side shields)	☐ High-Visibility Vest	☐ Ankle Height Footwear	☐ Gloves	☐ Hearing Protection
	Specify type: ☐ Type I (standard) ☐ Type II (climbing style)	Choose 1 or 2 as required: ☐ Safety glasses ☐ Spoggles ☐ Safety goggles ☐ Face shield	Choose type: ☐ Class 2 ☐ Class 3	Choose 1 or more as required: ☐ Work boots ☐ Steel toe ☐ Composite toe ☐ Metatarsal guard ☐ Electric rated ☐ Other - Specify: ….	Choose 1 or 2 as required: ☐ Nitrile ☐ Cut- resistant ☐ Thermal ☐ Vibration ☐ Electrical ☐ Other - Specify: ….	Choose 1 or both as required: ☐ Ear plugs ☐ Earmuffs
	Other:	Click or tap here to enter text.				

Note: Employees must have gloves readily available, even if the task does not require their use.
Note: All employees must wear shirts with sleeves that cover their shoulders and long pants at a minimum.

Tools and Equipment (Examples: air/noise monitoring equipment, tools, generators, traffic control devices, fire prevention equipment, etc.)	Click or tap here to enter text.

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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)*
Survey Equipment setup	Straining back or other parts of body due to improperly lifting or moving heavy objects	M	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.	**L**
	Bruising or broken bone in finger due to getting caught in a pinch point in the survey equipment.		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	
	Straining, tearing or fracturing body parts from slipping, tripping or falling from carrying too much equipment at one time		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.	
	Straining a wrist, arm or neck or sustaining other ergonomic injury due to prolonged survey work		Survey work can be repetitive – stretch regularly and report ergonomic injuries (strain, etc) as soon as you notice them.	
On-Site Edits:				

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Walking Through Site	Struck by vehicle or heavy equipment	M	No distracted walking / walking awareness – no use of cell phone or taking notes while walking; walk around obstructions. Listen for activity including any backup alarms/signals. Wear reflective clothing.	**L**
	Remote working conditions		Use a periodic check-in system; carry a cell phone at all times and work with a buddy whenever feasible.	
	Injury to eyes from flying debris		Wear appropriate eye protection to prevent dirt from entering the eye.	
	Injury to body or eyes from walking through thick vegetation		Wear required clothing (long sleeve shirt) to prevent scrapes on arms and legs. Wear safety glasses in dense vegetation to prevent branches from hitting your eyes.	
On-Site Edits:				

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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)*
Inspection of Facility, Chemicals, and Plants	Physical contact with chemicals, including chemical inhalation	M	Review SDSs, avoid contact with chemicals when possible. Wear chemical-resistant gloves (e.g., disposable nitrile gloves) only as a last resort. Immediately dispose of gloves and decontaminate after removing gloves. Do not handle containers that appear wet or stained or that have any substance pooling near the base. If a container needs to be handled, have a member of the facility move it. NEVER open any container to view its contents. Wash hands thoroughly with soap and water before eating or touching your face. Be aware of vapors in an enclosed room or area that may present an oxygen-deficient or explosive atmosphere. Review need for respirator if applicable, and if needed, ensure that you are fit tested annually, medically cleared to wear a respirator, use the correct respirator and filters for the hazards present, and inspect/clean respirator before use.	**L**
	Chemical spills causing falls or dermal or respiratory injury		Immediately leave the area and report all discovered spills to appropriate site personnel for proper clean-up and disposal. If a strong odor of unknown origin is present, immediately leave the area until the risk of entry can be assessed. Try to avoid multi-tasking. Do not pick up chemical containers whenever feasible. Leave the chemical on the shelf and turn it around to read the information while recording information. Use caution when shifting containers. Wear safety-toed boots. NEVER move a drum, battery, or compressed gas cylinder. Report all discovered spills to appropriate site personnel for proper clean-up and disposal.	
	Noise-related hearing loss		Minimize duration of exposure by taking breaks or alternating operators. Wear ear plugs.	
	Repetitive motion injury: crouching/bending during seed collection, examination, etc.		Stretch before working. Bend legs, not back; use knee pads or other padding to make kneeling or sitting more comfortable and avoid working in a bent-over position.	
	Loss of situational awareness due to both staff members focusing all attention on task	3	Have the staff member holding the seed collection bowl maintain situational awareness while the other shakes seeds into the bowl.	
On-Site Edits:				

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Inspecting alone Work	Getting lost, or injured while working alone	M	Ensure the lone worker procedures are reviewed and follow SOP instructions. These include: • Agreeing upon a specific communication plan prior to beginning work; • Checking in with supervisor/PM upon arriving and leaving site provided in SWP. Lack of communication will result in emergency services being notified after 30 mins after no contact of agreed upon time. • Mobile communications that have service, including cell phone, satellite phone or EPERB (Electronic Positioning Emergency Radio Beacon) in remote areas. • Travel itinerary, maps, enough water and food, and an emergency contact list.	**L**
On-Site Edits:				
On-Site Edits:				

Additional Notes

….

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All Employees

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

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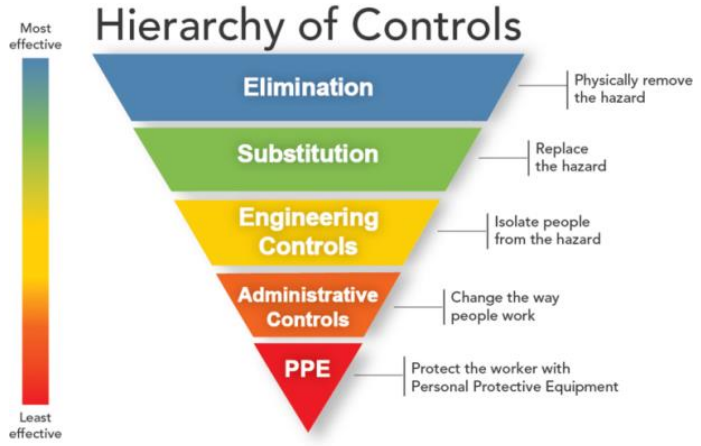

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Daily Safety Meeting

S3AM-209-FM5

Instructions

1. **Complete this form or equivalent in accordance with SH&E Risk Assessment and Planning – Americas S3AM-209-PR2.**
2. **Conduct the Daily Safety Meeting at the start of each shift. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Retain the completed form in the project files.**

AECOM Project Manager	Abdiel Lopez Torres		**Phone #**	+15189512393	
AECOM SH&E Contact	Caroline Lee		**Phone #**	(240) 678-4639	
Meeting Leader	….	**Project Name/Location**	338 Broadway, Kingston NY	**Project #**	60781325
Date …..	**Today's Scope of Work**	….			
Simultaneous Ops	☐ No ☐ Yes - **Specify impacts:** ….				
☐ **List Task Hazard Assessments (THAs; e.g., FLRAs) completed and reviewed for today's tasks**	….				

Muster Point Location:	**First Aid Kit Location:**	**Fire Extinguisher Location:**	**Spill Kit Location:**
….	….	….	….

1. Required Topics - Employees & Managed Subcontractors (Check if completed)

☐	Fitness for Duty requirements (all sign in/sign out)	☐	Personal Protective Equipment (PPE) (Required items per THAs are in good condition / in use by all.) **Specify Specialized PPE Needs:** ….
☐	Required training (including task specific) completed and current		
☐	SH&E Plan onsite (understood, reviewed, signed by all)	☐	Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public
☐	STOP WORK Right & Responsibility (all task changes/changed conditions must be reassessed with THA)	☐	Short Service Employees (SSE) (mentor/ oversight assignment for employees with less than 6 months experience working in the industry of the work to be performed)
☐	Requirement to report to supervisor any incidents (e.g., injury, illness, damage, near miss, unsafe act / condition)	☐	Required checklists/records available and understood **Describe:** ….
☐	Emergency Response Plan (including muster point, first aid kit, fire extinguisher, and clinic/hospital location)		

2. Discuss if Applicable to Today's Work (Check 'Yes' if reviewed, or 'NA' if Not Applicable. Work marked with [*] is considered high hazard work.)

Yes	NA		Yes	NA		Yes	NA	
☐	☐	Ergonomics (lifting, body position)	☐	☐	Hazardous Substances and Communication	☐	☐	Weather Hazards / Heat Stress / Cold Stress
☐	☐	Biological Hazards	☐	☐	* Railroads	☐	☐	* Hazardous Energy Control
☐	☐	*Ground Disturbance	☐	☐	* Underground Work	☐	☐	* Hand and Power Tools
☐	☐	*Work at Height	☐	☐	*Confined Spaces	☐	☐	* Working On, In or Near Water
☐	☐	*Highway & Road Work	☐	☐	*Heavy Equipment & Machines	☐	☐	Subcontractor Management (Review subcontractor plans and THAs)
☐	☐	* Required Work Permits/Plans are in place and understood. **Identify/ attach:** ….	☐	☐	Other Topics **Describe/ attach:** ….	☐	☐	Client Specific Requirements **Describe/ attach:** ….

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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**

4. Worker Acknowledgement and Sign In/Sign Out

SITE WORKERS (including AECOM Employees and Managed Contractors/Subcontractors): Your signature below indicates you understand the requirement to:

- Participate in creating, reviewing, & updating task hazard assessments (THAs) for all your tasks.
- Understand and continuously reassess tasks, hazards and mitigations, amending THAs as needed.
- Follow permit to work requirements if applicable to the work you are about to perform.
- Communicate any changes in personnel or conditions at the worksite to the supervisor.
- Exercise your authority and obligation to "Stop Work", intervene, and speak up / listen up if you are concerned or uncertain about safety or hazards, or if additional precautions are not recorded on the THA.

  Note: If you identify an imminent danger related to a contractor for which AECOM does not have contractual oversight, remove yourself and communicate your concerns to the contractor, site representative, and AECOM management immediately.

Your initials below certify you arrived and departed fit for duty, and have reported all incidents/near misses, meaning:

- You are physically and mentally fit for duty and have inspected your required PPE to ensure it is in satisfactory condition.
- You are not under the influence of any 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 and 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 ....

Attach additional Site Worker sign-in/out sheets if needed. Identify the number of attached sheets: ....

5. Site Visitor / Site Representative Sign In/Sign Out

Print Name & Company	Signature	Arrival Time	Departure Time
....		....	....
....		....	....
....		....	....
....		....	....

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Drill Site Safety Inspection Checklist

S3AM-303-FM3

Instructions

1. **This form is to be completed in accordance with Ground Disturbance – Americas S3AM-303-PR2.**
2. **Each shift must inspect all applicable items. If an unsatisfactory condition (fail) is observed, suspend the operation of the equipment, and report the condition to the site supervisor immediately.**
3. **Submit a safety observation each day before leaving the project site.**
4. **The completed form must be retained in the project files.**

Details	
Site / Project Name	338 Broadway Kingston, NY
Name of Inspector	....
Date and Time Inspected	....

Checklist		Yes	No	N/A
a.	**Morning**			
i.	Did a daily safety meeting occur and were all parties engaged and fit for duty?	☐	☐	☐
ii.	Did the driller complete their rig inspection checklist?	☐	☐	☐
iii.	Has equipment and Personal Protective Equipment (PPE) been verified, including the spill kit, fire extinguisher, first aid kit?	☐	☐	☐
iv.	Have drill rig emergency shut-off switches been verified to be functioning?	☐	☐	☐
b.	**Site Set/Rig Up**			
i.	Have overhead lines been identified and accidental contact controlled?	☐	☐	☐
ii.	Are paint markings for underground utilities still visible?	☐	☐	☐
iii.	Is the rig at the correct drill location, with GPS/maps/etc. checked?	☐	☐	☐
iv.	Is there plastic under the rig?	☐	☐	☐
v.	Is site control in place, such as cones and tape, as well as fencing?	☐	☐	☐
vi.	If needed, are leveling jacks in place/rig leveled/cribbing in place?	☐	☐	☐
vii.	Are line of fire hazards identified?	☐	☐	☐
c.	**Drilling**			
i.	Are augers/rods stored properly (e.g., not leaning on rig or truck)?	☐	☐	☐
ii.	Are spoils being removed from borehole safely?	☐	☐	☐
iii.	Are rods removed from the winchline when not in use (e.g., not left strung)?	☐	☐	☐
iv.	Are drillers communicating with each other (e.g., all hands clear when using wrenches and rotating augers)?	☐	☐	☐
v.	Are loads secured on forklifts?	☐	☐	☐
vi.	Are loads 50 pounds (22.7 kilograms) or greater either team or mechanically lifted?	☐	☐	☐
vii.	Are gloves and safety glasses in use?	☐	☐	☐

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Checklist		Yes	No	N/A
viii.	Are dust masks used when mixing grouting?	☐	☐	☐
ix.	Are five (5) minutes taken after lunch and before cleanup for a safety check-in?	☐	☐	☐
x.	Are three (3) points of contact used when entering/exiting equipment?	☐	☐	☐
xi.	Are drums properly labelled?	☐	☐	☐
xii.	Has equipment been observed for leaks of hydraulic fluid, fuel, etc.?	☐	☐	☐
d.	**Decontamination**			
i.	Has decontamination occurred per the approved location-specific safety plan?	☐	☐	☐
e.	**End of Day**			
i.	Is the borehole covered?	☐	☐	☐
ii.	Has feedback been provided to drillers?	☐	☐	☐
iii.	Has the plan been made for the next workday?	☐	☐	☐

Comments

....

Inspector Review and Approval

....		....
Inspector Name	Signature	Date/Time

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Heat Stress Monitoring Log

S3AM-112-FM1

Instructions

1. **This form is to be completed in accordance with Heat and Cold Stress – Americas S3AM-112-PR2.**
2. **The purpose of this form is to monitor employees for heat illness when applicable.**
3. **It is the responsibility of the Foreman or Supervisor-in-Charge to confirm that each person completes the required information.**
4. **The completed form shall be retained in the project files.**

Details

Project Name	338 Broadway SC		**Date**	…..	**Foreman/Supervisor Name**	….	
Work/Rest Duration:	….	Work (minutes)	….	Rest (minutes)	**Temperature Measured in**	☐ Celsius	☐ Fahrenheit

Employee Name	Water Provided[1]		Acclimated[2]		Vitals[3]	Period 1		Period 2		Period 3		Period 4	
	Yes	No	Yes	No		In	Out	In	Out	In	Out	In	Out
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….

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Employee Name	Water Provided[1]		Acclimated[2]		Vitals[3]	Period 1		Period 2		Period 3		Period 4	
	Yes	No	Yes	No		In	Out	In	Out	In	Out	In	Out
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….
….	☐	☐	☐	☐	**P**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**BP**	….	….	….	….	….	….	….	….
	☐	☐	☐	☐	**Temp**	….	….	….	….	….	….	….	….

[1] Each employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.

[2] An employee is “acclimated” if he/she has worked in a hot environment for at least 5 - 7 consecutive days. If an employee is acclimated, check “Yes.” If an employee is not acclimated, check “No” and reduce the work duration by 50 percent for that Employee until the 5 – 7 -day period is reached.

[3] P = pulse rate, BP = blood pressure, Temp = body temperature

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Vehicle Inspection Checklist

S3AM-005-FM2

Instruction

1. **This form or equivalent is to be completed in accordance with Driving – Americas S3AM-005-PR2.**
2. **This Vehicle Inspection Checklist is intended to be completed by the vehicle's driver prior to departing on a trip.**
3. **Checking boxes in the "Yes" column means that item is present and functioning.**
4. **Deficiencies that affect or could potentially affect the safe operation of the vehicle must be repaired or corrected before departure.**
5. **This checklist is not intended to replace a regular, comprehensive vehicle maintenance program.**
6. **The completed form must be retained in the project files.**

Vehicle Tag No	Mileage	Date	Time	Driver Name	Location
….	….	…..	….	….	….

	Item	Yes	No	N/A
1.	**General**			
a.	Proof of insurance and registration available and current?	☐	☐	☐
b.	Is the date of the last regular maintenance known, or is the mileage/date of next scheduled maintenance known?	☐	☐	☐
c.	Is the overall condition of the vehicle good (no body damage, unusual sounds, leaks, odors, etc.)?	☐	☐	☐
2.	**Tires**			
a.	Do all tires have sufficient tread for driving conditions? Legal limit: 2/32" (for rain/snow: > 4/32")	☐	☐	☐
b.	Are tires sufficiently inflated for driving conditions?	☐	☐	☐
c.	Are the lug nuts and stem caps present and tight for each tire?	☐	☐	☐
d.	Is the spare tire and jack present and in good condition?	☐	☐	☐
3.	**Vehicle Interior**			
a.	Are the brake and accelerator pedal pads in good condition?	☐	☐	☐
b.	Are the floor mats in good condition and not interfering with the brake or accelerator pedals?	☐	☐	☐
c.	Is the seat properly adjusted (including the headrest)?	☐	☐	☐
d.	Is the seatbelt in good condition?	☐	☐	☐
e.	Are the mirrors in good condition (not broken, dirty)?	☐	☐	☐
f.	Are the dashboard/instrument lights working?	☐	☐	☐
g.	Is the dashboard free of warning lights and do the gauges appear to work when the car is started?	☐	☐	☐
h.	Does the horn work?	☐	☐	☐
i.	Are distractions such as cell phones and GPS units secured so they do not encourage use?	☐	☐	☐
4.	**Lights and Signals**			
a.	Do the headlights and high beams work?	☐	☐	☐
b.	Do the tail lights function properly?	☐	☐	☐
c.	Do the turn signals work (front and rear)?	☐	☐	☐

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	Item	Yes	No	N/A
d.	Do the brake lights work (including high light in the rear window if applicable)?	☐	☐	☐
e.	Do the hazard lights (emergency flashers) work?	☐	☐	☐
f.	Do back up / reverse lights work?	☐	☐	☐
g.	If equipped with a back-up alarm, can it be heard clearly?	☐	☐	☐
5.	**Mechanical**			
a.	Do the brakes work and feel solid (not soft)?	☐	☐	☐
b.	Does the parking/emergency brake work?	☐	☐	☐
c.	Is the steering in good working condition (not loose)?	☐	☐	☐
d.	Is the engine oil level full or in the operating zone?	☐	☐	☐
e.	Excessive vehicle bounce going over bumps reported (possible sign of worn shock absorbers)?	☐	☐	☐
f.	Is the fuel level full or at an adequate level for the proposed usage?	☐	☐	☐
6.	**Windows and Windshield**			
a.	Is the windshield clean and unbroken?	☐	☐	☐
b.	Are the wiper blades in good condition (front and rear)?	☐	☐	☐
c.	Are all the windows clean and unbroken and windshield fluid available and operational?	☐	☐	☐
7.	**Emergency Equipment (as needed per conditions/project requirements)**			
a.	Is there a “Safety Kit” (fire extinguisher, first aid, safety triangle and 2 reflective vests)?	☐	☐	☐
b.	Is survival gear and equipment available (blanket, water, heat source, flashlight, etc.)?	☐	☐	☐
c.	Is a means for emergency communication available?	☐	☐	☐
8.	**Other Equipment (as needed per conditions/project requirements)**			
a.	Is there a means to secured loads (cargo next, container)?	☐	☐	☐
b.	Are cones or other warning devices available?	☐	☐	☐
c.	Is weather specific equipment (snow chains, tired etc.)?	☐	☐	☐
d.	Does the vehicle have a snow brush/ice scraper?	☐	☐	☐
9.	**Comments**			
….				

….		…..
Inspector Name	**Signature**	**Date**

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Appendix D Applicable SH&E Procedures

Biological Hazards

S3AM-313-PR2

1. Purpose and Scope

a. This procedure communicates the requirements and precautions to be taken by AECOM employees to protect against bloodborne pathogens, insects, arachnids, snakes, poisonous plants, feral animals, and other wildlife referred to herein collectively as “biological hazards.”

b. This procedure applies to all AECOM Americas employees and operations, as well as its contracted personnel required to comply with this document’s content.

2. Procedure

2.1 Critical Controls

a. The project team should identify potential biological hazard encounters during field work and develop a location-specific Safety, Health, and Environment (SH&E) plan and related task hazard assessments (THAs; e.g., field level risk assessments [FLRAs]) prescribing precautions to mitigate exposures and eliminate or reduce the severity of resulting illnesses. Refer to SH&E Risk Assessment and Planning – Americas.

b. The precautions to be taken by employees to decrease the risk of exposure to biological hazards can often directly increase the risk of heat-related illness due to thermal stresses. Refer to Heat and Cold Stress – Americas.

c. Employees must immediately notify their Project Manager or Supervisor of any biological hazard-related incident (e.g., imbedded tick, insect sting, animal bite, rash, abnormal reaction, or bloodborne pathogen-related exposure) and follow the reporting requirements found in SH&E Incident Response and Investigation – Americas. The Occupational Health Manager must be consulted in the event of any exposure incident.

d. Employees must be given information on how to respond to the applicable biological hazard-related incidents in their emergency response plan. Refer to SH&E Risk Assessment and Planning – Americas.

e. Employees with a history of severe allergic reactions to insect bites or stings should undertake work in areas infested with the allergens only after all required precautions are met. Specifically, such employees are encouraged to inform their project team of their allergies, avoid working alone, carry medications (e.g., Epi-pen) on them, and wear a medical identification bracelet or necklace.

2.2 Animals of Concern – General Requirements

a. Working in the field with or around small mammals, larger carnivores, and reptiles has inherent risks of injury or exposure to infectious diseases transmitted from animals to humans.

b. Wild animals can carry a variety of diseases that humans can contract i.e., viral, parasitic, bacterial, and protozoal. The risks can be either because of direct contact with a wild animal (i.e., break in the skin, or contact with the animal’s blood, saliva, or excrement) or through airborne diseases (e.g., hantavirus, histoplasmosis).

c. Full-length clothing, gloves, and a respiratory mask can greatly reduce the risk of exposure. Refer to Safety Gear – Americas and Respiratory Protection – Americas.

d. Wildlife biologists directly handling wildlife, dead or alive, or working with wildlife feces or in enclosed habitats (such as caves), have an increased risk of exposure to a wider range of zoonotic diseases and should take extra precautions. Any staff handling wildlife must be adequately trained and/or supervised by a wildlife biologist experienced in the task.

e. Employees must not work alone in areas where the risk of encounter with dangerous wildlife is high.

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2.2.1 Dogs

a. Treat unknown dogs encountered in field activities in the same manner as a wild animal.

b. Be conscious of behaviors indicating anxiety (e.g., tail under the belly), defensiveness, or aggressiveness, and attempt to leave the area if identified.

c. Gloves, catch sticks, caging, and other appropriate equipment should be considered and may be necessary.

2.2.2 Rodents

a. Rodents can carry a variety of diseases (e.g., hantavirus and bubonic plague). Although infections are rare, they can be fatal. Infection can be spread to humans when they:

   i. Breathe air contaminated by rodent saliva, urine, or feces containing infectious materials; or

   ii. Accidentally rub eyes, mouth, or broken skin with infected rodent mouse saliva, urine, or feces.

b. Rodent control measures must be employed at AECOM locations where there is a potential or evidence of rodent infestation. In these situations, the following precautions should be taken during field operations:

   i. Limit exposure to soil handling and use gloves where appropriate.

   ii. Wash or sanitize hands often throughout the day and before meals.

   iii. Equipment bags, storage areas, and vehicles should be frequently inspected for signs of mouse infestation.

   iv. Rodent-proof storage containers should be used when practical.

   v. Do not enter buildings infested with mice without adequate respiratory protection.

   vi. Droppings should never be removed by vacuuming or sweeping. Wetting down an area with a mixture of 1:9 household bleach and water solution will reduce risk of airborne exposure.

   vii. Repellent (i.e., DEET applied to skin or permethrin to clothing) should be used if there is potential exposure to rodent fleas.

2.2.3 Large Mammals – General Requirements

Most negative encounters with large mammals (e.g., bears, carnivores, and ungulates) can be avoided with a few key preventive measures:

a. When working in wilderness isolation, always travel in pairs and make lots of noise.

b. Always store food in air-tight containers away from sleeping areas (if camping), and never carry strong-smelling foods, which could attract animals.

c. Keep your eyes open for fresh animal signs that may indicate a dangerous situation.

d. Maintaining a distance of at least 100 feet (30 meters) allows large animals an escape route. If you notice any signs of aggression or behavioral changes, move away to a safe location. Wildlife should not be enticed by reaching out or simulating calls.

2.2.4 Bears

a. An encounter with a bear of any species can have a wide variety of outcomes, ranging from a simple sighting to a false charge, to a serious mauling or even death. Consequently, the risk of a bear encounter must be taken very seriously and can vary significantly depending on the location.

b. It is important to research the project area before field work commences to determine the expected probability of encountering bears and what type. Remoteness from urbanized areas should not be a criterion, as bears have been encountered within city limits, especially near landfills. The risk associated with a bear encounter also varies with the species of bear, the season, and the circumstances under which the bear is encountered.

c. The best defense against bears is to actively practice bear avoidance techniques when working in the field.

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2.2.5 Carnivores

a. Most wild carnivores in the feline family (cougars, lynx, and bobcat) or the canine family (wolves and coyotes) are more predictable than bears and are not predatory toward humans. However, all wild animals can be dangerous if they feel threatened or if they are sick or starving.

b. A fresh kill or carcass might indicate the presence of a carnivore that may become aggressive to defend its food.

2.2.6 Ungulates

a. Most ungulates (deer, moose, elk, and caribou) will avoid humans and will flee as soon as a human is sighted. However, females with young (during May and June) and males during mating season (September to November) can be very aggressive, especially if provoked.

b. Extensive fresh rubbing on branches in the fall might indicate the presence of a rutting male ungulate that may become aggressive to defend a potential mate.

2.2.7 Snakes

a. Staff working in areas known to be inhabited by venomous reptiles should take extra precautions, be able to identify the local species, and understand the best practices for administering first aid. Most venomous reptiles are non-aggressive and will only attack humans if immediately threatened.

b. The following precautions should be taken when there is a risk of a snake encounter:

   i. Be careful near heavy vegetation in or near the water's edge. This is where reptiles like to reside during the daylight hours.

   ii. Stay on trails where possible, and watch where you place your hands and feet, especially when climbing or stepping over fences, large rocks, and logs.

   iii. Take care when overturning any objects on the ground.

   iv. If you see a hazardous reptile, give it as much room as possible. Most snakes have a strike distance only half the length of their body.

   v. If venomous snakes are a risk, staff should contact local hospitals to determine availability of appropriate anti-venom and include all snakebite emergency response guidance in the applicable SH&E plan and THA.

2.2.8 Alligators

a. The chance of encountering an alligator is greatest during the animal's courtship and mating season (March to September). Also, July to September is when mother alligators are guarding their nests.

b. When trying to get past an alligator, do not walk between the alligator and the water in case the alligator gets frightened and runs toward the water. The alligator is not a natural runner and can tire out in a relatively short time. An alligator will often give up a chase when it sees the runner is moving away and too much effort is required.

2.3 Insects of Concern

Employees working outdoors may be exposed to a variety of insects, including but not limited to, ticks, mosquitos, spiders, and scorpions. Bites or stings from these insects may result in outcomes ranging from minor irritations to serious allergic reactions and/or illnesses.

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2.3.1 Flying Insects

Outdoor workers are at risk of being stung by flying insects (mosquitos, bees, wasps, and hornets). While most stings cause only mild discomfort, some may result in severe allergic reactions requiring immediate medical care and may cause death. As such, employees must take the following precautionary measures when working in habitat areas for flying insects:

a. Wear light-colored, smooth-finished clothing.

b. Avoid wearing perfume and cologne and strong-smelling deodorants, lotions, soaps, and shampoos.

c. Wear clean clothing and bath daily.

d. Wear clothing to cover as much of the body as possible.

e. Avoid flowering plants when possible.

f. Keep work areas clean. Some insects are attracted to discarded food.

g. Remain calm and still if a single stinging insect is flying around.

h. If an insect is inside your vehicle, stop slowly, and open all the windows.

i. Mosquitoes are known to breed in standing water; therefore, when standing water is found at a job site, actions should be taken to drain the water.

2.3.2 Ticks

a. The Centers for Disease Control and Prevention works with states, health authorities, and other experts on research to define and monitor the occurrence of disease-carrying ticks. See cdc.gov/ticks for additional information.

b. Employees working in or adjacent to areas where there are established tick populations must take the precautionary measures below.

   i. Before you go outdoors:

      1. Know where to expect ticks. Ticks live in grassy, brushy, or wooded areas, or even on animals. Avoid wooded and brushy areas with high grass and leaf litter and walk in the center of trails when possible.

      2. Treat clothing and gear with products containing 0.5% permethrin. Permethrin can be used to treat boots, clothing, and gear and remain protective through several washings. Alternatively, you can buy permethrin-treated clothing and gear.

      3. Tuck loose-cuff trousers into socks, wrap with duct tape completely around the cuff of the sock up to the surface of the pant leg to prevent entry of insects between the sock and pants, and preferably reverse wrap the tape with the sticky side out.

      4. Use government-approved repellants containing DEET, picaridin, IR3535, Oil of Lemon Eucalyptus (OLE), para-menthane-diol (PMD), or 2-undecanone. Always follow product instructions.

   ii. After you come indoors:

      1. Check your clothing for ticks. Ticks may be carried into the house on clothing. Turn clothing inside out and shake them at the end of day. Any ticks found should be removed. Tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing after you come indoors. If the clothes are damp, additional time may be needed. If the clothes require washing first, hot water is recommended. Cold and medium temperature water will not kill ticks.

      2. Examine gear and pets. Ticks can ride into the home on clothing and pets, then attach to a person or pet later, so carefully examine pets, coats, and daypacks.

      3. Shower within 2 hours of coming indoors. Showering may help wash off unattached ticks and it is a good opportunity to do a tick check.

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4. Check your body for ticks. Conduct a full body check upon return from potentially tick-infested areas. Use a hand-held or full-length mirror to view all parts of your body. Check these parts of your body and your child's body for ticks:
    - Under the arms
    - In and around the ears
    - Inside belly button
    - Back of the knees
    - In and around the hair
    - Between the legs
    - Around the waist

    Note: Tick testing is not recommended because results are unreliable for treatment decisions, may give false reassurance, and symptoms typically appear before results are available.

2.3.3 Spiders

a. The most common venomous spiders are the black widow and the brown recluse. Venomous spiders can be dangerous to outdoor workers. Spiders are not usually aggressive, and most bites occur because a spider is trapped or unintentionally contacted. It's important to know the risk of exposure to venomous spiders and how to protect yourself and what to do if you are bitten.

b. Workers can take the following preventive steps:

    i. Inspect or shake out any clothing, shoes, towels, or equipment before use.

    ii. Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials.

    iii. Minimize the empty spaces between stacked materials.

    iv. Remove and reduce debris and rubble from around the outdoor work areas.

    v. Trim or eliminate tall grasses from around outdoor work areas.

    vi. Store apparel and outdoor equipment in tightly closed plastic bags.

    vii. Keep your tetanus boosters up to date (every 10 years). Spider bites can become infected with tetanus spores.

2.3.4 Scorpions

a. Scorpions usually hide during the day and are active at night. They may be hiding under rocks, wood, or anything else lying on the ground. Some species may also burrow into the ground. Most scorpions live in dry, desert areas. However, some species can be found in grasslands, forests, and inside caves.

b. Workers can take the following preventive steps:

    i. Wear long sleeves and pants.

    ii. Wear leather gloves.

    iii. Shake out clothing or shoes before putting them on.

2.4 Plants of Concern

a. Employees working outdoors may be exposed to a variety of plants of concern, including but not limited to, poison ivy, poison oak, poison sumac, giant hogweed (giant cow parsnip), wild parsnip, devils club, and stinging nettle. This hazard still exists in the fall and winter in the form of stubble and roots.

b. Many plants are not harmful to the touch but may contain poisonous berries or foliage that could cause serious complications or death if they are ingested. Never eat any plants or berries, even if you are sure of their identity.

c. Workers should take the following preventive steps:

   i. Beware of your surroundings and the potential irritants in your work area.

   ii. Identify and avoid areas of poisonous plants.

   iii. Use skin guards to prevent the transfer of oils from clothes or equipment to skin.

   iv. If areas of poisonous plants need to be entered, consider clearing the area, when feasible, and wear protective clothing such as Tyvek.

2.5 Bloodborne Pathogens

There are a few activities for which potential occupational exposures to blood or other potentially infectious materials are of concern. These activities may include:

a. Investigations of properties receiving regulated wastes.

b. Site visits or audits at treatment, storage, and disposal facilities where wastewater or medical waste is handled.

c. Site visits or audits at medical or health care facilities.

d. Site work in areas where there is a potential risk for the presence of used hypodermic needles.

e. The provision of first aid or cardiopulmonary resuscitation (CPR).

   Note: First aid and CPR training is often on a voluntary basis and not directed by AECOM. As such, potential exposures may not be considered occupational exposures within the context of the OSHA Bloodborne Pathogens Standard.

f. Occasionally, potentially infectious material is encountered during an activity where none was expected. When this occurs, the work must be stopped, employee training conducted, and an exposure control plan prepared prior to resuming activities with potential exposures.

2.6 Exposure Control Plan for Bloodborne Pathogens

a. A site-specific exposure control plan (ECP) must be established for employees at risk for exposure to and possible transmission of infectious diseases from bloodborne pathogen sources. The ECPs must describe how employees are effectively informed of potential workplace health hazards, and the protective measures necessary to eliminate or effectively minimize the risk of bloodborne exposure incidents. ECPs for projects or programs extending over 1 year must be reviewed annually by the SH&E Manager and affected employees.

b. Sections 2.6.1 to 2.6.5 summarize key elements to be included in the ECP.

2.6.1 Potential Exposure Determination

Employees must consult with the Occupational Health Manager to determine if a Hepatitis A or B vaccination is appropriate given the site conditions and the proposed scope of work. These determinations should differentiate voluntary first-aid duties from occupational exposures as a component of the exposure determination.

2.6.2 Training

Refer to Section 3.

2.6.3 Hepatitis B Vaccination

a. Employees will be offered the Hepatitis B vaccination, at no cost to the employee, when assigned to tasks with potential occupational exposure to bloodborne pathogens or if incidental contact with potential sources of bloodborne pathogens occurs.

b. Employees choosing to take the vaccination series must sign a consent form. Employees who decline the Hepatitis B vaccine must sign a copy of a waiver form. All forms are to be stored by the Occupational Health Manager.

2.6.4 Engineering and Work Practice Controls

a. “Universal precautions” are a required method of control to prevent exposure to blood and body fluids. This term refers to the concept that all human blood and certain human body fluids are treated as if known to be infectious for human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and other bloodborne pathogens, regardless of the perceived risk status of another individual. Universal precautions apply to blood, and other body fluids containing visible blood. Universal precautions do not apply to feces, nasal secretions, saliva, sweat, tears, sputum, urine, and vomitus unless they contain visible blood.

b. Special provisions should be made so hand washing facilities are available on sites where bloodborne pathogens are suspected or present. If soap and running water are not available, an antiseptic hand cleaner in conjunction with clean paper towels or antiseptic towelettes are acceptable temporary alternatives to running water. When this alternative method is used, employees must wash their hands with soap and running water as soon as feasible.

c. Eating, drinking, smoking, applying cosmetics, and handling of contact lenses is prohibited in work areas where there is a reasonable likelihood of occupational exposure.

d. Fluorescent red or orange-red warning labels bearing the universal biohazard symbol and the legend BIOHAZARD must be firmly affixed to all containers (e.g., waste cans, sharps containers, and refrigerators) used for the storage or shipment of blood or other potentially infectious materials. Disposal manifests must be maintained in accordance with local law.

e. Any areas or equipment that are contaminated by potentially infectious material will be decontaminated using a 10% solution of household bleach. Utilize appropriate personal protective equipment to control exposure to the bleach (e.g. safety goggles, and gloves). Refer to Section 2.6.5.

2.6.5 Personal Protective Equipment

a. Personal protective equipment (PPE) will be provided at no cost to the employee and will be chosen based on the anticipated exposure to blood. PPE is considered appropriate if it does not permit blood or other potentially infectious materials to reach or pass through clothes, skin, or mucous membranes of the eyes or mouth under normal conditions of use, and for the duration of time the equipment is used.

b. Disposable single-use gloves must be used as a protective barrier in all situations in which contact with body fluids is anticipated. Gloves of the correct size will be provided. Disposable gloves must not be washed or disinfected for reuse and must be replaced between employees and if they become torn or punctured. Gloves are especially important if the Employee has cuts, abraded skin, chapped hands, or dermatitis.

c. Liquid-impermeable gowns, boots, and masks, in combination with eye-protective devices such as goggles and shatterproof glasses with solid-side shields or chin-length face shields, must be worn whenever splashing, spraying, or spattering of blood droplets or body fluids can be reasonably anticipated.

d. Disposable pocket mask ventilation devices must be provided in all first aid kits and used to avoid mouth-to-mouth contact during emergency cardiopulmonary resuscitation.

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e. Examples of recommended PPE include the following listed in Table 1 (depending on task, more PPE may be needed):

Table 1. PPE by Task

Task	Gloves	Gown	Mask	Goggles
Bleeding control w/ minimal bleeding	Yes	No	No	No
Bleeding control w/ spurting blood	Yes	Yes	Yes	Yes
Cardiopulmonary resuscitation	No	No	Yes	No
Decontamination/cleanup	Yes	No	No	No
Medical laboratory activities	Yes	Yes	Yes	Yes

2.6.6 Incident Response

a. All incidents in which an employee has been exposed to blood or other potentially infectious materials must be reported to the Employee's Supervisor and to the SH&E Manager immediately. The Occupational Health Manager must be consulted in the event of an exposure incident.

b. Post-exposure hepatitis vaccination will be offered to employees involved in an occupational exposure incident within 24 hours of possible exposure at no cost if required by the exposure determination.

3. Training

a. Employes must take appropriate training from AECOM University and third-party vendors to assist in the identification and control of biological hazards. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas.

b. All personnel who will work on projects or programs that involve potential contact with bloodborne pathogens are required to attend a training class prior to the start of the project or program and annually for continuing projects or programs. Refer to SH&E Training – Americas.

c. The specific requirements and provisions of the written ECP will be provided to each employee and any managed subcontractor assigned to work at the program/project site.

4. Terms and Definitions

a.	Bloodborne Pathogen Exposure	Exposure to blood containing pathogens including, but not limited to, HBV, HIV, hepatitis C, malaria, syphilis, babesiosis, brucellosis, leptospirosis, arboviral infections, relapsing fever, human T-lymphotropic virus Type I, and viral hemorrhagic fever (Ebola).
b.	CPR	Cardiopulmonary resuscitation.
c.	ECP	Exposure Control Plan – A plan addressing the requirements applicable to specific AECOM projects and activities designed to eliminate or minimize employee exposure. The ECP must be incorporated into the location-specific SH&E Plan and must be accessible to all employees.
d.	Field Work	Any activity conducted in outdoor settings; or at a site containing brush, overgrown grass, leaf litter, or poisonous plants; or located near mosquito breeding areas, including work in structures where animals harboring fleas or ticks might exist or where spiders and mites could be present.
e.	HBV	Hepatitis B virus.
f.	HCV	Hepatitis C virus.
g.	HIV	Human immunodeficiency virus.

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h.	Occupational Exposure (Exposed)	Reasonably anticipated skin, eye mucous membrane, or parenteral contact with blood or other potentially infectious materials resulting from the performance of an employee's duties. Employees are considered to be potentially exposed, even if they are using the universal precautions specified for the project or program.
i.	Poisonous	Capable of harming or killing by poison; toxic or venomous.
j.	PPE	Personal Protective Equipment.
k.	SH&E	Safety, Health, and Environment.
l.	Universal Precautions	All body fluids and materials potentially contaminated by body fluids will be considered to be infectious unless the fluids were from the person performing the cleanup or decontamination activities. All employees coming in contact with another person's body fluids must assume that the fluids are infectious and must wear prescribed personal protective equipment.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. SH&E Incident Response and Investigation – Americas S3AM-004-PR2

c. Heat and Cold Stress – Americas S3AM-112-PR2

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Respiratory Protection – Americas S3AM-123-PR1

6. Records

a. Bloodborne pathogens training class records must be maintained for at least 3 years from the date of training. The records will include the date of the training class, a summary of the class contents, the names of the qualified instructors, and the names and job titles of personnel attending the training.

b. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-302-PR2; consolidated portions of the contents from the following retired documents: Wildlife, Plants & Insects – Americas S3AM-313-PR1, Biological Hazard Assessment Decision Flowchart – Americas, S3AM-313-ATT01 , Ticks – Americas S3AM-313-ATT02, Poisonous Spider Identification – Americas S3AM-313-ATT03, Mosquito-Borne Diseases – Americas S3AM-313-ATT04, Plants of Concern – Americas S3AM-313-ATT05, Wild Parsnip Identification – Americas S3AM-313-ATT06, Alligators – Americas S3AM-313-ATT07, Bird Droppings Safe Practices – Americas S3AM-313-ATT08, Large Carnivores & Ungulates – Americas S3AM-313-ATT09, Bear Safety – Americas S3AM-313-ATT10, Small Mammals – Americas S3AM-313-ATT11, Snakes & Scorpions – Americas S3AM-313-ATT12, Bloodborne Pathogens – Americas S3AM-111-PR1, and Bloodborne Pathogens Exposure Control Plan – Americas S3AM-111-ATT1.	All

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Driving

S3AM-005-PR2

1. Purpose and Scope

a. This procedure establishes requirements for when operating:

   i. AECOM-owned, rented, or leased vehicles, client- or customer-owned vehicles, and personal vehicles used by AECOM employees on AECOM business.

   ii. Off-Highway Vehicles (OHVs), including all-terrain vehicles (ATVs), utility task vehicles (UTVs), and snowmobiles used to transport AECOM site personnel.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

c. Additional driving requirements are set forth in the Travel Policy – AECOM Global..

1.1 Critical Controls

The following is a list of the minimum required critical controls to be implemented as applicable by the Project Manager or Designee to prevent high potential/significant incidents:

a. Only Authorized Drivers are to operate a motor vehicle on AECOM business (this applies to rental, personal, client- or customer-owned, and AECOM-owned or leased vehicles). An Authorized Driver is an employee who receives Supervisor/Manager and, as applicable, Fleet Manager approval 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 while conducting AECOM business.

b. Authorized Drivers must maintain a valid and current driver's license with full privileges applicable to the vehicle to be operated and location. AECOM-owned, rented, or leased vehicles are for official business use only and are not to be used for personal activities.

c. Personal vehicles driven by Authorized Drivers on AECOM business must satisfy the registration and insurance legal requirements. Refer to the Travel Policy – AECOM Global, local travel procedures, and local Employee Handbook (refer to the Employee Handbooks Ecosystem page) for any additional requirements or approvals for personal vehicle use.

d. The Manager/Supervisor must work with the Safety, Health, and Environment (SH&E) Manager to determine driver training and qualifications specific to the project and vehicle. Refer to Section 3 - Training for additional information.

e. Prior to use of electric or hybrid electric vehicles, employees must review manufacturer charging instructions.

f. The use of fully autonomous, self-driving features is prohibited.

g. Employees with conditional licenses are prohibited from operating vehicles on AECOM business.

h. Drivers must follow all traffic laws and are prohibited from being under the influence of alcohol or drugs or improperly using medication in a way that could diminish an employee's ability to drive. Refer to Substance Abuse Prevention – Americas.

i. Authorized Drivers must immediately report the following:

   i. A change or limitation(s) to their operating license to the appropriate AECOM Human Resources Representative or Manager/Supervisor.

   ii. Receipt of a legal summons associated with a moving violation related to the use of a company vehicle to the appropriate Manager/Supervisor and SH&E Manager.

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j. All Authorized Drivers must perform a walk-around inspection of the vehicle prior to operation on company business and confirm the vehicle is in good working condition before operating. Pre-operation vehicle inspections can be documented by Authorized Drivers utilizing Vehicle Inspection Checklist – Americas or similar.

k. A roadside assistance service should be identified prior to operation of a vehicle on AECOM business. Employees must never change tires or make repairs to vehicles in the field unless this activity is covered in an approved project-specific SH&E plan, with justification provided.

l. The use of portable electronic devices, consumption of food, smoking, or other activities that may distract the driver while driving is prohibited. Electronic devices include, but are not limited to, all mobile phones, laptops, radios, GPS units, DVD players, tablets, and other portable electronic devices that can cause driver distraction whether hand-held or hands-free.

   Note: GPS units and devices (e.g., smart phones, tablets) 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. Consult jurisdictional requirements and with the SH&E Manager.

m. The vehicle may not move until the driver:

   i. and all passengers have fastened their restraints in the proper manner.

   ii. has adjusted their seat, all mirrors, steering wheel, and any other adjustable driver devices.

   iii. has adequately secured all transported cargo.

n. Authorized Drivers are responsible for monitoring their assigned AECOM-owned/leased/rented vehicle for any service or maintenance requirements and are expected to coordinate repairs and service through their respective Fleet Manager. Vehicles are to be maintained according to manufacturers' specifications, local law, and the applicable environmental and operating factors (e.g., winterized with appropriate fluids, winter tires installed, and appropriate coolant for hot climates).

o. AECOM-owned or leased vehicles are to have a first aid kit, portable fire extinguisher, safety triangle, and two reflective safety vests. If not available, contact the Project Manager/Supervisor or SH&E Manager to determine how to obtain a kit. The kit should be modified based upon the project Task Hazard Assessment (THA; e.g., field level risk assessment [FLRA] in Canada) or client requirements, with additional equipment such as additional means of communication for remote locations.

p. Motorcycles may not be operated on AECOM business unless specific written approval is received from the SH&E Manager.

q. Reverse parking of vehicles while on business is recommended. A spotter must be used when the backing of trucks and heavy equipment presents a risk of collision.

r. AECOM-owned/rented/leased vehicles, personal vehicles, and specialty vehicles must not be modified beyond manufacturer's specifications without relevant approvals from SH&E.

s. When practical, alternatives to road travel including teleconferencing/video conferencing, the use of public transportation, or carpooling should be evaluated.

t. Employees must never operate motor vehicles while excessively fatigued. Refer to Fitness for Duty – Americas.

1.2 Journey Management

a. Drivers who will undertake trips more than 250 miles (400 km) each way, drive in remote or hazardous areas, or when otherwise deemed necessary or specified in project-specific requirements, must develop and document a journey management plan (JMP) using Journey Management Plan - Americas or equivalent.

b. Refer to SH&E Risk Assessment & Planning – Americas for additional requirements.

c. A JMP typically includes the route; location of route hazards; timing; rest periods and locations; and communications, emergency response, and security arrangements.

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1.3 Commercial Motor Vehicles

Prior to operating a Commercial Motor Vehicle (CMV), an SH&E Manager must be engaged to clarify and confirm that CMV operator requirements have been met. This may include the following:

a. Additional training.

b. Driver's logs.

c. Appropriate marking of vehicles.

d. Medical exams.

e. Drug and alcohol testing requirements.

1.4 Off-Highway Vehicles (OHVs)

a. Prior to operation, employees must obtain approval to operate OHVs from the Project Manager and SH&E Manager. Examples of OHVs include ATVs, utility task vehicles (UTVs), and snowmobiles.

b. For OHVs, the following minimum personal protective equipment (PPE) must be worn and equipment available:

   i. Helmet including the appropriate institute label.

   ii. Eye and face protection (conduct THA for appropriate selection).

   iii. Ear protection as needed.

   iv. Gloves.

   v. Clothing: Wear protective over-the-ankle footwear with low heels, sturdy jackets and pants. Dress for cold and wind chill as appropriate (e.g., face guard, helmet liner, etc.). Do not wear scarves or loose clothing that could potentially become entangled with moving parts.

   vi. OHVs with seating for more than one person must be manufacturer-equipped with seat belts and rollover protection systems.

   vii. First aid kit.

   viii. Small fire extinguisher, as required.

c. Refer to Safety Gear – Americas for additional PPE requirements.

d. Prior to starting an OHV, the entire vehicle must be inspected using Off-Highway (OHV) Inspection – Americas or equivalent to confirm that the OHV is in a safe operating condition.

2. Training

a. Authorized Drivers must review this procedure and complete required training. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for training requirements.

b. Vehicles such as ATVs, four-wheel drive vehicles, motorized carts, snowmobiles, box vans, and trailers (towing) require specialized training and supervision.

c. All OHV operators must be trained by an SH&E Manager or approved training vendor. Training must include at a minimum:

   i. The operator's pre-trip inspection,

   ii. Use of personal protective apparel,

   iii. Operating skills according to the OHV manufacturer's specifications,

   iv. Basic mechanical requirements, and

   v. Loading and unloading the vehicle.

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vi. Employees unfamiliar with OHVs will also receive hands-on instruction on site by experienced and trained personnel.

3. Terms and Definitions

a.	AECOM Business	Any activity performed in the name of AECOM. This includes, but is not limited to, vehicle travel between work locations, client sites, and meeting locations as well as driving performed as a part of work-related travel (e.g., driving to and from airports, hotels, train stations), and all other reimbursable travel. AECOM business does not include driving part of a daily routine commute from home to an AECOM location.
b.	AECOM Owned/Leased Vehicle	A vehicle that is purchased or leased by AECOM for business use.
c.	ATV	All-Terrain Vehicle. An ATV can also be referred to as a quad, quad bike, three wheeler (illegal), or four wheeler. The ATV is defined by the American National Standards Institute (ANSI) as “a vehicle that travels on low pressure tires, with a seat that is straddled by the operator, along with handlebars for steering control.” This type of ATV requires an active rider and includes snowmobiles. For the purpose of this procedure and in alignment with various jurisdictions, the definition of ATV also includes all-terrain vehicles that instead require a passive rider and utility vehicles such as Argos, Gators, etc.
d.	Authorized Driver	An AECOM employee who receives Supervisor/Manager and, as applicable, Fleet Manager approval 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 while conducting AECOM business. Authorized Drivers must maintain a current driver’s license with full privileges applicable to the vehicle to be operated.
e.	Client- or Customer-Owned Vehicle	A vehicle that is owned by a client or customer—not AECOM—but is used for AECOM business.
f.	CMV	Commercial motor vehicle. Any self-propelled or towed motor vehicle used for AECOM business (e.g., to transport passengers or property) when the vehicle is one of the following: i. Has a gross vehicle weight rating (GVWR) or gross combination weight rating equal to or greater than the weight specified by the applicable jurisdiction; or ii. Is designed or used to transport more than the number of passengers specified by the applicable jurisdiction, including the driver, for compensation; or iii. Is designed or used to transport more than the number of passengers specified by the applicable jurisdiction, including the driver, and is not used to transport passengers for compensation; or iv. Is used in transporting hazardous material in quantities specified by the applicable jurisdiction at any time.
g.	Collision	Any incident in which a motor vehicle (whether in motion, temporarily stopped, or parked) makes contact with another vehicle or pedestrian, or results in property damage and/or bodily injury, regardless of who was injured, what property was damaged, or who was responsible.
h.	Distracted Driving	An activity that takes the driver’s attention away from the primary task of driving.
i.	Local Laws	Signs, postings, laws, regulations, ordinances, and codes applicable to the jurisdiction in which the motor vehicle is being operated.
j.	Personal Vehicle	A motorized vehicle owned or leased by an employee.
k.	PPE	Personal protective equipment.

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l.	Portable Electronic Device	A mobile electronic device that is used to receive or communicate voice, email, internet, and/or public media. The device requires user interaction (typing, dialing, reading, keying, etc.) that distracts the motor vehicle operator. Example devices include, but are not limited to, Mobile Communication Devices (MCDs); Personal Data Assistants (PDAs); iPads, iPods, or other tablet models; computers; and Global Positioning System (GPS) receivers.
m.	Rental Vehicle	A vehicle that is rented from AECOM's preferred suppliers and reserved through a Company-approved travel management company or Company-approved online booking tool.
n.	Spotters	Trained personnel may provide guidance when maneuvering in close and/or complex situations in order to avoid the occurrence of an incident.

4. References

a. SH&E Training – Americas S3AM-003-PR2

b. Fitness for Duty – Americas S3AM-008-PR2

c. Substance Abuse Prevention – Americas S3AM-019-PR1

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Travel Policy – AECOM Global TR1-001-PL1

g. Employee Handbooks – Ecosystem page

5. Records

a. Journey Management Plan – Americas S3AM-005-FM1

b. Vehicle Inspection Checklist – Americas S3AM-005-FM2

c. Off-Highway Vehicle (OHV) Inspection – Americas S3AM-005-FM3

d. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

6. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-005-PR2; consolidated portions of the contents from the following retired documents: Driving – Americas S3AM-005-PR1, Authorized Driver Safety – Americas S3AM-005-ATT1, All-Terrain Vehicles – Americas S3AM-319-PR1, ATV Safety – Americas S3AM-319-ATT1, and Commercial Motor Vehicles – Americas S3AM-320-PR1.	All

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Fitness for Duty

S3AM-008-PR2

1. Purpose and Scope

a. The purpose of this procedure is to provide direction for confirming employees can perform their assigned job responsibilities and are not adversely impacted by factors affecting their ability to work in a safe, secure, productive, alert, and effective manner including:

   i. Temporary conditions and physical limitations managed through a medical surveillance program.

   ii. Drugs and alcohol including prescription drugs; refer to Substance Abuse Prevention – Americas.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Employee Medical Surveillance

a. Employees and managed contractors involved in any of the following work activities may be enrolled in the medical surveillance program as a condition of employment:

   i. Work that exposes them to health hazards such as asbestos, noise, vibration, dust, gases, chemicals, fumes, contaminated lands, and dangerous goods.

   ii. Rigorous tasks such as rope access work.

   iii. Safety sensitive field work such as work near potential unexploded ordnance (UXO), Hazardous Waste Operations and Emergency Response (HAZWOPER) work, diving/underwater work, working near railways, and driving a commercial motor vehicle.

   iv. Other activities as determined by local law or company policy.

b. The Hiring Manager and/or Human Resources must inform a candidate in advance if the employment offer is conditional upon the candidate's enrollment in the medical surveillance program. This also applies to existing employees being assigned to a location, project, or client which requires a medical surveillance program.

c. Employees must:

   i. Follow the relevant business group's medical surveillance evaluation request process for determining whether medical screening is required and the frequency of periodic exams. This is to be completed prior to each exam so the Safety, Health, and Environment (SH&E) Manager can review and approve the physical.

   ii. Notify the examining clinic personnel if they know or suspect they will have an adverse reaction to elements of a scheduled physical, so appropriate safety precautions may be taken (e.g., medication, allergies, fear of needles, adverse reaction to needle sticks or pulmonary function tests, and latex allergies).

   iii. Promptly communicate any relevant changes in medical condition (e.g., medications, pregnancy) to the Occupational Health Manager to allow evaluation of the need for additional precautions.

   iv. Accurately complete medical questionnaire request forms, intake paperwork, and attend required physicals.

d. Project Managers/Supervisors must:

   i. Evaluate the duties of each Employee and prospective Employee reporting to them for potential participation in the medical surveillance program.

   ii. Confirm the Employee is enrolled in the medical surveillance program if the Employee's position requires enrollment and is removed from the program if the Employee's position no longer requires enrollment. Consult the SH&E Manager if assistance is needed.

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iii. Inform employees if their positions require medical surveillance.

e. The SH&E Manager must:

i. Assist in determining the frequency of the medical examinations based on regulation, assigned tasks, and the level of exposure to physical, chemical, and biological agents.

ii. Review medical surveillance evaluation (MSE) request submissions.

f. The Occupational Health Manager or SH&E Manager may:

i. Provide the Medical Service Provider (MSP) with appropriate references.

ii. Provide notifications approximately 30 days before periodic or exposure-specific medical examinations are due, and/or when employees are delinquent on required medical examinations.

g. Employee MSEs will be completed at no cost to employees, and in accordance with local law, codes of practice, client requirements, and internal standards as applicable.

h. If the Employee does not wish to fully participate in the medical screening and surveillance program and is permitted by local law, the Employee must complete a Waiver of Medical Screening and Surveillance Program – Americas form and provide it to the Occupational Health Manager or, in the case of Canada, the SH&E Manager.

2.1 Medical Assessment Types

a. The four types of medical assessments are the following:

i. Baseline medical examination – This is used to determine the suitability of an existing employee for a new assignment (pre-placement) or a candidate's suitability to be hired (pre-employment) for a particular position.

ii. Periodic medical examinations (i.e., annual or biennial).

iii. Exposure-specific examinations – The Occupational Health Manager or SH&E Manager will require an exposure-specific examination when he/she has reason to believe occupational exposures are impacting or may be impacting the health of an employee.

iv. Exit exams – Employees currently participating in MSEs will receive exit exams to assess occupational exposures potentially impacting the Employee's health status according to Appendix 1 – Exit Exam Determination. In the event an employee declines the exit exam, the Employee will be requested to sign the Waiver of Exit Medical Surveillance Exam – Americas form.

2.2 Exam Protocols

a. Exam protocols are determined by the MSP.

b. MSEs will be confidential and provided during normal business hours. All exam results are considered personal and confidential information.

c. A copy of health surveillance results must be provided to the Employee who has undergone the surveillance.

d. Only the Work Status Report for the Employee is required to be submitted back to AECOM by the MSP.

e. The assessment should not contain confidential information on the Employee's general health status unless it is relevant to the exposure and/or role.

f. If an assessment shows that an employee has been exposed to a hazardous chemical at work that has caused the Employee to contract a disease, injury, or illness, the Employee, HR Manager, SH&E Manager, Occupational Health Manager, and the Employees' Manager will work together to understand what actions need to be taken to:

i. Improve the Employee's health.

ii. Identify if any ongoing monitoring or treatment is required.

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iii. Determine whether the Employee can continue to work with that particular chemical or if alternate duties are required.

iv. Determine if any other staff may have been exposed and require further monitoring.

3. Fatigue Management

3.1 Minimum Requirements

a. Where there is a risk of fatigue, managers in conjunction with employees should conduct a risk assessment considering the fatigue risk factors relevant to the operation. This should be documented in the project-specific SH&E plan and task hazard assessments

b. The following minimum fatigue controls must be implemented:

i. Fatigue management requirements for driving. Refer to Driving – Americas.

ii. Working hours must not be longer than 12 hours per day (including the journey to and from work) without a proper risk assessment and approvals in place.

iii. Spilt shifts must not exceed 14 hours, determined by the start time of the first period of work and the finish time of the last period of work (e.g., 6 am to 12 noon, or 3 pm to 8 pm).

iv. The time between each shift should not be shorter than 10 hours (total rest not including the journey to and from work).

v. Employees must not work continuous shifts for more than 14 days.

c. Employees are responsible for notifying their supervisor if they are fatigued to the point of not being able to perform their duties safely.

d. Employees must never operate motor vehicles while excessively fatigued. Refer to Driving – Americas.

e. For every 5 days of work, the Employee will be entitled to 48 hours of rest (not inclusive of normal sleeping time). When the project requires working on shifts over a number of weeks, or it is a requirement that staff work Saturdays, the 48 hours should be accrued over the period and taken by the Employee at the end of the shift period.

f. When it is not possible to comply with the minimum controls outlined above, the Project Manager must, in consultation with the Employee's Manager/Supervisor and SH&E Manager, confirm that he/she has adequately assessed the risk of fatigue, encouraged staff to report fatigue-related concerns, and developed adequate controls to counteract fatigue.

3.2 Staffing Strategies

a. The following staffing strategies can act as guidelines for managers who make changes to work schedules:

i. Rapid rotation of shifts is preferable to slower rotation. A shift sequence changing every few days is preferable to a sequence with an extended rotation. A rapid system produces fewer disruptions to the internal body clock.

ii. Clockwise rotation is preferable to counterclockwise rotation. A series of days, afternoons, and nights mimics the body clock more effectively than a rotation of nights, afternoons, and then day shifts.

iii. Night shifts are particularly disruptive to employees' body clocks and lives. As such, night work should be limited or minimized wherever possible.

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3.3 Other Fatigue Management Strategies

Other fatigue management strategies include, but are not limited to, the following:

a. Additional supervision during periods of greater risk.

b. Providing additional rest-breaks, especially with repetitive, physically demanding, or high-concentration, and/or mentally demanding work.

c. Providing areas where employees can cat-nap (for approximately 20 minutes).

d. Providing access to low-glycemic index (GI) energy foods.

e. Working from home after period(s) of extended work activities.

f. Providing transportation or sourcing accommodations for staff who are unfit to drive or use public transport.

g. Identifying fatigue-critical tasks and implementing suitable controls where there are potentially increased risks of incidents, injury, or harm if employees become fatigued.

h. Providing information and training on fatigue management and health and lifestyle factors including:

   i. Sleep amount and quality; sleep disorders (e.g., apnea).

   ii. Effects of diet.

   iii. Effects of recent illness or injury.

   iv. Influence of alcohol or drugs (including prescription drugs).

   v. Commuting distance.

   vi. Other activities or responsibilities that may affect levels of fatigue (e.g., new baby, competitive sports).

   vii. Identification and control of environmental factors (e.g., heat, humidity, noise levels, vibration).

4. Not Fit for Duty Protocol

a. Fitness for duty expectations can vary with specific job tasks, location, and regulatory requirements. Fitness for duty may be affected by significant physical or mental fatigue, stress, emotional issues, illness, injury, or the effects of licit/illicit drugs and alcohol. Employees who are not fit for duty may present a safety hazard to themselves, to other employees, to AECOM, or to the public.

b. If an employee's fitness for work is in question:

   i. The Manager/Supervisor must immediately consult with the Employee to prevent further work activities.

   ii. Referral of this matter must be made immediately to the SH&E Manager and Human Resources with efforts made to effectively determine the Employee's fitness for work status.

   iii. The Manager/Supervisor in consultation with the Employee, SH&E Manager, and Human Resources may then decide on modified duties and/or other appropriate action.

   iv. When an employee is sent home under these circumstances, arrangements should be made to confirm the Employee can get home safely.

c. Each instance must be evaluated on a case-by-case basis, and medical professionals must be provided with complete and accurate information on the Employee's job duties, responsibilities, and expectations to make a fully informed decision. Please refer to Description of Job Duties – Americas.

5. Confidentiality

a. All reasonable efforts consistent with safety, practicality, and legal requirements will be maintained to ensure an employee's privacy at all times.

b. An employee's 'Fit for Duty' information will only be disclosed following permission from the Employee to those persons who have a legitimate need to know.

6. Employee Assistance Provider (EAP)

a. All employees may obtain free confidential advice regarding psychosocial issues, such as stress and depression, from AECOM's EAP, details of which can be obtained on Employee Assistance Program – Ecosystem.

b. Employees involved in a Fit for Duty issue may also be referred to the local EAP for further assistance.

7. Training

a. The relevant requirements of this procedure must be communicated and included in workplace and project orientation programs, as required.

b. Refer to SH&E Training – Americas for training requirements. Additional training may be required depending on the site, client, and/or legal requirements.

8. Terms and Definitions

a.	Baseline Medical Examination	Used to identify physical capabilities and medical limitations potentially impacting the candidate's ability to perform in the position for which he/she is being considered and to provide a baseline against which periodic or project-specific monitoring can be compared.
b.	EAP	Employee Assistance Program.
c.	Exposure-specific Examination	A medical test used to assess the impact of occupational exposures associated with a particular activity or project.
d.	Fatigue	Primarily caused by a lack of sleep but may also be associated with prolonged periods of physical and/or mental exertion without sufficient time to recover. Fatigue can be caused by work-related stresses, non-work-related stresses, or a combination of both. Work-related stress may be due to items such as pace of work schedule, location of work, environmental conditions of the work area (e.g., noise, lighting, tasks), and degree and duration of concentration required to perform a task. Non-work-related fatigue is influenced by personal lifestyle, health issues, and family and relationship responsibilities.
e.	Fitness for Duty	A state (physical, mental, and emotional) of an individual that enables the individual to perform assignments competently and in a manner that does not threaten the health and safety of the individual or others.
f.	MSP	Medical Services Provider – Manages all occupational medical services, including medical surveillance programs, travel medicine, and documentation.
g.	Periodic Medical Examination	Used to evaluate an employee's continued fitness for duty and to assess any impact occupational exposures may have on his/her health status.

9. References

a. Driving – Americas S3AM-005-PR2

b. Substance Abuse Prevention – Americas S3AM-019-PR1

c. SH&E Training – Americas S3AM-003-PR2

d. Employee Assistance Program (EAP) – Ecosystem

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10. Records

a. Description of Job Duties – Americas S3AM-008-FM1

b. Waiver of Medical Screening and Surveillance Program – Americas S3AM-008-FM2

c. Waiver of Exit Medical Surveillance Exam – Americas S3AM-008-FM3

d. Employees who participate in a medical surveillance or physical examination program or have had exposure monitoring conducted will have access to their exposure and medical records maintained by AECOM and the MSP. An employee or designated representative may request to review his/her medical records in writing. The SH&E Manager will forward the request to the MSP, who will provide the Employee with a copy of the medical records.

e. Employees in medical monitoring programs must be notified of the existence, location, and ability to access medical records maintained by the MSP. Upon request, each Employee (or designated representative) will have access to his/her medical records. Prior to the release of health information to the Employee (or designated representative), a specific written consent must be signed by the Employee. Records will be provided in a reasonable time and manner at no cost to the Employee. All personal identifiers (name, address, social security number, payroll number, etc.) are required to be removed from records before access is granted.

f. Medical records must be preserved and protected in accordance with applicable local law for the duration of employment plus 30 years, minimally. Verify the local law to confirm the time period. To meet the obligations of the Privacy Act on preserving the medical records and protecting the information they contain, AECOM has arranged for the MSP to manage the medical records.

g. The MSP provides employees with a copy of their results after each physical. If employees would like a copy of their historical records, the MSP will supply the copy.

h. The MSP performs quality control checks on all medical records to ensure examining physicians appropriately record the findings of the examination and tests. The MSP has access to all medical records to perform quality assurance checks to ensure proper recording and preservation.

i. Projects that use local clinics or employer/client clinics may store records at that site, but at the termination of the project, all employee medical records must be transferred to long-term record retention.

j. In the event AECOM ceases operations, medical records will be transferred to the successor employer. If no successor employer is available, records will be transferred to the National Institute for Occupational Safety and Health.

k. Managed contractor records will be retained by the contractor in accordance with its own company protocols.

11. Appendices

a. Appendix 1 – Exit Exam Determination

12. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-008-PR2; consolidated portions of the contents from the following retired documents: Fitness for Duty – Americas S3AM-008-PR1, Fatigue Management – Americas S3AM-009-PR1, Medical Screening & Surveillance – Americas S3AM-128-PR1, and Exit Exam Determination – Americas S3AM-128-ATT1.	All

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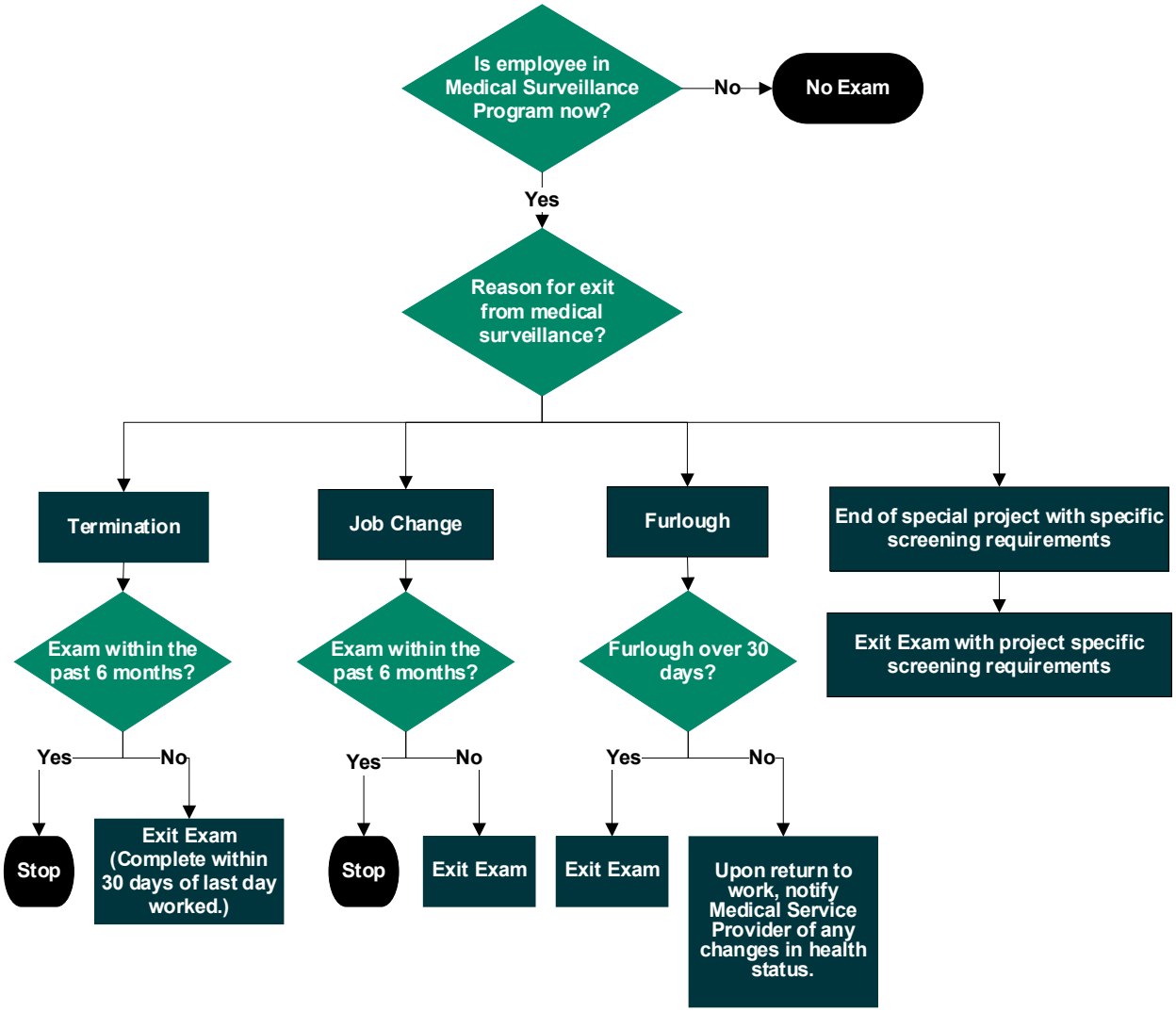
Appendix 1 Exit Exam Determination



Please note: Exit exams from Medical Service Provider or previous employer may be used for review as an AECOM baseline exam if completed within the past 3 months. A WorkCare Medical History Questionnaire is completed by the employee and submitted with a copy of the previous exam for physician review and approval.

AECOM

AECOM Global

Minimum Global Safety, Health & Environment Requirements

S2-001-WI3

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Global

Minimum Global Safety, Health & Environment Requirements

S2-001-WI3

Global Safety, Health and Environment (SH&E) requirements have been developed and shall be implemented as the minimum requirements to be met by AECOM operations. Global SH&E documents are identified with document numbers beginning with S2. Supplementary SH&E procedures to the Global SH&E Requirements shall be developed and implemented when additional detail is necessary based on differences in services offered by Business Lines, and in laws and statutes across geographies and regions. These supplementary SH&E procedures are identified with document numbers beginning with S3 for documents applying to the super-geographies, (Americas [AM], Asia-Pacific [APAC], Europe, Middle East & Africa [EMEA]), and with S4 for Region, Business Line, or country-specific documents.

The Global SH&E Requirements are as follows:

0. SH&E Essentials

0.1 Stop Work

a. All employees have the authority and responsibility to stop work if SH&E is being compromised without fear of reprisal or retribution. Nothing is ever so urgent or important that we cannot take the time to do it safely.

b. Work associated with the affected area or operation will not resume unless the corrective actions identified have been resolved to an acceptable level and management approval obtained to restart.

c. AECOM's Safety Red Card is a tangible reminder of stop work authority for AECOM employees and subcontractors. The cards are designed to be paired with Company and / or customer ID badges; every employee shall have or have access to their own Red Card. An equivalent tool shall be established where the red card cannot be used (e.g., cultural significance of red, conflicts with client badging, etc.).

0.2 Induction / Orientation and Training

a. Each employee shall be trained and competent to perform tasks that may impact on SH&E in the workplace and as required by legislation, company procedures and client expectations.

   i. Assessment of competence and training will consider responsibility, ability, literacy and exposure to risk.

   ii. Comprehension of training shall be appropriately verified (e.g., demonstration of skills, quiz, etc.).

b. Potential employees are required to bring evidence of their qualifications to job interviews. Project Managers or supervisors, in coordination with Human Resources (HR), use employee training records and resumes to confirm potential employees have the required skills, knowledge, training and experience for the proposed tasks. Where appropriate, resumes are included in job tenders for client perusal.

c. Within one week of starting at AECOM, project managers or supervisors are responsible for ensuring each new employee receives induction / orientation training to set the expectations of the AECOM Safety for Life program including incident reporting, stop work authority, accessing SH&E resources and tools, and a clear expectation of zero injuries.

d. Employees shall also complete any applicable site-specific field or office orientations.

e. Supervisors shall confirm visitors complete an orientation appropriate to the location or site they are to visit, supplemented by appropriate visual material (e.g., handout, iPad, etc.) and subsequently abide by AECOM SH&E policies and procedures when visiting our premises or sites.

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f. Visitors to AECOM premises or sites shall be escorted by an AECOM employee who shall confirm local security arrangements are applied, appropriate Personal Protective Equipment (PPE) is provided, and the visitor is aware of SH&E management requirements, including those for emergency response and incident reporting.

g. Project Managers and Supervisors shall complete appropriate training to support AECOM's Culture of Caring and to enable effective execution of our Safety for Life program.

h. The responsibility for ensuring that employees receive adequate SH&E training rests with the operation leaders based on the requirements of these minimum requirements and the jurisdiction's applicable SH&E procedures.

    i. Supervisors are responsible for confirming that each employee within their direct control is competent to undertake their job as specified.

    ii. AECOM Regional and Business Line leadership shall develop a training matrix for employees of their area of responsibility. Managers are required to arrange the appropriate training as identified in the training matrix and on a timely basis (e.g., upon hire, or upon commencement of a new task).

    iii. On-going employee competence and training needs are assessed as part of our annual performance and review process.

    iv. SH&E training needs may also be identified through individual risk assessments, incident investigations, observed non-compliance, or when procedures change. As required, appropriate training will be arranged, and may be provided through AECOM University courses, safety meetings, and / or classes delivered by internal or external providers. Employees identifying a particular training requirement are expected to discuss this with their managers if the requirement cannot wait until their next appraisal.

    v. Employees are encouraged to take part in continuing professional development activities to enable retention, competency, and remaining abreast of emerging techniques and processes.

i. Supervisors shall confirm employee training is adequately documented and records are maintained.

0.3 Newly Hired or Transferred Employee

Employees who have been newly hired or transferred to a different position in the company shall be:

a. Trained to AECOM procedures and client requirements prior to performing work.

b. Supervised by a competent person.

c. Visually identifiable and their presence in field locations recorded.

0.4 Fit for Duty

a. Employees shall come to work in a fit state that does not place themselves or others at risk due to physical, mental, and emotional factors.

b. Employees who come to work in an unfit state shall inform their supervisor so that adjustments to their activities can be made accordingly. This may include but is not limited to:

    i. Temporary conditions (e.g., fatigue, stress)

    ii. Physical limitations (e.g., eyesight, hearing, flexibility, lifting restrictions)

    iii. Cognitive limitations (e.g., brain damage)

    iv. Psycho-social factors (e.g., depression, anxiety, fears)

c. Employees who observe another employee that may be working in an impeded manner or unfit state are expected to inform a supervisor immediately.

d. Employees who have experienced an off-the-job injury should consult their supervisor, Human Resources (HR) business partner and/or AECOM's Occupational Health Team for assistance in assessing their scope of work to determine any potential for risk of further complications. Adjustments to activities may be appropriate to facilitate a return to full health.

e. Specific work environments and/or activities may warrant a fitness for duty assessment program to assess employees' / candidates' fitness for duty prior to assignment to identify potential physical, mental, and emotional risk to the individual, and to take appropriate action given the identified risk.

   When risks indicate a fitness for duty assessment program is necessary, an appropriate program shall be developed specific to that identified risk through consultation with Regional HR, Legal (labor and employment counsel) and SH&E (including the Occupational Health Team) and approved by the applicable Regional Executive and AECOM's Corporate labor and employment counsel. Programs shall identify:

   i. Assessment requirements (including methods to restrict results to those needed to assess the risk).

   ii. Involved parties and associated responsibilities.

   iii. Methods to maintain confidentiality in accordance with Global Privacy Notice – AECOM Global.

   iv. Actions appropriate to the assessment results and the risk prior to assignment (e.g., who is consulted when a risk to the individual is identified).

   v. Fitness for duty assessment prior to assignment shall involve informing the employee / candidate of the work environment and/or activity's exposures and expectations.

f. Where an incident has occurred and there is reason to believe the individual may not have been fit for duty the local SH&E team and HR business partner shall be contacted immediately.

0.5 Fatigue Management

a. The responsible manager or supervisor shall assess the activity and task specific risks, duration and exertion level as appropriate, and mitigate them to an appropriate level to enable the employee to effectively manage fatigue hazards.

b. Employees shall work within prescribed guidelines, including a maximum of 14 hours a day, 60 hours a week, unless additional risk management strategies are implemented, such as increased supervision or additional rest breaks, to combat the effects of fatigue.

c. The SH&E Plan shall address fatigue issues as part of the risk assessment.

0.6 Drugs & Alcohol (Including Prescription Medication)

a. AECOM prohibits employee use, possession, presence in the body, distribution, manufacture, concealment, transportation, promotion or sale of the following items or substances when providing services on behalf of AECOM or when on or in AECOM / client property:

   i. 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.

   ii. Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances.

   iii. Alcoholic beverages while at work or while on any customer or AECOM controlled property. This prohibition on alcohol applies whenever an employee is on-duty, including during meal or break periods, while on Company premises, or while representing AECOM. AECOM may make exceptions and permit the consumption of alcohol beverages at work-related events, such as Company-sponsored or approved business meals, conferences, or holiday events. Employees who choose to consume alcohol on approved occasions are expected to exercise good judgment and to refrain from becoming intoxicated or impaired. If an employee has consumed alcohol and needs transportation home, the Company will reimburse the cost of a taxicab or other reasonable costs of transportation so that the employee may avoid driving.

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b. AECOM does not prohibit lawful use and possession of current medication prescribed in the employee's name or over-the-counter medications. Employees are expected to consult with their health care provider about any prescribed medication's effect on their ability to perform work safely and/or any associated work restrictions.

c. An employee whose ability to perform work safety may be impaired due to consumption of a prescribed or over-the counter medication shall disclose to their supervisor, HR business partner, or Occupational Health Team, only those effects or restrictions applicable to safe performance of work.

0.7 Emergency Planning

a. Each AECOM office and worksite SH&E Plan shall include a site-specific Emergency Response Plan (ERP) suitable to the location and local requirements. The author of the ERP shall check with applicable stakeholders (e.g., client, site owner, building manager, landlord, etc.) regarding the various parties' current emergency procedures and will incorporate these, as appropriate, into the AECOM Emergency Response Plan.

b. Project Managers are responsible for emergency planning regarding SH&E risks on project work and for recording their arrangements within the project documentation. Plans shall include confirming appropriately trained personnel are on site as required, and emergency equipment and supplies are available and in operable condition. Inspection, testing and maintenance of emergency and first aid equipment shall be identified, scheduled and undertaken in accordance with local legislative and manufacturer requirements. Affected personnel shall be briefed on the arrangements, trained in their roles and responsibilities, and be knowledgeable about alarm and communication requirements. Testing and evaluation of the plan is achieved through review of actual incidents and mock drills.

c. SH&E Plans shall comply with client requirements and specifications, shall be appropriately posted, and will typically contain the following:

   i. Reporting Procedures for Fires, Environmental Incidents and Other Emergencies.
   ii. Alarm System and Security Measures.
   iii. Evacuation Routes, Assembly Points, Shelter In Place Procedures.
   iv. Extreme / Severe Weather Planning.
   v. Natural Disaster Planning (e.g., earthquake, flood, etc.).
   vi. Critical Equipment / Operations Procedures.
   vii. Assisting Disabled or Medically Restricted Personnel.
   viii. Personnel Accounting Procedures.
   ix. Rescue and Medical Duties.

d. Emergency response personnel (e.g., evacuation coordinators, first aid responders, fire wardens, etc.) shall be identified in accordance with potential emergencies, legislation, and requirements of the site-specific SH&E Plan.

e. The number of first aid persons / appointed persons and standard of qualifications will differ due to the varying risk level associated with different environments and activities. First aid or appointed persons shall be identified to meet first aid requirements in accordance with legislation and the requirements of the site-specific SH&E Plan.

0.8 Incident Reporting, Notifications, Investigation, and Injury Management

a. All work-related injuries, illnesses and incidents, including those of employees and subcontractors under direct AECOM control, shall be reported to an AECOM supervisor immediately. Any associated regulatory notification requirements of the applicable jurisdiction shall be met.

b. Injuries, illness and incidents shall be entered into IndustrySafe using the initial incident form within one business day of the event.

c. For company-wide SH&E statistics, OSHA recordkeeping requirements shall be used in all Regions / Business Lines. To comply with local regulations, additional SH&E reporting and statistics may be required to be maintained.

d. Where required, injury logs shall be signed by senior management of Operations.

e. A formal investigation process (e.g., Why Tree, 5-Why) shall be utilized to determine root causes and contributing factors for all recordable and high potential incidents ([HiPos] assessed at a risk rating of 10 or above using the AECOM Risk Matrix). Refer to section 'Hazard Identification & Risk Management' for an explanation of the AECOM Risk Matrix.

f. All records applicable to an incident shall be retained as defined in the AECOM Records Retention Procedure and as necessary to manage any future action associated with the incident.

g. Executive Incident Reviews shall be performed for all high potential or high actual consequence (HiPo) incidents.

h. The Executive Incident Review (EIR) shall be presented by the respective Project Manager to the appropriate executive / leadership (Geography, Business Line, Region, Legal, Human Resources, etc.) and Regional SH&E Director. The following table provides direction concerning EIR content:

Required EIR Content
Cover slide
Project Description / Scope
Incident Summary - Overview and Actual Risk
Investigation - Investigation Team / Interviewees
Investigation - Applicable Photos / Sketches
Investigation - Timeline / Details
Immediate Incident Response and Care Management
Ongoing Care Management
Why Tree or other Root Cause Analysis
Results - Corrective and Preventative Actions
Results - Lessons Learned Summary
Discussion / Questions / Comments

Optional EIR Content
Agenda
Invitee Guidance
Incident Summary - Potential Risk
Incident Summary - Involved Employee Background
Investigation - Hazard Assessment (Photo of document)
Investigation - Project Planning & Execution Efficacy
Results - Cost
Invited / Attended

i. Injuries shall be managed in accordance with the procedure(s) applicable to the jurisdiction.

j. When possible and unless restricted by local regulation or law, labor agreement or client provided treatment, a supervisor (or designee) should escort an injured employee to the initial physician visit. The Supervisor shall confirm that the Company's return to work policy is followed and assist in communication between the injured employee and management.

0.9 Ground Transportation / Motor Vehicles

a. When traveling for business purposes (excluding commute to and from work), two-wheeled modes of transportation (e.g., bicycles, motorbikes, etc.) are prohibited unless specified and approved in the applicable SH&E Plan.

b. The below requirements apply to employees who operate motor vehicles that are owned, rented, or leased by AECOM and to employees who use personal, client or government-supplied vehicles while conducting AECOM business.

   i. Motor vehicles shall be selected, equipped, operated, and maintained in a way that protects personnel from harm.

   ii. At-risk driving behavior by AECOM employees shall be identified and managed appropriately (e.g., retraining, driving restrictions, disciplinary action, etc.).

iii. Motor vehicle operators shall adhere to all local laws including, signs, postings, regulations, ordinances, and codes applicable for the jurisdiction in which the motor vehicle is being operated.

iv. Commercial motor vehicles and operators are required to meet the jurisdiction's applicable commercial motor vehicle regulatory requirements.

v. Only licensed and appropriately insured drivers, who are fit for duty, shall operate a motor vehicle.

vi. Travel shall be assessed to allow for safe management of the journey.

1. Drivers who are to undertake trips in excess of 250 miles (400 km) each way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan.

2. Plans typically include the route, location of route hazards, timing, rest periods and locations, communications, emergency response and security arrangements.

3. Appropriate planning shall include, but not be limited to, personal protective equipment, competence in vehicle recovery, positive communications, and ensuring adequate drinking water and supplies are available in the event personnel become stranded.

vii. The use of electronic devices that may distract the driver while driving is prohibited. This includes cell phones, two-way radios and other items whether hand-held or hands-free.

1. GPS units and devices (e.g., smart phones, tablets) 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.

2. Electronic devices shall be setup for operation prior to commencing driving activities and shall not be changed by the driver while driving.

viii. Motor vehicle occupants are required to wear seatbelts at all times when the vehicle is in operation.

ix. When driving in off-road conditions employees shall confirm they have a fit for purpose vehicle and have experience or training for the conditions.

0.10 Consultation & Communication

a. AECOM shall provide appropriate resources, time, training, and methods to facilitate SH&E communication and consultation between management and employees. Any identified barriers to effective communication and consultation, such as language barriers, or fear of reprimand, shall be appropriately addressed and removed to allow for employee participation.

b. AECOM leadership shall promote awareness of SH&E issues in AECOM offices, facilities, and worksites through such approaches as the use of banners, SH&E notice boards, AECOM's intranet, newsletters, alerts (including those issued by clients), key performance indicators and other SH&E-related material.

c. Communication and coordination amongst key stakeholders (e.g., AECOM personnel, subcontractors, clients, teaming partners, regulatory bodies, etc.) shall be conducted as appropriate throughout the lifecycle of a project to safeguard our employees, subcontractors, the public and the environment.

d. Values moments should be shared in every meeting via webcast, telephone, video conference, or live. When the Values moment is not safety-related, safety should be included in the agenda.

e. As appropriate, employees shall be consulted during SH&E activities. Associated SH&E documentation shall be completed and provided to affected personnel as a method of SH&E communication (e.g., SH&E hazard assessments, plans, permits, inspections, investigations, lessons learned, etc.).

f. All personnel are encouraged to discuss any SH&E concerns, good practices or ideas with their Supervisor, and to enter SH&E observations within LifeGuard or IndustrySafe. Content shall be monitored by the SH&E Team and appropriate response or close–out action taken.

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g. Regular SH&E meetings shall be conducted between management and employees. Frequency as established in the applicable SH&E Plan shall be met.

h. AECOM encourages the establishment of SH&E committees, including Safety Leadership Teams (SLTs), with the aim of allowing a direct interface between management, SH&E team, and other employees.

i. Where established, the requirements of these committees or SLTs should be developed; basic agenda, membership composition, frequency of meetings (at least quarterly), with meeting minutes published and posted for employees to access.

j. Requests for information from external interested parties shall be reviewed and dealt with on a case-by-case basis and in accordance with legal, AECOM and client requirements. Project related requests shall be managed by the associated Project Manager, with necessary assistance provided by the SH&E Team.

0.11 Recognition and Rewards

a. Rewards and recognition programs shall be developed and implemented to recognize individuals, teams, projects, and offices that meet established criteria in SH&E performance. Project rewards and recognition programs shall be included in the project's SH&E Plan.

b. All levels of supervision are encouraged to recognize the SH&E initiatives, milestones and efforts made by those who work with them on an ongoing basis. This recognition may be as simple as publicly thanking an employee for reporting hazards, taking the time to do a job safely, participating in SH&E Committees, or refusing unsafe work. This recognition will also include team, project, and office recognition of achievements in SH&E.

1 Exposure Management

1.1 Toxic and Hazardous Substances

a. Where there is a risk of exposure to toxic and hazardous substances, the activity and task shall be assessed for employee exposure and, as applicable, appropriate hazard controls developed, implemented, communicated, and maintained.

    i. While hazardous substances commonly encountered on worksites include asbestos, silica, benzene, cadmium, chromium (VI), hydrogen sulfide, and lead, any other toxic or hazardous substances that may be encountered by AECOM employees (e.g., ammonia, arsenic, coal dust, isocyanates, mercury, etc.) shall also be assessed.

b. When the assessment identifies the potential hazard of toxic or hazardous substance exposure, medical screening and surveillance requirements shall be defined if applicable to the substance and jurisdiction.

c. Employees shall be informed of the hazards of the chemicals to which they may be exposed in the course of their work (e.g., container labeling, training, etc.). The Global Harmonization System shall be applied in alignment with the applicable jurisdictional requirements.

d. Appropriate training and guidance shall be provided to employees to eliminate or control occupational exposures to toxic or hazardous substances (gas, vapor, aerosol [dust], mist, fume, fog, fiber, smoke) to the lowest level practicable.

1.2 Industrial Hygiene & Medical Screening

a. Industrial hygiene hazards shall be identified, including as applicable, toxic and hazards substances, physical agents (acoustic, thermal, etc.) and biological airborne contaminants. To the extent possible, the associated risks shall be reduced to as low as reasonably practicable, given the available technology and known toxicological or adverse human health effects.

b. Only competent and trained personnel shall perform work where employees and subcontractors are exposed to industrial hygiene hazards.

c. Current exposure limits identified by the *American Conference of Governmental Industrial Hygienists* (ACGIH) shall be used as the maximum exposure limit. Exposure limits established by local regulatory standards or consensus standards that are more conservative than those identified by ACGIH shall be applied in the applicable jurisdiction.

d. Medical screening and surveillance shall be conducted as necessary based on potential exposures and regulatory requirements.

e. Appropriate hazard control measures shall be in place where exposures will be above established occupational exposure levels.

f. Project SH&E Plans shall specify exposure limits and action levels.

2 Planning & Oversight

2.1 Safety in Design

- Safety in design shall be incorporated into the design and constructability aspects of temporary and permanent facilities, structures, and processes from concept to completion, including proposals and marketing, engagement of subcontractors, construction operations and subsequent operation, maintenance, and demolition of the product.
- Where the principles of safety in design are not required by law, the practices of safety in design shall be incorporated in the design and building aspects of temporary and permanent facilities, structures and processes to minimize risk to people, and capitalize on intrinsic efficiencies of an enhanced design process.

2.2 Hazard Identification and Risk Management

a. The Project Manager shall confirm risk assessment processes are conducted to identify hazards and manage the associated risks applicable to the location. Risk assessment processes shall be utilized throughout the lifecycle of the project:

   i. SH&E risk assessment during the pre-bid stage of a project is conducted to inform the go / no go decision as well as identify potential SH&E planning, budgetary and staffing requirements. Please refer to *S2-001-ATT4 Catastrophic and Critical Consequences Guidance* for a listing of potential events or outcomes to be considered in relation to a project's work scope.

   ii. Project start-up activities require appropriate SH&E planning prior to work commencing, including identification of hazards, associated risk, and appropriate controls for each task and operation found in the work scope. Completed risk registers / hazard assessments shall be incorporated into the Project's SH&E Plan.

   iii. Project execution activities shall confirm the Project SH&E Plan is reviewed and hazards are further assessed given current conditions. To capture nuances or site-specific conditions immediately present that are otherwise unacknowledged, task hazard assessments (THAs, also known as Safe Work Method Statements, Field Level Risk Assessments, Risk Assessment Method Statements, etc.) must be completed and reviewed immediately prior to initiating the task at the work location by those conducting the task.

   iv. SH&E performance reviews at close-out of a project shall be conducted to identify successes and any potential improvement opportunities. As appropriate, preventive actions shall be developed with the goal of continual improvement to industry-, client-, or location-specific SH&E activities, as well as the AECOM SH&E Management System.

b. The manager shall plan required SH&E activities and incorporate SH&E procedures into the location or project SH&E Plan. The SH&E documentation for any project lasting twelve (12) months or longer will be reviewed at periodic intervals, but at least annually.

c. Where necessary, the Project Manager shall seek input from the relevant SH&E team and affected workers into the planning process.

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d. Risk assessment processes shall identify the hazards and mitigations or controls required to eliminate or reduce the associated risk to as low as reasonably practical for each hazard.

e. Those involved in a documented risk assessment shall include trained and competent personnel in hazard identification and use of risk management tools and processes.

f. Results shall be communicated to affected personnel (e.g., SH&E Plans, Tailgate meetings, daily safety huddles, review of documented assessments, etc.).

g. Risk mitigations or controls shall be monitored on an ongoing basis for effectiveness.

h. A risk ranking shall be performed for pre- and post-mitigation efforts. The risk ranking shall be completed using the following AECOM Risk Matrix:

	Severity				
Probability	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**

i. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. If the final risk rating cannot be reduced to 4 or lower, additional approvals, as shown below, are required before the activity can begin.

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 Supervisor or equivalent
10 to 25 (High)	Risk requires the approval of the Project Manager & SH&E 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	Almost certain 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, though possible during task/activity	1/1,000
Improbable	Highly unlikely to occur during task/activity	1/10,000

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j. The Project Manager shall review the risk assessments incorporated in the SH&E Plan on site and modify them if circumstances are different or change during the work. Site personnel shall sign the SH&E Plan initially and after any changes to show they have read and understood it.

k. Situations may arise that were not foreseen or accounted for when the operating procedures or plans were developed. The purpose of Management of Change is to protect personnel from hazards caused by major changes in the scope of work. Stop work shall be initiated and appropriate changes in the way the operations are conducted shall be identified so the work can recommence and be performed safely. The changes may be temporary or permanent. A record of the Management of Change shall be documented and employee training on the change completed before work restarts.

l. Mitigation of Hazards

i. Supervisors shall refer to the SH&E Plan to confirm task-based risks are managed in accordance with the hierarchy of controls.

ii. Advance planning enables Safety in Design to be applied to systems, equipment and work areas in order to eliminate, substitute, or apply engineering controls to the hazard.

iii. When determining appropriate controls to mitigate the risk presented by each hazard, the most effective controls (ordered from the most effective at the top of the image above to the least effective at the bottom) shall be assessed and applied as is practicable, with PPE considered the last line of defense.

iv. Layers of control or redundancy shall be established whenever possible (utilizing multiple means e.g., engineered control further supplemented by safe work practices and PPE).

v. When PPE is required, specific basic and/or specialized PPE shall be identified in the SH&E Plan. Supervisors will verify workers and visitors have access to the appropriate PPE and that workers and visitors are properly trained and competent in the use and requirements related to the given PPE. Advice on the use, care, storage and maintenance of PPE is available on the company intranet, or from the SH&E Team.

vi. Managers shall assess the workplace for potential violence scenarios and incorporate findings into the emergency preparedness and response planning where applicable.

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2.3 Personal Protective Equipment (PPE)

a. The following basic PPE is required to be worn at all times on industrial sites:

   i. Hard hat/ bump cap (selected based on applicable hazards), safety glasses with side-shields, work boots, full length trousers, shirt with sleeves, gloves.

   ii. All personnel shall have gloves in their immediate possession 100% of the time when in a shop or on a work site. Appropriate gloves 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.

   iii. PPE shall be worn at all times on industrial sites unless the employee is in an area clearly marked and the differing PPE requirements defined, in which case the area's requirements shall be met.

b. All personal protective equipment required for the identified hazards shall meet applicable standards (e.g., approved safety glasses worn in environments presenting eye hazards [meaning prescriptive eyewear shall also meet applicable safety standards when eye hazards are present], appropriate class / type of hard hat in a high voltage electrical environment, etc.).

c. All personal protective equipment shall be in good working condition and maintained to manufacturer's specifications. Defective or damaged equipment shall be discarded and replaced.

2.4 Permit Required Activities

a. All work activities shall be evaluated to determine if work permits or specific plans are required.

b. Activities requiring a completed permit or specific plans before work begins (e.g., confined space, lockout / tagout, electrical, hot work, fall protection, radiation, blasting and explosives, temporary protection, critical lifts, excavation, underground work) to safely perform work shall be planned, managed, and executed by competent personnel.

c. Additional tasks (e.g., core drilling, perimeter work, elevator shaft work, stair installation, etc.) shall be assessed based on risk, regulatory requirements and client requirements to determine whether Permit to Work processes are required.

d. The responsibilities, accountabilities, training and competency requirements for the permit issuer, individual permit holders and persons performing permitted tasks shall be clearly defined.

e. All personnel undertaking work requiring a permit shall be made aware of the hazards, how the hazards are being controlled, and the permit conditions that are required to be met.

2.5 Oversight of AECOM Subcontractors / Subconsultants

a. Subcontractors / subconsultants that work for or on behalf of AECOM will be selected/ prequalified in accordance with AECOM's subcontractor management procedure / process.

b. Subcontractor / subconsultant SH&E plans and applicable procedures shall be reviewed prior to initiation of work.

c. Subcontractors / subconsultant SH&E plans and applicable procedures shall comply with the client and AECOM site specific SH&E plan.

d. AECOM shall monitor performance and conduct and report on routine inspections of work activities of subcontractors / subconsultants. Feedback shall be provided as appropriate.

e. Subcontractors / subconsultants shall immediately report all incidents to AECOM and investigate as appropriate.

f. Subcontractors / subconsultants shall follow equivalent due diligence processes for any lower-tiered subcontractors.

2.6 Environmental Procedures

a. AECOM project and office SH&E Plans shall document the identification and assessment of the various environmental aspects and impacts resulting from our business activities. These can be positive or adverse, direct (under AECOM direct control) or indirect (e.g., those created by the activities of our partners and contractors / suppliers).

b. Full account is taken at each stage of office and project activities including under normal / abnormal operating conditions and contingencies (incidents, emergency situations), past / present / foreseeable activities, partner / supplier activities and so on.

c. As applicable to the activities and tasks, the environmental impacts and aspects shall each be assessed for significance to develop, document, and implement suitable and sufficient controls, emergency arrangements, and procedures for identifying, assessing, and managing environmental sustainability for the following considerations:

- Air Quality and Pollution.
- Contaminated Land.
- Ecology, Archaeology and Cultural Heritage.
- Noise.
- Resource Consumption.
- Statutory Nuisance.
- Traffic Management.
- Waste Management.
- Water Quality and Pollution.
- Dust Control Measures.
- Storm Water Management.
- Spill Response.
- Delivery, Storage and Refueling of Fuel, Oil and Chemicals.
- Energy and Water Use, Recycling.

d. In addition, when planning new processes, the environmental risks and impacts are re-assessed in light of any specific, new, or changed factors posed by the proposed new activity and location in accordance with the procedures for risk management and management of change.

   i. The results of these assessments are collated into a country-specific Register of Environmental Aspects and Impacts (as applicable) which is reviewed upon major activity change and / or at least annually and updated accordingly.

2.7 Regulatory Agency Visits

a. Visits or inspections by regulatory agencies for the purpose of these requirements include:

   i. Any non-routine announced or unannounced visit or inspection of an AECOM office or project site by a regulatory agency involved with Occupational Health and Safety and Environmental laws and regulations.

   ii. Periodic visits from service or local agencies to project sites to approve certain activities such as utility hook-up, utility clearance, etc. are not considered regulatory visits or inspections.

b. The Project Manager shall:

   i. Confirm a senior AECOM employee meets with the agency representative to obtain copies of credentials, determine the purpose of the visit or inspection and to request applicable documentation.

   ii. Confirm the visit or inspection is reported in IndustrySafe as an incident within one business day.

   iii. Confirm notification of the relevant Regional SH&E Director and SH&E Manager of the visit or inspection.

   iv. Notify the client a regulatory visit or inspection is occurring on their project site so the client may have representation during the visit or inspection, at their discretion.

   v. Confirm an appropriate AECOM escort is identified and accompanies the agency representative at all times to address questions, observe activities and monitor evidence gathering (this may include obtaining duplication of evidence, such as dual photos and split samples).

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vi. Confirm copies of the visit record and other documents or postings that the agency representative may issue are obtained.

vii. Request a debrief session.

viii. Where a citation, violation, or penalty was issued:

1. Confirm direction is given to the local employees to stop the performance of the cited activity until the appropriate corrective actions are implemented.

2. Confirm any required posting is completed in accordance with the directions outlined by the agency.

3. Confirm a formal response is submitted to the issuing agency and facilitate payment of any associated monetary fine after approval from Counsel.

4. As applicable, serve, or designate an appropriate individual to serve, as AECOM's informal and formal agency negotiation meeting representative to discuss the citation, violation, or penalty.

2.8 Office Safety

a. Each AECOM office will develop an Office SH&E Plan in accordance with the template provided on the company intranet.

b. Managers shall confirm that employees understand any specific risks, are briefed in the correct emergency response procedures, and have access to emergency equipment.

c. All visitors to the office shall sign in and be given an SH&E orientation / induction.

d. All offices shall have an SH&E noticeboard in place with current relevant materials posted to include but are not limited to the AECOM SH&E Policy, Life Preserving Principles as well as any other local regulatory or geography specific information.

e. Offices shall be inspected to identify and address any specific hazards. Hazards shall be controlled or have actions in place to mitigate the risk.

f. Safety committees shall be established in accordance with jurisdictional requirements and as a minimum, in AECOM offices of more than 50 employees.

g. All office equipment and workstation design and installation shall take ergonomic performance into account. Equipment and workstations shall be, as far as practicable, designed and installed to suit the individual(s) interacting with them.

h. Workplace ergonomic hazard assessments shall be performed when necessary and required controls implemented as far as practicable.

3 Field

3.1 Confined Space Entry

a. All confined spaces shall be evaluated and classified by a competent person as permit or non-permit.

b. Efforts shall be made to eliminate the need to enter a confined space where practicable.

c. Confined space entries shall be planned and managed by competent personnel.

d. Only trained, authorized, and fit for duty personnel shall enter, or attend the entry of, a confined space.

e. No entry shall occur without an assessment that includes hazard identification and appropriate hazard control measures (e.g., suitable atmospheric testing requirements defined, inspection requirements to confirm equipment is fit for purpose, etc.).

f. A rescue plan shall be prepared and communicated to the entry and rescue teams.

g. Confined space entry shall never be conducted alone.

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h. Atmospheric testing is required for all permit-required confined spaces, and if necessary to confirm absence of atmospheric hazards in non-permit confined spaces.

3.2 Working at Heights / Fall Protection

a. An assessment shall be completed prior to the start of working at heights.

b. Where practicable eliminate the need to work at heights. Alternatively, a safe working platform shall be a priority (e.g., elevated lift or scaffolds). Fall prevention shall take preference over fall arrest systems.

c. As a minimum standard, fall protection is required and will be provided for any work/job/task to be performed above the normal walking/working surface at heights of 6 feet (2 meters) or greater in the construction, mining, and demolition industry, and 4 feet (1.2 meters) or greater in all other industries. Local regulatory standards or consensus standards that are more conservative than this minimum standard shall be applied in the applicable jurisdiction.

d. Only competent / qualified / trained personnel shall select and use personal fall prevention/arrest systems or access equipment that provides appropriate protection from falls (e.g., aerial lift, scaffold).

e. Edges shall be considered when evaluating proper fall protection.

f. Only competent / A rescue plan for personal fall arrest systems shall be in place for work at heights.

g. Material and tools used at heights shall be adequately secured or prevented from falling and an appropriate exclusion zone shall be established when working at heights.

h. Three points of contact (two hands and one foot, one hand and two feet) shall be maintained when accessing ladders or other structures. Ladders shall not be used as a working platform.

3.3 Demolition

a. Demolition operations shall be planned and managed by competent personnel. Where appropriate to accurately identify applicable hazards, an engineering survey of the structure shall be incorporated into the work planning (e.g., planning for mechanical equipment, debris containment, etc.).

b. Applicable permit to work processes shall be followed prior to demolition work commencing.

c. An assessment shall be completed that identifies and documents the hazards and controls associated with the planned demolition activities.

d. The demolition structure shall be assessed for the presence of harmful materials. Methods for monitoring, testing and management of potential exposures to atmospheric contaminants will be established and evaluated by a qualified person.

e. All activities involving demolition equipment, explosives and blasting shall be managed by competent and authorized personnel.

f. All sources of energy including, but not limited to, electric, gas, water, steam, sewer, and other service lines shall be isolated.

3.4 Energy Isolation

a. Where the release of energy during major replacement, repair, renovation, or modification of machinery, equipment, or systems or during installation of new machines, equipment or systems may cause injury to personnel, an assessment shall be conducted.

b. Lockout tagout (LOTO) activities are required when:

   i. An unexpected energization or start-up of machines and/or equipment would result in the release of stored energy which could cause injury to an employee.

   ii. Any employee (or contractor) is required to remove or bypass a guard or other safety device.

iii. Any employee (or contractor) is required to place any part of their body into the mechanism of a piece of equipment or path of hazardous energy.

c. No work shall be initiated (including LOTO procedures) prior to obtaining any required work permits.

d. Only qualified and licensed personnel shall be allowed to work on energized systems including testing and tagging of equipment.

e. Competent personnel shall verify systems are de-energized prior to conducting work activities.

f. Locks shall not be removed without proper authorization.

g. Identify and communicate to all affected personnel and to all employees whose work operations may be in an area where LOTO procedures may be utilized.

h. LOTO procedures shall include requirements applicable to:

i. Shut-down of equipment or request for de-energization of an energy source(s).

ii. Lockout of energy source(s) and tagging to identify the lockout controls and parties involved.

iii. Inspection and verification of de-energization, and application of locks and tags.

iv. Methods to coordinate multiple locks and the continuation of LOTO protection through shift or personnel changes.

v. Control and accountability of locks and tags, including processes for emergency lock removal.

vi. Equipment-specific LOTO procedures.

3.5 Electrical Safety

a. All applicable electrical codes, SH&E procedures and manufacturer's specifications shall be followed to eliminate the need to directly work on live electrical systems where practicable.

b. Electrical work, (meaning work associated with equipment or systems of 50 volts or greater, or a current of 20 amps or greater) shall be assessed, planned, and managed by competent personnel.

c. Only competent and authorized personnel shall perform work on live electrical system components.

d. Written and approved justification is required to work on energized systems and is only authorized when de-energizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations (life supporting interruptions, deactivation of emergency alarms, shutdown of ventilation equipment in hazardous location).

e. A permit to work process shall be established and implemented for live electrical work.

3.6 Excavation & Trenching

a. Excavation and trenching operations shall be planned, managed, and executed by competent personnel.

b. Applicable permit to work processes shall be followed prior to excavation or trenching activities commencing.

c. Before any excavation work is undertaken, an assessment shall be conducted to identify, assess, and manage the hazards present.

d. Overhead obstructions and underground utilities / installations shall be clearly identified.

e. Appropriate control measures to prevent contact with overhead obstructions and underground utilities / installations, including establishing suitable clearances, shall be in place prior to work commencing.

f. Fit-for-purpose equipment, protective systems (e.g., barriers, lighting, signage, etc.), and means of access/egress shall be selected, installed, operated, and maintained in a way that minimizes the risk of injury to personnel and the public, and damage to property.

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g. Inspection of excavations (as a minimum, any excavation greater than 1.5 meters [5 feet]) and any protective systems shall be undertaken by a competent person as appropriate to the conditions and in compliance with regulatory requirements.

3.7 Underground Work / Tunneling

a. Tunneling operations shall be planned, managed, and executed by competent personnel.

b. Project managers or supervisors are responsible for confirming employees involved in underground work possess any required training, registrations, or certifications.

c. Applicable permit to work processes shall be followed prior to underground work / tunneling activities commencing.

d. Before any underground work is undertaken, an assessment shall be conducted to identify, assess and manage the hazards present.

e. A safe means of access to and egress from all work locations shall be provided and access to all openings controlled to prevent unauthorized entry.

3.8 Heavy Equipment

Heavy equipment (also referred to as mobile equipment) includes, but is not limited to, equipment such as backhoes, excavators, skid steers, graders, loaders, dozers, tractors, cranes, drills, and draglines.

a. Verify that employees comply with applicable regulatory, client and supplier requirements relevant to operating heavy equipment.

b. Tower cranes and personnel hoists shall be inspected by an independent third party both at the third party's facility and at the site prior to mobilization.

c. Heavy equipment shall be selected, equipped, operated, inspected, and maintained in a way that enables safe operation, protects personnel from harm, and conforms with regulatory and manufacturer requirements.

d. Ground guides / spotters shall be used to facilitate safe movement of heavy equipment near personnel, equipment and utilities, and when obstructions or congestion present hazards to safe operation.

e. Back up alarms or equivalent means to allow for safe reverse movement, are required on all heavy equipment.

f. Daily documented inspections shall be completed on all heavy equipment prior to operation.

g. Only authorized operators who are fit for duty and meet jurisdictional requirements shall operate heavy equipment.

h. All local laws including signs, postings, regulations, and codes applicable for the jurisdiction in which the equipment is being operated shall be observed.

i. Heavy equipment operations shall be adequately separated from light vehicles, workers and pedestrians. If separation is not possible, appropriate procedures shall be implemented to maintain the safety and health of personnel involved.

j. Positive communication shall be implemented between ground personnel and heavy equipment operators.

3.9 Lifting Operations

a. Lifting operations shall be planned, managed, and executed by competent personnel.

b. Operators, riggers, banks-man, and inspectors shall be certified according to jurisdictional requirements to carry out their work as it relates to lifting operations.

c. Fit-for-purpose lifting equipment shall be selected, positioned, installed, operated, and maintained in a way that minimizes the risk of injury to personnel or property damage. This is to include equipment used for incidental lifts.

d. Inspection and testing of lift equipment shall be undertaken by a qualified person.

e. No lifts shall commence without a lift plan in place and approval by a qualified person.

f. Critical lifts require a formal, written plan. A critical lift is a non-routine crane lift (e.g., more than one crane or hoisting device, lifts over structures or equipment, load may be out of the operator's view, hoisting personnel, etc.) requiring detailed planning and additional or unusual safety precautions.

g. Lift plans shall specify wind restrictions in accordance with jurisdictional requirements, manufacturer requirements. As a minimum 30 mph (48 km/h) shall be the maximum wind speed for material hoisting, and 20 mph (32 km/h) for hoisting of personnel.

h. Audible alarms or equivalent communications means shall be utilized to alert personnel in the area immediately prior to the imminent lifting operation.

i. Appropriate exclusion zones shall be defined and in place prior to lifting operations commencing so as to prevent the risk of injury from the equipment or the load falling or striking personnel, and may be comprised of physical barriers, warning signs, signage and/or spotters.

j. Taglines shall be used to control load movement. If tagline usage poses a safety hazard this shall be reflected in the planned procedure and the task hazard assessment, and a short line of suitable length shall be attached to allow the worker to catch the load.

3.10 Working Alone

a. An employee is considered a lone worker if he / she is performing work with no line of sight or direct voice communication with another person who is aware of their assignment and capable of initiating emergency response.

b. When traveling alone, staff shall take appropriate precautions, including notifying their manager of the travel plans, check in times, as well as carrying a communication device and appropriate safety equipment.

c. Managers shall plan work to restrict personnel from working alone on any site without an appropriate risk assessment, controls, and approvals. If an employee will be out of contact with other personnel, the manager shall establish a buddy system or check-in procedure with another employee or responsible person.

d. Employees shall not conduct permit required or high residual risk tasks (e.g., confined space entry, work on an energized system) while working alone.

e. Where employees are undertaking office / computer-based work alone outside of normal working hours, they shall confirm security measures are in place (e.g., lock doors), support can be contacted and provided in the event of an emergency, and where appropriate, check-in procedures are established.

3.11 Temporary Works

Temporary works are the structures and installations enabling permanent construction to take place (e.g., formwork, false work, precast, shoring, scaffolding, back propping, temporary structures, etc.).

a. Temporary works shall be identified, designed and independently verified by appropriately qualified persons, and shall be installed in accordance with the design. Installation shall be verified by an appropriately qualified and competent person prior to initial use and loading.

b. Temporary works shall be regularly inspected by competent persons.

c. No changes to installed temporary works shall be made without prior acceptance of the designer, and if necessary, further design certification and independent verification of the changes.

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d. Temporary works shall be physically protected and secured where there is a risk of collision, or damage through adverse weather conditions or adjacent work practices.

3.12 Unmanned Aircraft Systems (UAS)

All AECOM operations using UAS shall be properly planned, managed, and executed to enable compliance to applicable requirements and prevent harm. AECOM has established the UAS Working Group; a team comprised of SH&E, Insurance, Operations, and UAS expertise. The UAS Working Group provides oversight of UAS operations to:

a. Provide expertise and support for commercial UAS operations within AECOM to enable compliant, professional, and responsible operations.

b. Review proposed UAS activities in AECOM for adherence to established procedures and operating guidelines, approval of personnel, performance in accordance with project work plans, and approval by UAS subject matter experts.

c. Approve UAS operations as appropriate and coordinate approved UAS activities with the Insurance function for appropriate insurance coverage.

d. Confirm field-level risk mitigation strategies are developed and integrated with the project work plans, and that flight safety briefings with all project personnel are conducted prior to the flights.

3.13 Working on or Near Water

a. Work activities that entail operations on, above, under or near water shall be assessed for hazards and the hazards appropriately mitigated.

b. If applicable to the identified hazards, a rescue plan and communication arrangements shall be established.

c. The hiring or leasing of watercraft shall take into consideration the seaworthiness of the vessel and that only licensed personnel can operate the craft.

d. Diving activities are prohibited unless specifically approved by the applicable Regional SH&E Director or designee (e.g., Diving Board).

3.14 Marine Safety & Vessel Operations

a. Project managers shall confirm boats / vessels selected are appropriate to the planned work activities and vessel operators are licensed to operate in the applicable jurisdiction.

b. All boats and vessels shall be properly equipped and operated by a qualified vessel operator (e.g., Marine Operations Superintendent, Master Mariner, Barge Captain, or similar authority and title) in accordance with the applicable jurisdiction’s Marine Safety Laws.

c. A site-specific SH&E Plan, Float Plan and any other SH&E planning documents shall be developed and in place prior to vessel operation.

3.15 Rail Corridors

a. AECOM employees shall not enter a railroad right of way without appropriate coordination and approval by a local railway employee (or representative of the railway owner) with knowledge of the operation and means and authority to enable on track safety.

b. Prior to performing work in a railroad right of way or railyard, AECOM employees will be provided with clear instructions applicable to the specific railroad operations, associated hazards, procedures, and requirements to enable employee safety associated with occupying the railroad right-of-way / fouling of tracks and the means of communication.

c. AECOM employees and equipment shall not foul the track (be in such proximity to a track that the individual or equipment could be struck by a moving train or on-track equipment) without securing appropriate approvals.

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d. An on-site safety briefing shall be conducted at the start of the shift, after work breaks, and any time there is a change in the nature of the work, a change in method of on-track safety being provided, or a change in the work area environment. Additional parties shall be engaged and included as required and appropriate (e.g., host railroad employee with the means and authority to provide on track safety protection).

e. Written documentation of the on-site safety briefing shall be provided by the AECOM employee-in-charge (EIC) of the work being performed on railway property.

3.16 Munitions & Explosives of Concern / Unexploded Ordnance (MEC/UXO)

a. Prior to beginning any activities on a site suspected of MEC / UXO, every effort shall be made to determine whether munitions-related activities ever occurred on the specific work area or within waters on which AECOM operations/activities will take place.

b. All MEC / UXO encountered or suspected on AECOM jobsites shall be treated as extremely dangerous. Employees shall not touch the suspected material and shall retreat. Employees shall identify the location, notify other team members, keep all employees out of the area, and report the finding to their supervisor.

c. MEC support activities, including surface and subsurface removal activities, shall be handled by UXO-qualified personnel only.

4 Change Log

Rev #	Change Date	Description of Change	Location of Change
1	15-Jun-2015	Complete rewrite – integration of URS & AECOM programs	Various locations
2	01-Aug-2016	Refer to SH&E Management System Manual Edit Summary – August 2016	Various locations
3	01-Aug-2017	Refer to SH&E Management System Manual Edit Summary – August 2017	Various locations
4	14-Jan-2019	Rewrite and restructure into 1 manual and 3 attachments (this document as ATT3). Refer to SH&E Management System Manual Edit Summary – January 2019	Various locations
5	03-May-2019	Added reference to S2-001-ATT4 SH&E High Risk Events Guidance	Section 2.2
6	14-Jun-2023	Revisions throughout to align with current organizational terminology. Renumber from ATT3 to WI3.	Various locations
7	13-Dec-2023	Remove EIR Template reference and revise required / optional EIR content.	Section 0.8 h
8	21-Mar-2024	Added new bullet (e) and sub-bullets to section 0.4 Fit for Duty	Section 0.4 e
9	22-July-2025	Updated core value reference. Updated hazard assessment content and probability table.	Section 0.10 and Section 2.2
10	13-Nov-2025	Revised Risk Acceptance Authority for Medium Risk to “Risk requires approval by Supervisor or equivalent”	Section 2.2 (h.i.)

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Ground Disturbance

S3AM-303-PR2

1. Purpose and Scope

a. The purpose of this procedure is to safeguard employees, property, and the environment from hazards associated with excavation, drilling, surface mining, and other ground disturbance operations.

b. For underground work, including underground mines, refer to Underground Work – Americas.

c. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

The following are the minimum required critical controls to prevent high-potential and/or significant incidents to be implemented by the Project Manager or Designee.

a. Protective systems must be used to protect workers entering an excavation and are required when an excavation is greater than 5 feet deep (1.22 meters in Canada) and is not entirely in stable rock, unless local law is more stringent.

b. If there is a danger of a worker or equipment falling into an excavation, or whenever the edge is not clearly visible, identify the trench or excavation perimeter with visual markers (e.g., barricade tape, wooden railings, stop logs, etc.). If the trench or excavation is 4 feet (1.22 meters) or greater in depth, the visual barrier must be a minimum of 6 feet (1.83 meters) from the edge. If possible, the grade should be away from the excavation.

c. Prior to beginning ground disturbance work at a site, the location of all underground and overhead utilities must be identified, and work locations must be carefully planned to avoid any potential for inadvertent contact with them. Appendix 1 provides a summary of these requirements. Also, the Utilities and Subsurface Clearance Checklist – Americas must be completed, reviewed, and signed by the Project Manager.

d. Refer to Hazardous Energy Control – Americas for additional requirements regarding overhead utilities present at a work location.

2.1 Utilities

2.1.1 Utility Locating Services

a. Contact the regional one-call/click-before-you-dig provider at least 3 working days prior to commencing ground disturbance.

b. The route and/or area of the proposed ground disturbance must be identified using flags, paint, or stakes prior to the arrival of the locator.

c. In urban areas, roadways, areas of high utility density, and/or areas where one-call/click-before-you-dig services are not available, private utility locating companies must be called to identify and locate the presence of underground utilities through geophysical surveys and/or other means.

2.1.2 Surface Markings

a. Markings must be maintained and remain visible throughout the duration of the ground disturbance activities on the project of the.

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b. If the surface over a buried installation is to be removed, supplemental offset markings must be used. Offset markings must be on a uniform alignment and must clearly indicate the actual installation is a specific distance away.

c. Uniform Color Coding – The colors and corresponding installation type are listed in Table 1 unless otherwise contract-specified:

Table 1. Color Coding for Marking of Buried Facilities

White	Proposed Ground Disturbance Area
Pink	Temporary Survey Markings
Red	Electric Power Lines, Cables, Conduit and Lighting Cables
Yellow	Gas, Oil, Steam, Petroleum Lines or Gaseous Materials
Orange	Conduit, Cable, Communication, Alarm or Signal Lines
Blue	Potable Water
Green	Sewer, Storm Sewer and Drain Lines
Purple	Reclaimed Water, Irrigation and Slurry Lines (non-potable)

2.1.3 Mapping Underground Utilities

a. The locations of subsurface utilities and subsurface installations must be documented on a site plan (a scaled site plan must be used when feasible).

b. The site plan must be available on the worksite where ground disturbance activities will be conducted.

2.1.4 Site Walk

a. A site walk will be conducted by the Project Manager, or their designee, and any other appropriate personnel with the objectives of reviewing all planned ground disturbance locations, the location of subsurface and overhead utilities, overhead obstructions, and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.

b. Site walks should be repeated as necessary following the identification and mapping of utility and subsurface structures as visual verification of the hazards.

2.1.5 Ground Disturbance Set Back Distance

Minimum set back distances from subsurface and overhead utilities and subsurface installations must be established including 5 feet (1.5 meters) from any subsurface utility, 7 feet (2.1 meters) from the pad surrounding any underground storage tanks, and 10 feet (3 meters) from any overhead energized electrical line (or farther depending on the voltage of the line). Government regulations, client requirements, and utility requirements may dictate a greater set back distance.

2.1.6 Utility Clearance Investigation / Location Confirmation

a. The Utilities and Subsurface Clearance Checklist – Americas must be completed, reviewed, and signed by the Project Manager.

b. At a minimum, all underground utilities and subsurface installations within a 5-foot (1.5-meter) radius of the work site must be identified and physically located (seen) using non-destructive techniques before use of mechanical excavation equipment is permitted. Legal, client, landowner, and utility owner requirements must be consulted, as the required hand exposure radius may be larger.

c. Non-destructive ground disturbance techniques must be acceptable by project stakeholders.

d. Equipment must be designed and operated with proper grounding controls in place.

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e. In urban areas, roadways, and/or areas of high utility density, proposed subsurface locations must be cleared by hand / non-destructive technique to 5 feet (1.5 meters) using non-mechanical methods. If boring depth is less than 5 feet, clearance depth must be discussed with the Project Manager and Safety, Health, and Environment (SH&E) Manager.

f. In non-urban areas, clearing by hand/non-destructive technique is still recommended or conducted if required by local law.

g. Hand/non-destructive technique clearance should be extended if locations of deep utilities and structures are not known, or if frost line depth indicates the potential presence of deep utilities.

h. Large mechanical equipment and attachment dimensions may require expanding the established zone around underground utilities and subsurface installations physically located (seen) prior to the use of the equipment. Borehole diameters must be cleared to 120% of the proposed borehole diameter.

i. Warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks), and any departure from native soil or backfill may be evidence of subsurface installations and utilities.

2.2 Drilling, Boring, and Direct-Push Probing

2.2.1 Site Set-up

The Project Manager and/or Site Supervisor must:

a. Confirm the work area is adequately identified:

   i. Including the zone around the drilling, boring, or direct-push equipment, as well as fluid carrying equipment, entry point, exit point, and any excavated areas.

   ii. Utilize barricades, signage, pylons, snow fence, etc. as appropriate.

b. Implement traffic control as necessary.

   i. When operating near public vehicular and pedestrian traffic, the on-site personnel must take every precaution necessary to see that the work zone is properly established, identified, and isolated from both moving traffic and pedestrians.

   ii. All traffic control devices must be installed, placed, and maintained in accordance with a Traffic Control Plan, Highway and Road Work – Americas, client specifications, and/or the Manual of Uniform Traffic Control Devices.

c. Coordinate concurrent operations to identify their associated hazards and controls.

d. Provide sufficient lighting.

e. Confirm that the cleared/levelled area is large enough to accommodate the drill rig and supplies.

f. Set up any sample tables and general work areas for employees at a safe distance from the rig. The recommended minimum safe distance is the height of the fully extended mast plus 5 feet (1.5 meters).

2.2.2 Equipment Inspections

a. Drillers are required to inspect all equipment prior to the initiation of operations and daily during operations. Drill Site Safety Inspection Checklist – Americas, or equivalent, must be completed by AECOM staff responsible to confirm that drill inspections are being conducted by the drillers prior to the start of drilling each day.

b. Defective equipment must be immediately tagged and taken out of service until repaired, altered, or replaced, and appropriately verified as safe for operation by a Competent Person.

2.2.3 Operating Requirements

a. Operation of the rotary drilling, coring, boring or direct-push equipment must be restricted to the designated operator except to activate the emergency shut-off as required.

b. Sit-on track mounted direct push rigs are not permitted unless the rig has been modified (in accordance with manufacturer's requirements) to be operated by remote control

c. The use of J-hooks and catheads are prohibited.

d. Consult local law and client requirements regarding the use of auger guards, which may be required during hollow-stem auger drilling operations.

e. The following safety measures must be taken during drilling, boring or probing operations on site:

   i. The rig operator and helper must be present during all active rig operations.

   ii. Hands, feet, and other body parts must be kept away from moving parts (e.g., hoisted, rotating, pushing, etc.) including augers, drill rods, and reamers.

   iii. When observing drilling, stand upwind and uphill of the drill rig to prevent potential exposure to vapors emitted from the borehole. Gas monitoring must be conducted at all sites.

   iv. The rig's emergency shut-off switch must be identified to site personnel and tested daily by the operator.

   v. Unauthorized personnel must be kept outside of the established work zone.

   vi. Rig crew and other worksite personnel must not use a cell phone while operating the drill rig or other equipment or within the rig work zone.

   vii. Do not drive the rig from hole to hole with the mast (derrick) in the raised position.

   viii. Before raising the mast (derrick), look up to check for overhead obstructions.

   ix. Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must be first levelled and stabilized with levelling jacks and / or solid cribbing.

   x. Before raising the mast (derrick), all non-essential personnel and visitors should be cleared from, any area within the fall radius of the mast All rig personnel and visitors should be informed the mast is being raised prior to raising it.

   xi. The drill rig must be releveled immediately if it settles after initial set up or at any time during operation that the rig becomes unlevel

   xii. Lower the mast (derrick) only when the levelling jacks are down and engaged, and do not retract the levelling jack pads until the mast (derrick) is lowered completely.

   xiii. After the rig has been positioned to begin drilling, all brakes and / or locks must be set before drilling begins.

   xiv. The rig operator must only operate the drill rig from the position of the controls. The rig must not be in operation if the operator of the rig leaves the area of the controls.

   xv. If it is necessary to operate the rig within an enclosed area, make certain exhaust fumes are ventilated out of the area.

   xvi. All unattended bore holes must be adequately covered and marked or otherwise protected to prevent rig personnel, site visitors, or animals from stepping or falling into the bore hole.

   xvii. Upon completion of the drilling project, all open bore holes must be covered, protected, or backfilled adequately and according to local law.

f. Stop work if unanticipated concrete, gravel, or other types of fill material are encountered and/or a void is encountered, as these conditions may indicate the presence of underground utilities or subsurface installations. If these conditions are encountered. drilling may only proceed with Project Manager or SH&E Manager approval.

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2.3 Excavation and Trenching

2.3.1 Excavation Requirements

a. A Professional Engineer must be engaged if specified by the applicable local law and as appropriate to the soil conditions and proposed excavation considerations (e.g., wall slope, shoring requirements, load calculations, etc.).

b. Excavated (spoil) material must be kept at least 2 feet (0.61 meters) from the edge of the excavation, or farther if local law is more stringent.

c. Excavated (spoil) material must be piled in a manner to prevent sloughing of loose material. Local law may specify spoil pile sloping requirements.

d. If the walls of an excavation or trench are 6 feet (1.83 meters) in depth and not sloped or cut back, barriers must be placed around the perimeter. The barrier must be at least 3.5 feet (1.07 meters) in height.

e. Regularly monitor water removal equipment controlling water accumulation to confirm proper operation.

f. If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means must be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

g. All excavations must be appropriately secured at the end of the day to prevent unauthorized or inadvertent entry into the excavation. This may require a protective covering, barriers, fencing, signage, or other measures appropriate to the excavation and associated conditions.

h. Backfill as soon as reasonably possible after work is complete.

2.3.2 Soil Classification

a. Soil classification must be conducted to confirm appropriate measures are taken to protect workers and to secure excavation walls.

b. Soil characteristics evaluated when classifying include, but are not limited to:

   i. Cohesiveness/compaction/compressive strengths (e.g., fissured, hardpan, fractured rock, etc.).

   ii. Composition (sand, clay, gravel, layered, etc.).

   iii. Moisture content/submersion.

   iv. Compaction.

   v. Exposure to vibration (e.g., traffic, pile driving, etc.).

   vi. Previous disturbances.

c. Consult the applicable local law, as classification methods, definitions, and terms can vary. In general classifications or types, include:

   i. Stable soil, dense, and heavy and primarily consisting of clay.

   ii. Soil with a medium level of stability and generally including silt, sandy loam, and medium clay.

   iii. Unstable soil, which generally includes gravel, loamy sand, and soft clay.

d. Methods of soil classification include:

   i. Plasticity Test

   ii. Dry Strength Test

   iii. Thumb Penetration Test

   iv. Pocket Penetrometer

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e. Type A Soil:

   i. Type A soils are cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) or greater. Examples of cohesive soils are clay, silty clay, sandy clay, clay loam, and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A.

   ii. However, no soil is Type A if ANY of the following conditions apply:

      1. The soil is fissured.

      2. The soil is subject to vibration from heavy traffic, pile driving, or similar effects.

      3. The soil has been previously disturbed.

      4. The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of 4 horizontal to 1 vertical (4H:1V) or greater.

      5. The material is subject to other factors requiring it to be classified as a less stable material.

f. Type B Soil includes ANY of the following:

   i. Cohesive soil with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf.

   ii. Granular cohesionless soils including angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam.

   iii. Previously disturbed soils except those which would otherwise be classed as Type C soil.

   iv. Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration.

   v. Dry rock that is not stable.

   vi. Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than 4H:1V, but only if the material would otherwise be classified as Type B.

g. Type C Soil includes ANY of the following:

   i. Cohesive soil with an unconfined compressive strength of 0.5 tsf or less.

   ii. Granular soils including gravel, sand, and loamy sand.

   iii. Submerged soil or soil from which water is freely seeping.

   iv. Submerged rock that is not stable.

   v. Material in a sloped, layered system where the layers dip into the excavation or a slope of 4H:1V or steeper.

2.3.3 Protective System Requirements

a. Protective systems must be used to protect workers entering an excavation and are required when an excavation is greater than 5 feet deep (1.22 meters in Canada), unless otherwise noted per local law, and is not entirely in stable rock.

b. The protective system may include sloping the excavation walls, shoring the excavation walls, and/or installing a shielding system. The protective system(s) chosen must have the capacity to resist, without failure, all loads to be applied to the system as determined by the Competent Person. All sloping, shielding, or shoring must be conducted in accordance with applicable local law.

c. Slope angle, or type of shoring or shielding, must be determined by:

   i. Soil classification, including structure, strength, moisture content.

   ii. Depth of the excavation.

   iii. Weather and environmental conditions.

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iv. Anticipated duration of excavation activities.

v. Loading of soil and soil stress (e.g., proximity of structures, location of equipment, stored material, anticipated vibration, etc.).

d. Refer to Figure 1 for an example diagram of slope height-to-depth ratio and angle, and refer to Figure 2 for an example drawing of a simple 34-degree slope sketch commonly used around the site for cave-in protection.

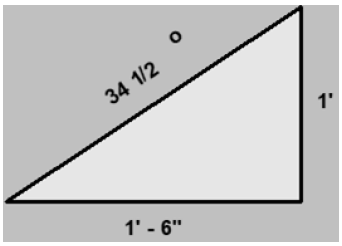

Figure 1. Slope Height-to-Depth Ratio and Angle Example Diagram

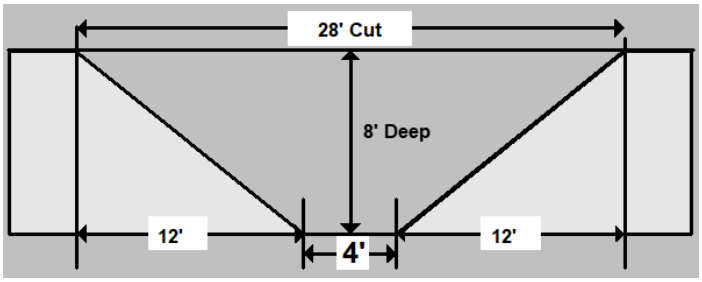

Figure 2. Example of a simple 34-degree slope commonly used around the site for cave-in protection

e. If an excavation may affect the stability of an adjacent building or structure, precautions must be taken to prevent damage to the structure. The precautions must be specified in writing by a Professional Engineer.

f. The depth of the excavation or trench is to be measured at its greatest vertical dimension. Be aware that crouching or kneeling in any unprotected trench, regardless of depth, may still pose significant hazard for the employee involved.

g. Use of Sloping or Benching as a Means of Protection:

i. If sloping is used as the means of protection, the trench or excavation walls must be sloped back so the ratio of the horizontal distance to the vertical rise (H:V ratio) of the sloped wall or degree from horizontal is appropriate to the soil type as determined by the Competent Person.

ii. If benching is used as the means of protection, the soil must be classified as Type A or Type B as determined by the Competent Person.

h. Use of Shoring as a Means of Protection:

i. Workers must be protected whenever shoring is being installed or removed.

ii. Shoring, stringers, or bracing must be installed from the top of the trench or excavation down. Removal must be completed from the bottom up unless conditions exist that would make doing so unsafe. A removal method must be developed without worker entry.

iii. Check hydraulic shoring (leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, other damaged or defective parts) once per shift at a minimum and more frequently as required.

iv. Hydraulic or pneumatic trench jacks must have a means of ensuring they will not collapse in the event of loss of internal pressure.

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i. Use of Shielding as a Means of Protection:

   i. Other protective systems meeting applicable legislative regulations must be utilized (e.g., shield systems, trench jacks, aluminum hydraulic shoring, etc.), and the manufacturer's data must be explicitly followed.

   ii. Shielding and trench boxes may be used in combination with sloping and benching.

   iii. The excavated area between the outside of the trench box and the face of the trench should be as small as possible and must be backfilled to prevent lateral movement of the shield.

   iv. The box must extend at least 18 inches (0.45 meters) above the surrounding area, or as specified by local law.

   v. Earth excavation below the shield is permitted only if:

      1. The excavation does not exceed a depth of 2 feet (0.61 meters) below the shield,

      2. The shield can withstand the forces calculated for the full depth of the trench, and

      3. There are no indications while the trench is open of possible loss of soil from behind or below the bottom of the support system.

   vi. A shield must not be subjected to loads exceeding those for which it was designed to withstand.

2.3.4 Work Around the Trench/Excavation

a. Structural ramps used for excavation access or egress of equipment must be constructed in accordance with local law and the instructions or designs of an individual competent and qualified in structural design.

b. If the ramp has an open side, it must have a curb or a restraining device.

c. Confirm equipment placement does not compromise the integrity of the excavation wall and optimizes visibility of the work zone and any contact hazards (spoil placement should also take these into consideration). Use wheel chocking or barricades as necessary to prevent encroachment of the edge.

d. If the appropriate setback of equipment is not possible, confirm appropriate blocking or matting is used to disperse weight. These requirements may need to be determined by a Professional Engineer.

e. While workers are in a trench, an aboveground observer or spotter must be present to warn of earth movements and to advise equipment operators of the presence and location of those in the trench to avoid vibrating equipment near trenches or excavations.

f. If there is a danger of a worker or equipment falling into an excavation, or whenever the edge is not clearly visible, identify the trench or excavation perimeter with visual markers (e.g., barricade tape, wooden railings, stop logs, etc.). If the trench or excavation is 4 feet (1.22 meters) or greater in depth, the visual barrier must be a minimum of 6 feet (1.83 meters) from the edge. If possible, the grade should be away from the excavation.

g. If walkways are permitted over excavations or trenches (e.g., trench over 6 feet [1.8 meters] in depth and wider than 30 inches [76 centimeters]), the installation must be in such a manner as to not compromise the stability of the excavation.

h. Crossings and/or walkways must be equipped with guardrails and constructed in accordance with local law.

i. If vehicle crossings over excavations are required, they must be designed by and installed under the direction of a Professional Engineer.

j. Precautions must be taken to isolate or remove loose rocks, trees, or other materials that may slide, roll, or fall into the trench and onto workers prior to entry by workers into an excavation.

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2.3.5 Work Within the Trench/Excavation

a. Personnel must not be permitted on the faces of sloped or benched excavations at levels above other workers unless those workers at lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

b. Employees must not work in excavations in which there is accumulated water or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation.

c. The precautions necessary to protect employees adequately vary with each situation but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and retrieval line.

d. A stairway, ladder, ramp, or other safe means of egress must be in excavations or trenches that are 4 feet (1.22 meters) or more in depth to minimize lateral travel for employees. Maximum lateral travel distances must be no more than 25 feet (7.6 meters). Ladders should extend at least 3 feet (0.91 meters) above the trench top.

e. Structural ramps used by employees or equipment as a means of access or egress from excavations must be designed by a Competent Person.

2.3.6 Confined Spaces and Hazardous Atmospheres

a. An excavation may contain hazardous gases, vapors, dusts, fumes or an oxygen-deficient or -enriched atmosphere:

   i. To prevent exposure to harmful levels of atmospheric contaminants, the task hazard assessment (THA; e.g., field level risk assessment [FLRA] in Canada) must evaluate atmospheric hazards when workers are required to enter trenches and excavations.

   ii. Appropriate atmospheric testing is necessary to accurately identify these hazards. Ongoing atmospheric monitoring, use of attendants, and rescue equipment may be necessary to address the identified hazards.

b. Hazardous atmospheres may exist in excavations where there is limited access or egress and in which a hazardous gas, vapor, dust, or fume or an oxygen-deficient atmosphere may occur. Consult local law, as the excavation may or may not be subject to confined space requirements.

2.3.7 Stability of Adjacent Structures

a. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning must be provided to confirm the stability of such structures for the protection of employees.

b. Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees must not be permitted except when:

   i. A support system, such as underpinning, is provided to confirm the safety of employees and the stability of the structure; or

   ii. The excavation is in stable rock; or

   iii. A Professional Engineer has approved the determination that the structure is sufficiently distanced from the excavation and will not pose a hazard to employees.

c. In addition, sidewalks, pavements, and secondary structures must not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

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2.3.8 Inspections

a. Daily inspections of excavations, the adjacent areas, and protective systems must be made by a Competent Person for evidence of situations that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. In these situations, exposed employees must be removed from the hazardous area until the necessary precautions have been taken to confirm their safety. Refer to Daily Excavation Checklist – Americas.

b. An inspection must be conducted by the Competent Person prior to the start of work and as needed throughout the shift. Inspections must also be made after every rainstorm or other hazard-increasing occurrence.

2.3.9 Backfilling

a. Perform any required notifications within the necessary timeframes prior to backfilling.

b. Confirm accurate classification of soil types of backfill material and absence of signs of contamination, discoloration, and smell.

c. Confirm the re-establishment of the original soil integrity using the original material (if suitable) or designated fill material(s).

d. Backfilling must be done with care to prevent damage to any exposed utilities or facilities.

e. A spotter may be necessary to avoid encroachment (e.g. working around other equipment, traveling under overhead lines, working in close conjunction to underground facilities and other workers, compromised line of vision) and to watch for any rocks falling into the excavation, which may damage exposed facilities. If fill contains rocks or hard material, a shield or alternate fill material may be used to protect the facilities.

f. Confirm piping or facilities are properly supported prior to backfilling.

g. If shoring was used, remove from the bottom up.

h. If a trench box has been used, it should be placed no more than 24 inches above the base of the excavation or a sub-trench bed containing the pipe.

i. Appropriate measures must be taken to confirm proper backfilling and compaction of soil below the trench box.

j. No worker must occupy a trench box while it is being moved.

k. If compaction is required, confirm the appropriate method is employed and compaction testing is conducted in a manner that does not damage any facilities or pipelines in the excavation.

l. Final grading and cover of the ground disturbance should be done so that erosion is controlled. The original state of the area and access must be considered when backfilling.

m. Any excess excavation material must be properly disposed of.

2.4 Ground Disturbance at Potential MEC / UXO Sites

If there is a potential to encounter munitions and explosives of concern (MEC), which includes unexploded ordnance (UXO), discarded military munitions (DMM), and explosive compounds, on a project site, the Project Manager must contact the SH&E Manager who must then engage the AECOM Munitions Response Program (MRP) Technical Group to determine what type of site-specific documents and staffing are required to safely conduct the project.

3. Responsibilities

a. A Competent Person must:

   i. Be present during all work that involves excavations greater than 5 feet (1.52 meters) in depth and/or whenever workers need to enter an excavation.

   ii. Identify prompt corrective measures to eliminate recognized present or anticipated hazards.

iii. Determine the maximum allowable slope for the walls of the trench or excavation.

iv. Classify the soil in the trench or excavation.

v. Inspect the excavation or trench daily when the potential for employee exposure to the hazards of the trench or excavation exists (use the Daily Excavation Checklist – Americas).

vi. Training

vii. The list below includes the most common training that may apply to ground disturbance activities. requirements.

viii. Excavations/Trenching

ix. Competent Person – Excavations

x. Confined Spaces Training

xi. Ground Disturbance/Utility Clearance Training

xii. Driller Safety Training

xiii. Occupational Safety and Health Administration (OSHA) 10-Hour Construction Safety Training

xiv. OSHA 30-Hour Construction Training

xv. Hazardous Waste Operations and Emergency Response (HAZWOPER)

xvi. Hydrogen sulfide (H2S) Alive

xvii. H2S Awareness

b. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training.

4. Terms and Definitions

a.	Clearance	Includes the following: The positive locating of underground utilities or subsurface installations in or near the work area and/or a signed statement by an appropriate representative attesting to the location of underground utilities and/or the positive de-energizing (including lockout) and testing of electrical utilities.
b.	Competent Person	Person, who, by way of training, knowledge, and/or experience, is capable of classifying soils and is also capable of identifying existing and predictable hazards in excavation/trenching work areas and who has the authority to take prompt corrective measures to eliminate them.
c.	Excavation	A manmade cut, cavity, trench, or depression in an earth surface formed by earth removal.
d.	Faces (or sides)	The vertical or inclined earth surfaces formed as a result of excavation work.
e.	Ground Disturbance	Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work in which the ground is penetrated. Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits/trenches or other man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.
f.	Hazardous Atmosphere	An atmosphere that by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful may cause death, illness, or injury.
g.	HAZWOPER	Hazardous Waste Operations and Emergency Response.
h.	Non-Destructive Ground Disturbance Technique	A safe excavation method that is used to visually expose an underground utility without causing damage. Non-destructive ground disturbance techniques may include, but are not limited to:

		i. Hand digging. ii. Use of non-conductive tools. iii. Air knifing. iv. Hydro-vacuuming.
i.	OSHA	Occupational Safety and Health Administration.
j.	Protective Systems	Devices or methods that protect employees in an excavation from cave-ins, a collapse, or falling material. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.
k.	Subsurface Installations	Structures beneath the surface. Examples: Subterranean tunnels, underground parking garages, and other structures beneath the surface.
l.	Tolerance Zone	A pre-defined horizontal distance (5 feet) extending from the outer edge of a line or pipe, or 7 feet extending from the outer edge of subsurface structures, that acts as a warning to proceed with caution while digging in this area. Ground disturbance within the tolerance zone requires use of non-destructive techniques. Visual exposure of the utility is required before mechanical excavation equipment may be used. Tolerance zones may be larger based on local utility requirements.
m.	Trench	An open, narrow excavation made below the surface of the ground. In general, the depth is greater than the width.
n.	Underground Utilities	All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling, and communications, etc.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. Hazardous Substances and Communication – Americas S3AM-110-PR2

c. Noise – Americas S3AM-118-PR1

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Subcontractor Selection and Stewardship – Americas S3AM-213-PR1

g. Confined Spaces – Americas S3AM-301-PR1

h. Hand and Power Tools – Americas S3AM-305-PR2

i. Highway and Road Work – Americas S3AM-306-PR1

j. Heavy Equipment and Machines – Americas S3AM-309-PR2

k. Hazardous Energy Control – Americas S3AM-302-PR2

l. Underground Work – Americas S3AM-330-PR2

6. Records

a. Daily Excavation Checklist – Americas S3AM-303-FM1

b. Drill Site Safety Inspection Checklist – Americas S3AM-303-FM3

c. Utilities and Subsurface Clearance Checklist – Americas S3AM-303-FM4

d. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

7. Appendices

a. Appendix 1 – Underground Utilities and Subsurface Installation Flow Chart

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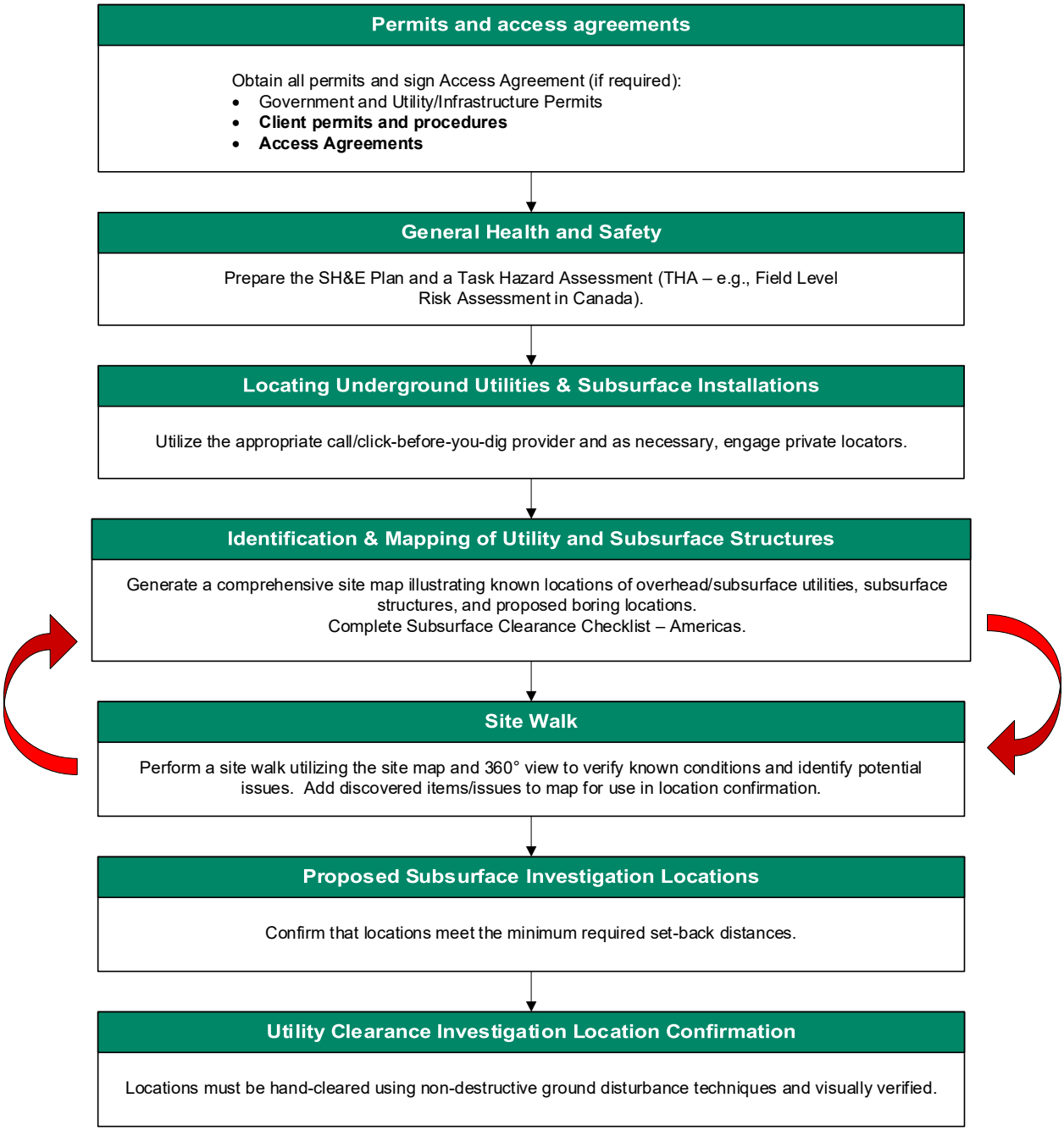
8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-303-PR2; consolidated portions of the contents from the following retired documents: Excavation – Americas S3AM-303-PR1, Drilling, Boring, & Direct Push Probing – Americas S3AM-321-PR1, Core Drilling, Boring & Direct Push Probing Flow Chart – Americas S3AM-321-ATT1, Underground Utilities– Americas S3AM-331-PR1, and Underground Utilities & Subsurface Installation Clearance Flow Chart – Americas S3AM-331-ATT2.	All

Appendix 1 Underground Utilities and Subsurface Installation Flow Chart



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Hand and Power Tools

S3AM-305-PR2

1. Purpose and Scope

a. The purpose of this procedure is to provide a set of minimum controls for the use of hand and power tools, including portable and powered equipment used on sites such as chain saws, brush cutters, powder-actuated tools, and similar high-hazard implements.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

The following is a list of the minimum required critical controls to be implemented as applicable by the Project Manager or Designee to prevent high potential/significant incidents.

a. All tools and equipment used by employees or managed subcontractors to conduct work on projects or sites under AECOM control must be maintained and operated in compliance with local law and the manufacturer's specifications.

b. No employee or subcontractor must use any hand or power tool unless they are familiar with the use and operation of the equipment and have received specific instruction on its use and operation.

c. A task hazard assessment (THA; e.g., field level risk assessment [FLRA] in Canada) or equivalent must be completed, reviewed, and approved before beginning any activity involving tools, machines, and/or equipment. Any task involving high-risk work requires review and approval by a Safety, Health, and Environment (SH&E) Manager. See SH&E Risk Assessment and Planning – Americas.

d. All tools must be used for the jobs for which they were designed and in accordance with manufacturer's specifications. Do not use tools for jobs they are not intended for. For example, do not use a slot screwdriver as a chisel, pry bar, wedge, or punch, or use wrenches as hammers.

e. Confirm lockout devices (padlocks, multiple lock hasps, tags) are utilized as necessary. Refer to Hazardous Energy Control – Americas.

2.2 General Requirements

a. Use approved tools only. Never modify or use makeshift tools.

b. Keep surfaces and handles clean and free of excess oil and grease to prevent slipping.

c. Do not carry sharp tools (e.g., knives, chisels, screwdrivers) in pockets; this practice may cause puncture wounds.

d. All tools must be properly maintained. Clean, dry, lubricate, and repair tools as applicable, and return to a suitable toolbox, room, rack, or other storage area upon completion of a job.

e. All tools designed to accommodate guards must have the guard(s) in place when the tool is in use. Do not modify, remove, or disable any machine guards.

f. Do not allow loose clothing, long hair not tied up, loose jewelry, rings, and chains to be worn while working with power tools.

g. Utilize good housekeeping practices to confirm tools do not present a tripping hazard.

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h. Do not throw tools from place to place or from person to person or drop tools from heights. Hand them, handle first, directly to other workers.

i. Screens must be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

j. Confirm that proper ergonomic principles are being observed when using hand and power tools, such as but not limited to:

   i. Avoid static and awkward positions when possible by doing the following:

      1. Move at intervals to reduce muscle fatigue.

      2. Consider tools with a trigger strip, rather than a trigger button. This strip exerts force over a greater area of the hand that, in turn, reduces muscle fatigue.

   ii. Do not apply excessive force or pressure on tools.

   iii. If possible, use tools with comfortable grips that are designed to allow the wrist to stay straight. Avoid using a bent wrist.

   iv. Choose hand tools that have a center of gravity within or close to the handle.

   v. Frequently used tools weighing more than 1 pound (0.45 kilograms) should be counterbalanced.

   vi. Position the body properly when using a tool to prevent slips or falls in the event of unanticipated tool behavior (slip, kickback, etc.). Avoid over-reaching.

   vii. Pull on tools such as wrenches or pliers whenever possible. Loss of balance is more likely when pushing if the tool slips. If pushing is necessary, hold the tool with an open palm.

   viii. Reduce power to the lowest setting that can complete the job safely. This action reduces hand-arm vibration exposure associated with the use of hand tools.

   ix. Consider the need for controls such as limiting time of use.

   x. If safe to do so, adjust to a looser but stable grip, and use anti-vibration gloves.

   xi. Use of heavy tools such as jackhammers can cause fatigue and strains. Heavy rubber grips can reduce these effects by providing a secure handhold.

   xii. Do not increase a tool's leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length.

k. Avoid placing fingers and hands in danger zones by doing the following:

   i. Confirm hands and fingers have enough clearance in the event the tool slips.

   ii. Confirm stability of the workpiece. Use workpiece holders (e.g., vice and chisel holder) whenever possible to prevent injury to hands or deflection of tool or workpiece.

   iii. Use push sticks or guides when cutting or machining smaller material.

l. If the task presents electrical hazards, the Employee must be competent and/or qualified and use the appropriate insulated tools to perform work that includes the risk of electrical shock. Cushioned grip handles do not protect against electrical shock. Refer to Hazardous Energy Control – Americas.

m. Secure or tether tools when working from heights to prevent them from falling. Never leave tools on ladders, scaffolds, or overhead work areas when they are not in use. Refer to Work at Height – Americas.

n. Make provisions to prevent tools from automatically restarting upon restoration of power. Refer to Hazardous Energy Control – Americas.

o. Use non-sparking and intrinsically safe tools in atmospheres with flammable or explosive characteristics and where highly volatile liquids and other explosive substances are stored or used. Refer to Hazardous Substances and Communication – Americas.

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2.3 Cutting Tools

a. When using cutting tools, employees must fully observe the following precautions when possible:

   i. Use the correct tool and correct size tool for the job. Tubing cutters, snips, self-retracting knives, concealed blade cutters, and related tools are task specific and minimize the risk of hand injury. For more information about cutting tools, see Appendix 1 – Alternative Cutting Tools.

   ii. Cut in a direction away from yourself and not toward other workers in the area. Direct the tools away from aisle areas and away from other employees working in proximity whenever possible.

   iii. Maintain the noncutting hand and arm toward the body and out of the direction of the cutting tool if it were to slip out of the material being cut.

   iv. Confirm the tool is sharp and clean; dirty and dull tools typically cause poor cuts and more hazard than a sharp, clean cutting tool.

   v. Store these tools correctly with covers in place or blades retracted, as provided by the manufacturer. Place sharp tools on benches so sharp points or edges face away from the edge.

   vi. On tasks where cutting may be very frequent or last all day (e.g., liner samples), consider cut-resistant (e.g., Kevlar®) gloves in the Personal Protective Equipment (PPE) evaluation for the project. Refer to Safety Gear – Americas.

b. Paper cutters must always be kept in a locked position when not in use. Do not remove guards on paper cutters.

c. Fixed open-blade knives (FOBKs) are prohibited from use during AECOM work. A FOBK is a tool with an exposed, prominent, sharp-edged blade that is fixed or can be locked into a fixed position. Examples of FOBKs include pocket knives, multi-tools, hunting knives, and standard utility knives.

   Note: Any exception to this requirement requires approval of the Project Manager and SH&E Manager via SH&E Management System Variance Request – Americas or an equivalent form.

2.4 Battery Powered Tools

a. Use only the type of battery specified by the tool manufacturer for the battery-powered tool to be used.

b. Recharge a battery or battery-powered tool only with a charger specified for the battery.

c. Store battery packs safely to prevent contact between the battery terminals and metal objects such as nails, screws, or wrenches. Such contact could cause a short circuit, potentially resulting in sparks, fire, or burns.

d. Battery storage and charging areas should be located in designated spaces that are dry, well-ventilated, and free from potential hazards such as combustible materials or incompatible substances. These areas should also include fire protection, adequate ventilation, and protection from foot or vehicle traffic.

2.5 Personal Protective Equipment (PPE)

a. Use PPE appropriate to the task: gloves, safety-toed boots, hard hats, safety glasses with side shields, goggles, hearing protection, respiratory protection, etc. Refer to SH&E Risk Assessment and Planning – Americas and Safety Gear – Americas.

b. Head and face protection is recommended for employees working with pneumatic tools.

c. Noise hazard is associated with pneumatic and many other tools. Working with noisy tools such as jackhammers requires proper, effective use of appropriate hearing protection. Refer to Noise – Americas.

2.6 Inspections

a. Inspect all hand tools on a regular basis and always prior to use. Defective tools must be immediately removed from service and tagged or destroyed to prevent further use.

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b. Where hand tools are identified as not fit for purpose, an observation report must be raised along with a corrective action. The corrective action must confirm that any non-compliant items identified during the inspection are rectified.

c. All tools must be inspected to confirm compliance with manufacturer's specifications. All tools must be inspected to ascertain all safety devices are present and functioning properly.

3. Training

a. Instruction in the proper use, safe handling, and maintenance of tools must be provided to employees unfamiliar with the tool. Training must include applicable manufacturer's specifications.

b. Employees must demonstrate knowledge and competency in the use, safe handling, and maintenance of the applicable tool prior to operation, especially in relation to the use of powered tools.

c. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training requirements.

4. Terms and Definitions

a.	High Potential/Significant Incident	An incident with potential or actual consequences assessed at a severity level of Major, Critical or Catastrophic using the Severity Table found in SH&E Risk Assessment and Planning – Americas.
b.	PPE	Personal Protective Equipment.
c.	THA	Task Hazard Assessment.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. Hazardous Substance and Communication – Americas S3AM-110-PR2

c. Noise – Americas S3AM-118-PR1

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Hazardous Energy Control – Americas S3AM-302-PR2

g. Work at Height – Americas S3AM-304-PR2

h. Manufacturer's specifications

6. Records

a. The following documents, when applicable, must be maintained in the project file:

   i. Site briefings regarding appropriate use of tools and equipment.

   ii. Records of inspections of tools and equipment.

   iii. Copies of any required tool operating licenses (as applicable, e.g., powder-actuated tools).

   iv. Records of tools and equipment removed from service.

b. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

c. SH&E Management System Variance Request – Americas S3AM-215-FM2

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7. Appendices

a. Appendix 1 – Alternative Cutting Tools

8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-305-PR2; consolidated portions of the contents from the following retired documents: Hand and Power Tools – S3AM-305-PR1, Hand Safety – Americas S3AM-317-PR1, and Safe Alternative Tools – Americas S3AM-317-ATT1.	All

Appendix 1 Alternative Cutting Tools

The following are types of safety knives or alternative cutting tools:

Figure 1. Self-retracting utility knives (brands – OLFA, Martor, Allway Tools)

Figure 2. Guarded utility knives (brands – The Safety Knife Co., Martor)

Figure 3. Shears, snips, scissors (brands – Ridgid, Craftsman, Wolfcraft)

Figure 4. Concealed blade cutters (brands – The Safety Knife Co., Martor)

Figure 5. Pipe cutters (brands – Ridgid, Empire)

Figure 6. Specialty cutter (brand – Geoprobe)

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Hazardous Substances and Communication

S3AM-110-PR2

1. Purpose and Scope

a. This procedure establishes Safety, Health, and Environment (SH&E) requirements associated with common work-related exposures to toxic or hazardous substances (e.g., gas, vapor, aerosol, dust, mist, fume, fog, fiber, and smoke).

b. This procedure includes a Hazard Communication Program to inform AECOM employees of hazardous substances present in workplaces where employees may be exposed under normal conditions or in a foreseeable emergency. This program does not apply to general consumer products (e.g., cleaners, printer toner, and white out) when used in their intended manner.

c. This procedure applies to all AECOM Americas-based employees and operations as well as personnel contractually required to comply with this document's content.

2. Procedure

2.1 Critical Controls

The following is a list of minimum mandatory critical controls to be implemented, as applicable, by the Project Manager or Designee to prevent high potential and/or significant incidents:

a. Identify materials, operations, or tasks having a potential of exposing employees to toxic or hazardous substances via review of project documents and Safety Data Sheets (SDSs) and discussions with project stakeholders. Various activities undertaken by employees (e.g., construction, maintenance, demolition, renovation, and production) may present potential toxic or hazardous substance exposure hazards. These exposures may be a result of materials disturbed, products handled or by-products of activities performed (e.g., welding, drilling, and grinding).

b. Employees' exposure to toxic/hazardous substances must not exceed established exposure limits. Refer to exposure limits outlined in the Project Hazardous Substance Exposure Control Plan - Americas.

c. If toxic/hazardous substances are identified or suspected at a work site with potential employee exposure:

   i. Check if historical air data exists for initial hazard assessment.

   ii. Inspect and test to confirm substances.

   iii. Develop a substance-specific hazard assessment, exposure control, and emergency response plan only when there is a potential for employee exposure to any chemicals listed in the form. This determination should be based on information obtained from historical investigations and other relevant sources indicating that the chemicals may be present at elevated concentrations at the site. If such potential exists based on information from historical investigations or other sources, the Project Hazardous Substance Exposure Control Plan - Americas, or equivalent, must be completed and attached as an appendix to the applicable SH&E plan.

   iv. Project Hazardous Materials Communication Plan - Americas, or equivalent, must be completed and attached as an appendix to the applicable SH&E plan when the project scope of work requires chemical materials (i.e., hazardous materials/substance and/or Materials of Trade) to be brought onto the site to perform work.

   v. Refer to SH&E Risk Assessment and Planning – Americas for additional SH&E plan requirements.

d. Confirm that employees who are potentially at risk of exposure have completed training per local law and AECOM requirements.

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e. Provide medical surveillance as needed; refer to Fitness for Duty – Americas.

f. Give consideration to storing, handling, using, generating, transporting, and disposing of each chemical according to regulations and Appendix 1 – Storage, Handling, Use, Transport, and Disposal Storage, Handling, Use, Transport and Disposal following whichever guideline is more stringent.

g. Review legal and client requirements to determine if substance-specific requirements exist. Substance-specific requirements are supplemental to the sections contained below and must be incorporated into the applicable SH&E plan. Substances with specific requirements include, but are not limited to, acrylonitrile, anhydrous ammonia, arsenic, asbestos, benzene, cadmium, chromium (IV), corrosive and reactive materials, flammable and combustible liquids, hydrogen sulfide, isocyanates, lead, mercury, silica, and vinyl chloride.

h. When performing activities at hazardous waste sites where an employee may be exposed or potentially exposed to hazardous wastes and health hazards, the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard must apply. Employees working where local law does not have a direct counterpart to HAZWOPER must still comply with this standard, in accordance with applicable duty of care/general duty clauses, and as far as it aligns with legal requirements.

i. Any breach of toxic or hazardous substance containment would require removal of employees from the affected area until the exposure hazard has been adequately controlled.

j. All confined space entry planning must assess the potential of toxic or hazardous substance exposures and must be done according to Confined Spaces – Americas.

k. A list of all known hazardous materials must be present at the facility per the section on Hazardous Materials Inventory below. Hazardous substances must not be brought into any AECOM office without prior approval from SH&E and Facilities Management.

l. Copies of this program and the SDSs must be available to any employee as required by local law and/or upon request in the native language of the employees.

m. Project Managers and employees must verify a SDS is available for each hazardous substance in their work area including chemicals brought on-site by subcontractors. SDS access can be via internal database or paper copies if employees can readily access them.

n. Hazardous material containers shall be labeled per Section 2.2.2.

o. Project Managers must confirm all employees (including new employees) under their supervision have received the appropriate training required by this procedure prior to assigning employees to tasks involving the use of, or potential exposure to, hazardous materials.

p. Project Managers must incorporate minimum requirements for welding, cutting, and other hot work activities (e.g. internal combustion engine or electrical equipment in flammable atmospheres) into the applicable SH&E plan.

2.2 Hazard Communication

2.2.1 Hazardous Materials Inventory

a. Project Managers must review and update the inventory as items are utilized or discontinued. Specific information on each noted hazardous material can be obtained by reviewing its SDS.

b. Project Managers must notify managed subcontractors of any hazardous substances used or stored by employees to which the subcontractor's employees may be exposed.

c. Project Managers must notify clients or property owners/operators of chemicals brought onto their property by employees or managed subcontractors.

d. The hazardous materials inventory must be maintained and regularly updated to reflect any work that is conducted to remove or encapsulate hazardous materials or to include additional areas where hazardous materials have been identified.

2.2.2 Labeling and Communication

a. To avoid any inadvertent interaction, hazardous substances must be clearly identified in the official language of the location.

b. Hazardous substance containers must have the following information on the label:

   i. Product Identifier

   ii. Pictogram

   iii. Hazard Statement

   iv. Signal Word

   v. Precautionary Statement

   vi. Supplier's Contact Information (Name and Business)

c. Primary containers must have the manufacturer’s original label unless they have been defaced or damaged.

d. Secondary containers must be labeled with either the manufacturer’s original label or a Globally Harmonized System-compliant alternate label.

e. Confirm proper hazardous substance labeling. See Appendix 2 – Sample Labels for examples of proper labeling.

f. All identified hazardous substances must, where practicable, be labeled or a sign posted as per local regulatory requirements. A container label must be replaced immediately if it is missing or the hazard information on the label is unreadable.

g. Labeling and signage must be clearly visible to persons working in the area.

h. Employees receiving chemical shipments are responsible for certifying the chemical containers are labeled. If the chemical containers are not labeled or if the label is damaged, the Employee must contact their manager.

2.3 Worker Exposure Control Program – General

For tasks with potential toxic/hazardous substance exposure above Action Level (AL) (or limit), requirements may include those below.

a. For exposure monitoring:

   i. Conduct initial and ongoing personal air sampling or area monitoring.

   ii. Choose suitable testing protocols and equipment.

   iii. Train employees to confirm that equipment is calibrated and tested according to manufacturer’s specifications.

   iv. If instrument calibrations are not performed daily, then daily bump tests (exposure to a known concentration of contaminant) must be performed to verify calibration and confirm alarms are working appropriately.

   v. Determine acceptable levels based on equipment and limits.

   vi. Use air samplers near breathing zones as needed.

   vii. Sample frequency depends on substance and exposure.

   viii. Share results with affected employees on site.

   ix. Continuous monitors should have visible and audible alarms. All personal hydrogen sulfide detectors must be set to alarm at the action level (e.g., 10 ppm) or lower as dictated by local law and/or client requirements.

b. For medical surveillance requirements:

i. Employees with potential AL-exceeding exposure may need baseline medical evaluation and must consult with SH&E and the Occupational Health Team (e.g., A medical surveillance program is required for all employees whose silica exposure is equal to or exceeds the action level for 30 or more days per year). Refer to Fitness for Duty – Americas.

ii. Conduct ongoing surveillance as needed by exposure type and per local law.

c. Medical Evaluation – Employees who experience excessive exposure must be temporarily removed based on medical evaluation.

d. Respiratory Protection – Where respiratory protection is specified for use in controlling worker exposures to toxic or hazardous substances, refer to Respiratory Protection – Americas for requirements. Respiratory protection is required when engineering controls or work practice controls are not feasible enough to reduce exposure to toxic or hazardous substances at or below the Action Level (or if applicable, established exposure limit).

e. Personal Protective Equipment (PPE) and Hygiene Facilities:

i. If airborne toxic or hazardous substance concentrations are above the AL, or the possibility of skin or eye irritation exists, and exposure cannot be controlled by other means, PPE must be used. Refer to Safety Gear – Americas.

ii. In addition to PPE, employees must be given access to clean changing, showering, and hand-washing facilities as needed to prevent cross contamination to regular clothing. Emergency eyewash units and body flush (shower) facilities may also be required - refer to Safety Gear – Americas.

f. For a Regulated Area:

i. A Regulated Area must be established to define where an airborne substance exceeds the AL.

ii. Only authorized personnel must access the Regulated Area, and no entry is allowed without functional safety controls.

iii. Regulated Areas must have demarcation and signage.

iv. No eating, drinking, smoking, or cosmetics are allowed in a Regulated Area.

g. Emergency Preparedness – The project-specific emergency response must include procedures relevant to the potential emergencies presented by the toxic or hazardous substances. Refer to SH&E Risk Assessment and Planning – Americas.

h. The cutting, grinding, drilling, and finishing of concrete and masonry poses a potential silica dust hazard. For respirable crystalline silica, a task-specific silica exposure control plan must be implemented per local law when applicable. Suggested engineering and work practice controls for preventing silica dust are as follows:

i. Employ wet methods.

ii. Connect the tool to a point-of-operation dust collection system.

iii. Contain the work area with barricades and similar devices.

iv. Use a ventilation system that removes and collects dust.

v. Point exhaust away from other workers.

i. Asbestos air monitoring data must be recorded per local law and industry standard.

j. For asbestos abatement work, an asbestos abatement plan must be developed and implemented per local law and industry standard. The plan must address:

i. the locations and/or materials where employees may be exposed to asbestos

ii. the health hazards of asbestos

iii. prompt housekeeping requirements of dust and waste resulting from abatement activities

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2.4 Hot Work

a. Hot work is a work activity that by the nature of the operation (e.g., grinding, burning, thermo cutting/welding, soldering, brazing, etc.) creates an open source of ignition (primary source of ignition or secondary source of ignition) or that could produce temperatures high enough to cause the ignition of flammable gases and combustible materials.

b. Equipment must be inspected daily, prior to use. Only properly marked and identified hot work operation equipment in good condition and specifically manufactured for the activity shall be used. Defective apparatus and equipment shall not be used and must be removed from service until repaired or replaced.

c. A hot work permit must be issued and signed by all relevant parties prior to starting hot work with control measures maintained throughout.

d. When feasible, combustible materials should be at least 50 feet away from hot work operations.

e. Engineering controls shall be implemented to control hot work hazards to the extent feasible. Positive air shut-off valves on internal combustion engines may be required to prevent ignition of flammable or combustible atmospheres.

f. Ventilation, air monitoring and respiratory protection, as needed, must be in place to control atmospheric hazards.

g. Portable welding screens and/or shields must be used to protect other workers and/or the public in the immediate area, and if combustible materials cannot be separated from hot work operations.

h. Fire extinguishing equipment (i.e. fire extinguishers) must be provided near hot work operations and must be immediately available for use, as needed.

i. When normal fire prevention precautions are not adequate for hot work activities, fire guards or fire watches must be assigned and maintained for a minimum of sixty (60) minutes following the completion of the hot work to confirm that no possibility of fire exists. Fire guards must be provided with necessary fire protection equipment and be trained in its use.

j. Employees performing hot work and/or are in the vicinity of hot work must be appropriately trained to the applicable tasks and associated hazards (i.e. hot work operator, authorize air monitor, fire watch).

k. Employees must be familiar with client requirements for welding, cutting and other hot work activities where applicable, and coordinate such activities with the client representative.

2.5 Flammable and Combustible Substances

a. Flammable substances must be stored separately from ignition sources and from substances they might react with.

b. Conductive containers must be electrically bonded to each other or electrically grounded during transfer of contents.

c. Place all rags, waste, etc., soiled by combustible or flammable materials in tightly closed metal containers for daily disposal.

d. A Class B (or ABC) fire extinguisher must be readily available while working with or near flammable and combustible liquids.

e. Employees must not enter or remain in a work area if more than 10% of the lower explosive limit (LEL) of an explosive substance is present in the atmosphere.

2.6 Compressed Gas Cylinders

a. Valves and regulators shall be visually inspected for foreign materials such as oil or dirt and deficiencies such as damaged threads or broken gauges. Deficient valves or regulators shall be removed from service and replaced.

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b. Hoses and/or connections must also be inspected per manufacturer's specifications.

c. Cylinders presenting potential deficiencies (e.g., dent, missing labels, valve protection cap cannot be removed by hand, and corrosion) must be tagged 'Do Not Use', removed from use, and returned to the supplier. Leaking cylinders should be moved to an isolated, well-ventilated area, away from ignition sources, and the project-specific emergency response plan must be followed as part of the project-specific SH&E plan – refer to SH&E Risk Assessment and Planning – Americas.

d. When withdrawing cylinder content, the cylinder valve must be opened slowly using the appropriate tool (e.g., manufacturer supplied, non-sparking, etc.). Point the valve opening away from people.

e. Empty cylinders shall be marked 'empty'.

f. Gas cylinders are also subject to the applicable requirements of Storage, Handling, Use, Transport, and Disposal in Appendix 1.

3. Training

a. Employees and operational first responders exposed to or potentially exposed to toxic or hazardous substances at or above the AL must undergo appropriate training, complying with legal and client requirements (Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas).

b. Training will be given before or at the start of employee assignments, after significant operational changes, and as required by applicable local law (e.g., annual Lead Awareness refresher in the U.S.). The training will be documented and provided to employees at no cost.

c. Training content includes, as applicable:

   i. Specific duties and responsibilities (e.g., spill response/reporting, decontamination).

   ii. Toxic or hazardous substance exposure limits and regulatory requirements.

   iii. Job-specific exposure hazards and prevention measures.

   iv. Health hazards and symptoms associated with exposure.

   v. Recognizing and evaluating hazardous situations, including:

      1. Characteristics of the toxic/hazardous substance, such as what the substance looks and smells like.

      2. The recognition of areas where specific toxic/hazardous substances may be found.

      3. Proper use of equipment for atmospheric testing and monitoring.

      4. Exposure monitoring purpose and procedures.

      5. Specific substance details, storage, and operations causing exposure.

   vi. Engineering controls, work practices (e.g., proper use, storage, handling, and spill prevention), and Exposure Mitigation Plan review.

   vii. Shipping of hazardous materials or waste

   viii. Proper management of hazardous waste (e.g., Resource Conservation and Recovery Act [RCRA] training)

   ix. Regulated area rules, entrance restrictions, and identification (e.g., signage).

   x. Container contents identification.

   xi. Self-protection measures, habit modification, and hygiene.

   xii. AECOM's protective procedures and labels.

   xiii. Client requirements.

   xiv. Respirators, protective clothing, other PPE, and technical guidelines.

xv. Project-specific emergency procedures (including uncontrolled release or spill response), first aid, and employee roles.

xvi. Medical surveillance program details, including when it is required, and self-examination.

xvii. Employee rights regarding record access (e.g., monitoring results, medical records).

d. Additional related training, such as confined space or respiratory protection, must also be completed before assignments, after significant changes, and as required by jurisdictional regulations.

e. Hazard Communication training may be provided via AECOM U's annual safety core curriculum or included as part of the Field Safety/HAZWOPER refresher.

f. Before employees are permitted to work, managers must identify the hazardous substances and their associated hazards (e.g., fire, toxicity, and reactivity hazards) used in their work area and communicate them to employees and any managed subcontractors. The SH&E plan and mitigation plan content will be communicated and made available to affected employees. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training requirements.

3.1 Employee Training Time Schedule

Employees must be trained on hazardous substances in their work area:

a. At the time of their initial assignment.

b. Whenever a new hazardous substance is introduced into their work area.

c. Whenever a new or significantly increased risk has been identified related to an existing hazardous substance (e.g., as identified in an updated SDS).

d. Whenever non-routine tasks not addressed during initial training are performed that will potentially result in exposure to hazardous substances, or exposure under the circumstances.

e. According to jurisdictional requirements (e.g., GHS, etc.).

f. Annually as a refresher.

3.2 Initial Hazard Communication Training

The initial training will provide instruction in the following:

a. Methods used to detect the presence or release of a hazardous substance in the work area (such as personal monitoring, recognizing visual appearance or odor of hazardous substances being released, etc.).

b. The physical and health hazards of substances in the work area and measures and procedures implemented to protect employees including the proper use of required PPE and emergency procedures.

c. The details of this Hazard Communication Program including an explanation of the labeling system and the SDS, and how employees can obtain and use appropriate hazard information.

d. Any operations in their work area in which hazardous substances are present.

e. Location and availability of this written Hazard Communication Program (this procedure).

f. The Employee's right to personally receive, and have their physician receive, information regarding hazardous substances to which they may be exposed.

4. Terms and Definitions

a.	Action Level	An airborne concentration of a potentially toxic or hazardous substance, measured in parts per million by volume (ppm), microgram per cubic meter ($\mu g/m^3$) milligram per cubic meter (mg/m^3) or fibers per cubic centimeter (f/cc), that triggers certain provisions as required by the applicable jurisdictional legislation. In many cases, the action level is 50% of the established exposure limit.
b.	Combustible Liquids	Any liquid with a flash point at or above 100 degrees Fahrenheit (37.8 degrees Celsius) but below 200 degrees Fahrenheit (93.3 degrees Celsius).
c.	Container	Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like containing a hazardous chemical. For the purposes of this procedure, pipes or piping systems, and engines, fuel tanks, or other systems in a vehicle are not considered containers.
d.	Corrosive Material	Corrosive materials are materials that have a pH less than 2.0 (acid), or greater than 12.5 (base).
e.	Established Exposure Limit	The maximum regulatory exposure concentration to which an individual may be exposed to for an 8-hour time weighted average (TWA). This limit is referred to by different terminology depending on local law (e.g., Permissible Exposure Limit [PEL], Contamination Limit, Occupational Exposure Limit [OEL], Threshold Limit Value [TLV], etc.). Acceptable methods of adjusting this limit to correspond to a different exposure period (e.g., 10 hours) vary by jurisdiction and substance.
f.	Exposure	Any situation arising from work operations in which an employee may ingest, inhale, absorb through the skin or eyes, or otherwise contact a hazardous substance.
g.	Exposure Limit: Ceiling Value	The maximum exposure concentration during any part of the working duration, assuming direct reading instruments are used. Ceiling exposure limits “C” must at no time exceed the exposure limit given for that substance. If instantaneous monitoring is not feasible, then the ceiling must be assessed as a 15-minute time weighted average exposure that must not be exceeded at any time during the working day.
h.	Exposure Mitigation Plan	A comprehensive document that describes the controls necessary to mitigate the risk for exposure to a specified toxic or hazardous substance. This plan is referred to by different terminology depending on the jurisdiction (e.g., Compliance Program, Exposure Control Plan, etc.).
i.	Flammable Liquid	Any liquid that has a flash point below 100 degrees Fahrenheit (37.8 degrees Celsius) when tested by a specific method, known as a closed-cup test.
j.	GHS	The Globally Harmonized System of Classification and Labelling of Chemicals – This was developed by the United Nations with the goal of an international system to define and classify the hazards of chemical products and communicate health and safety information on labels and safety data sheets (SDS).
k.	Hazardous Chemical	Those chemicals appearing in any of the following reference sources are established as hazardous chemicals for hazard communication purposes: i. 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, OSHA. ii. Hazardous Products Act, R.C.S. 1985, c. H-3, Section 2, Canada. iii. For operations within the State of California, the list of hazardous substances prepared by the California Director of Industrial Relations pursuant to Labor Code Section 6382. The concentrations and footnotes, which are applicable to the list, shall be understood to modify the same substance on all other source lists or hazards determinations set forth in 8 CCR 5194(d)(5)(D).

l. Hazardous Substance (Controlled Substance)

A hazardous chemical or carcinogen, or a product or mixture containing a hazardous chemical or carcinogen, provided that:

i. The hazardous chemical is 1% or more of the mixture of the product, and

ii. The carcinogen is 0.1% or more of the mixture or product.

iii. Manufacturers, importers, and distributors will be relied upon to perform the appropriate hazard determination for the substances they produce or sell.

iv. The following materials are NOT covered by the Hazard Communication Standard:

1. Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 et seq.) when subject to regulations issued under that act by the Environmental Protection Agency.
2. Tobacco or tobacco products.
3. Wood or wood products. Note: Wood dust is not exempt since the hazards of wood dust are not “self-evident” as are the hazards of wood or wood products.
4. Consumer products (including pens, pencils, adhesive tape) used in the workplace under typical consumer usage.
5. Articles (e.g., plastic chairs)
6. Foods, drugs, or cosmetics intended for personal consumption by employees while in the workplace.
7. Foods, drugs, or cosmetics in retail stores packaged for retail sale.
8. Any drug in solid form used for direct administration to the patient (I.e., tablets or pills).

m. HAZWOPER

Hazardous Waste Operations and Emergency Response – Any onsite contamination investigation, hazardous waste clean-up activities, hazardous substance emergency response and hazardous waste treatment, storage, and disposal (TSD).

n. HIS / WHMIS Log

Hazardous Substance Inventory / Workplace Hazardous Materials Information System log – A listing of all chemicals stored or used at an office or project site. Note that many lists may be imbedded in a project SH&E plan.

o. Location

Any separate and distinct AECOM office, laboratory, project site, or other company facility.

p. Mixture

Any solution or intimate admixture of two or more substances that do not react chemically with each other.

q. NFPA

National Fire Protection Association – The NFPA is a trade association that issues standards and codes concerning risks associated with fire. A system of categories has been established by NFPA standard 704, which designates colors and numbers to provide basic hazard information concerning hazardous materials. It enables firefighters and other emergency personnel to easily decide whether or not to evacuate an area or proceed with emergency control operations. The three principal categories of identification are Health, Flammability, and Instability. A numerical range of 0 to 4 indicates the severity of the hazard. A 4 indicates the most severe, and a 0 indicates a minimal hazard.

r. Primary Container

The container the hazardous substance originally came in when purchased.

s. Reactive Material

A reactive material is a chemical that may be sensitive to shock or may react with air or water depending on its makeup.

t. Reactivity

A measure of the tendency of a substance to undergo chemical reaction with the release of energy.

u. Regulated Area

Any area where concentrations of airborne toxic or hazardous substances exceed or can reasonably be expected to exceed the allowable employee exposure limits, either the 8-hour time-weighted average exposure limit or the short-term exposure limit as averaged over a sampling period of 15 minutes.

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v.	SDS	Safety Data Sheet – Informative published material on a substance prepared pursuant to U.S. state and federal regulations, OSHA Form 174, and Canada regulations (Hazardous Products Act & Regulation).
w.	Secondary Container	Any container that the hazardous substance is transferred to from the primary container.
x.	SH&E plan	A document prepared for a specific project that details the hazards, precautions, emergency planning, medical, and training requirements for that project. Refer to SH&E Risk Assessment and Planning – Americas.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. Respiratory Protection – Americas S3AM-123-PR1

c. Fitness for Duty – Americas S3AM-008-PR2

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Confined Spaces – Americas S3AM-301-PR1

g. Records Management and Retention Procedure – AECOM Global Q1-004-PR1

6. Records

a. Project Hazardous Materials Communication Plan – Americas S3AM-110-FM2

b. Project Hazardous Substance Exposure Control Plan – Americas S3AM-110-FM3

c. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

d. Medical Qualification / Surveillance Examinations

e. Environmental Testing and Monitoring

f. Hazardous Materials Storage, Handling, and Disposal

g. Employee Concerns Files

h. Chains of Custody

i. SH&E Training

j. All training (initial, periodic, and biennial) must be documented and include attendance sheet with signature, trainer details, training date, and content.

k. Location-Specific Hazardous Substance Inventory, as applicable.

l. All exposure monitoring records (e.g., air sampling) must be kept in the project files.

7. Appendices

a. Appendix 1 – Storage, Handling, Use, Transport, and Disposal

b. Appendix 2 – Sample Labels

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8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-110-PR2; consolidated portions of the contents from the following retired documents: Toxic & Hazardous Substances – Americas S3AM-110-PR1; Compressed Gases – Americas S3AM-114-PR1; Asbestos – Americas S3AM-109-PR1; Hazardous Materials Communication – Americas S3AM-115-PR1; Pictograms & Sample Labels – Americas S3AM-115-ATT1; Hazardous Materials Shipping – Americas S3AM-116-PR1; Hazardous Waste Operations – Americas S3AM-117-PR1; Corrosive & Reactive Materials – Americas S3AM-125-PR1, Flammable & Combustible Liquids – Americas S3AM-126-PR1, Exposure Monitoring – Americas S3AM-127-PR1, Respirable Crystalline Silica – Americas S3AM-129-PR1, Hot Work – Americas S3AM-332-PR1, and Blasting & Explosives – Americas S3AM-336-PR1.	All

Appendix 1 Storage, Handling, Use, Transport, and Disposal

a. Storage, handling, use, transport, and disposal of hazardous materials must be carried out in accordance with the SDS for the specific chemical.

b. When undertaking removal, disturbance, or maintenance of hazardous material, all regulatory requirements must be adhered to, including any requirements to give written notice to the regulator in advance of planned removal.

c. AECOM employees, contractors, and subcontractors may be required to complete client-issued permits prior to commencing removal or disturbance activities.

1.1 Storage

a. Toxic or hazardous substances in containers (including empty gas cylinders) must be suitable for the purpose they are employed for, kept in good condition, and appropriately labeled to identify the product and provide suitable warnings.

b. Hazardous substances shall be stored in a manner that prevents spillage and leakage from exposing people or the environment to the chemical.

c. Storage areas must clearly show signage in accordance with local law.

d. Minimum control measures for hazardous material storage areas must include:

   i. Chemical compatibility and segregation rules must be observed.

   ii. Sources of ignition, heat, and combustion materials must be removed (where applicable).

   iii. Security and access control systems and hardware must be in place, appropriate to the risk, to manage access to areas where hazardous materials are stored and used.

   iv. Provisions for safe drainage and containment must be identified and implemented.

   v. The storage area should always be kept well-ventilated and clean.

   vi. Food, food packaging, or personal use products should not be in proximity to the storage area.

   vii. Storage temperatures must be maintained in relation to the hazardous material properties.

e. Where the storage of hazardous chemicals exceeds manifest quantities, the Project Manager must ensure that any local regulatory notification and approval requirements are met.

1.2 Handling and Use

a. All hazardous materials must be used in strict accordance with the SDS and label instructions.

1.3 Transport and Shipping

a. AECOM employees must not transport hazardous materials in quantities requiring licensing or compliance with Dangerous Goods Transport Codes / Legislation. This must only be done by an approved contractor engaged by AECOM who can demonstrate compliance with the relevant legislation unless an AECOM staff member has received training by the required regulatory authority.

b. Compressed gas cylinders shall only be stored or transported in an upright or vertical position using a cylinder basket or cart.

c. Specific control measures for transporting compressed gas (CG) cylinders in vehicles should include:

   i. Cylinders containing oxidizing, flammable, or toxic gases must not be transported inside the passenger compartment of a motor vehicle.

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ii. Non-flammable or non-toxic gases should also not be transported in a passenger vehicle, and alternate arrangements should be made for primary control. If no alternative is available, the following additional controls must be implemented:

1. At least one vehicle window must remain open.

2. An effective cargo barrier must be installed (e.g., car trunk, specifically fitted metal cargo barriers in SUVs, etc.) separating vehicle occupants from CG cylinders.

iii. Confirm that CG cylinders are suitably secured to prevent cylinder movement during transport.

iv. Confirm that cylinder valves are closed and protective caps are installed (hand tight) when not in use or before moving.

v. Remove CG cylinders from the vehicle as soon as possible.

vi. CG cylinders (including small calibration gas cylinders) are considered Dangerous Goods and cannot be carried by air in personal baggage. CG cylinders must instead be couriered to the site.

1.4 Disposal and Waste Management

a. SH&E and Legal must be consulted either when wastes are generated via AECOM project activities or when AECOM is requested to sign waste manifests for a client.

b. Any used containers and materials must be disposed of appropriately, in accordance with the SDS.

c. All wastes must be evaluated to determine if such waste is a hazardous waste. This evaluation may include, but is not limited to, analytical test results, process knowledge, or review of SDS.

d. Hazardous waste must be collected, stored, preserved, segregated, treated, recycled, and disposed of separately from other waste and must not enter the general waste stream.

e. All hazardous waste must be accompanied by a Hazardous Waste Manifest (unless exempt by legislation) and must be marked, labeled, and placarded as stipulated by local law.

f. A record of disposal of hazardous waste must be obtained from the party disposing of the waste. The record must be retained and accessible (i.e., in the project folder or online system) if project related.

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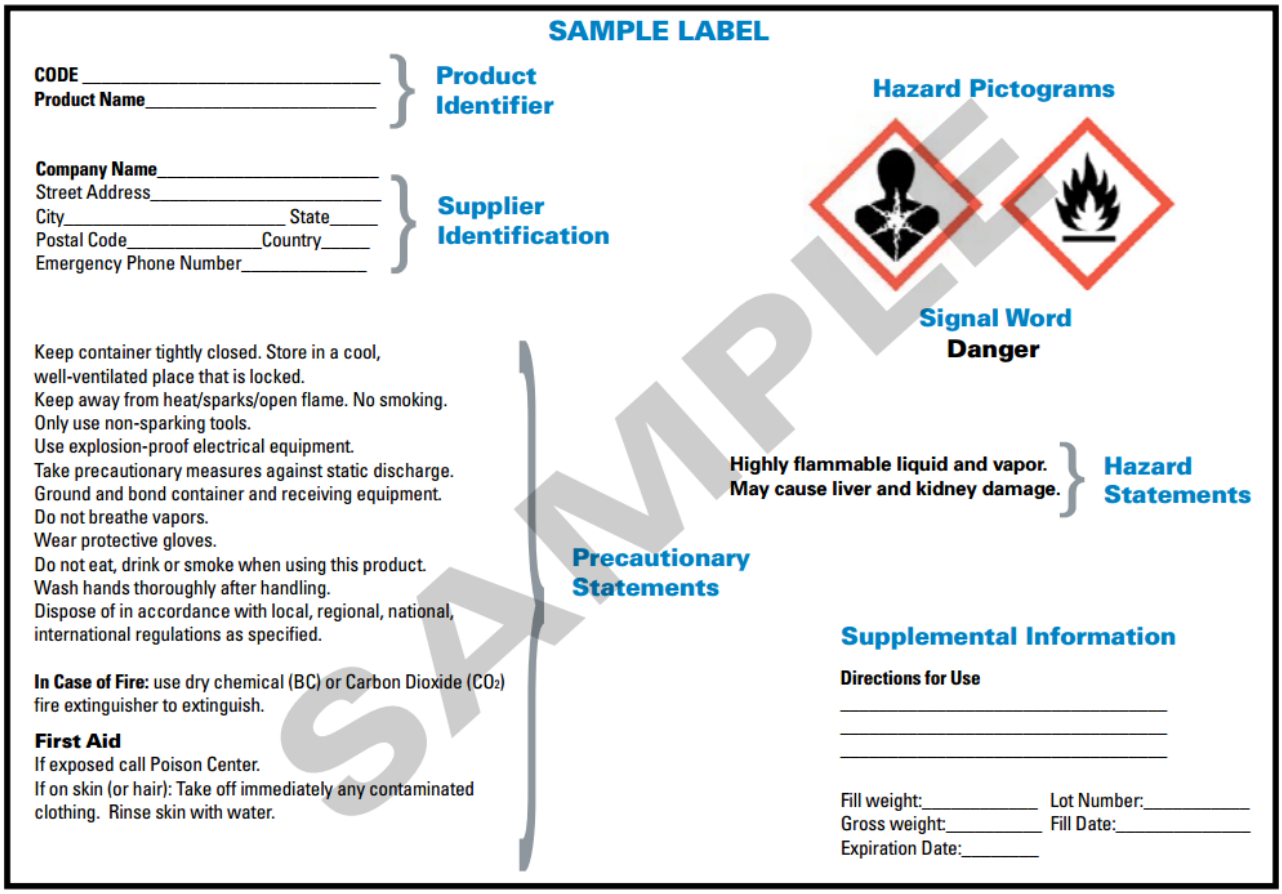
Appendix 2 Sample Labels

2.1 GHS Hazard Pictograms

2.2 Sample Supplier Label



2.3 Canada WHMIS Sample Label

a. A workplace label will require the following information:

   i. Product name (matching the SDS product name).

   ii. Safe handling precautions; may include pictograms or other supplier label information.

   iii. A reference to the SDS (if available).

b. Workplace label requirements fall under the local law of the project location.

c. Supplier labels may be one bilingual label, or two labels (one English and another in French).

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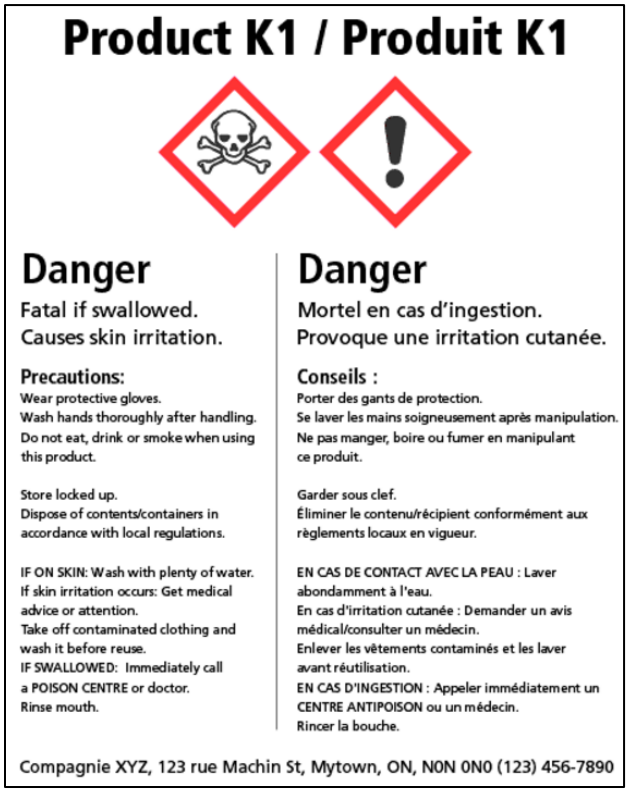
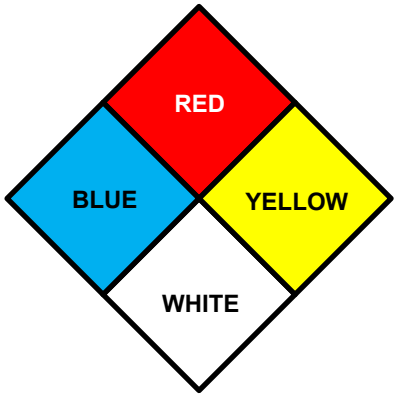


2.4 National Fire Protection Association (NFPA) Label



BLUE Health Hazard	**RED** Flammability Hazard	**YELLOW** Instability Hazard	**WHITE** Special Hazard
4 = Can be lethal	4 = Will vaporize and readily burn at normal temperatures	4 = May explode at normal temperatures and pressures	OX = Oxidizer
3 = Can cause serious or permanent injury	3 = Can be ignited under almost all ambient temperatures	3 = May explode at high temperature or shock	SA = Simple asphyxiant gas
2 = Can cause temporary incapacitation or residual injury	2 = Must be heated or high ambient temperature to burn	2 = Violent chemical change at high temperature or pressures	~~W~~ = Reacts explosively or violently with water
1 = Can cause significant irritation	1 = Must be preheated before ignition can occur	1 = Normally stable. High temperatures make unstable	
0 = No hazard	0 = Will not burn	0 = Stable	

Heat and Cold Stress

S3-AM-112-PR2

1. Purpose and Scope

a. Provide guidance to employees on the effects of heat and cold stress and controlling exposure to hot and cold working conditions.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

a. The Project Manager must monitor weather forecasts and current conditions and identify potentially hazardous heat or cold exposures. If potential for hazardous heat or cold exposure exists, the Project Manager must develop a heat/cold stress exposure control plan, incorporate the plan in the project-specific Safety, Health, and Environment (SH&E) plan, and confirm implementation in the field. Refer to SH&E Risk Assessment and Planning – Americas.

b. During a task hazard assessment (THA; e.g., field level risk assessment [FLRA] in Canada), potential heat and cold stress hazards must be evaluated, and appropriate control measures must be implemented to mitigate associated risks. Refer to SH&E Risk Assessment and Planning – Americas.

c. Employees must not be exposed to levels exceeding those specified for the given work level and work-rest regimen.

d. Employees must immediately report any signs or symptoms of heat or cold stress they may experience or observe in fellow employees. Refer to SH&E Incident Response and Investigation – Americas. Project managers should use such information to adjust the work-rest schedule.

e. Initiate emergency response procedures when necessary, including contacting emergency medical services as appropriate and in accordance with the project-specific SH&E plan. If an employee shows signs or reports symptoms of heat or cold stress, they must be removed from the hot or cold environment and treated by a first aid-trained person or by a physician, as needed.

f. The Project Manager should include costs in project budgets for specialized equipment and supplies needed to complete the field activities.

2.2 Heat Stress Planning and Prevention

a. Requirements for working in extreme heat may be triggered by regulatory criteria (e.g., state law in California, Washington, Oregon, Nevada, and Maryland) or as a result of a hazard analysis assessing various contributing factors.

b. Monitor ambient temperatures and conduct heat stress monitoring, as required, in accordance with the project-specific SH&E plan. Revise the heat stress monitoring and controls if there are any reports of discomfort due to heat stress.

c. Monitor temperatures in each unique environment in which employees perform work. Follow manufacturer's specifications on proper use of the thermometer.

d. Assess and apply as is practicable the hierarchy of controls (ordered by level of effectiveness) to reduce employees' exposure.

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2.2.1 Engineering Controls

a. Wherever possible, a designated break area should be established in an air-conditioned space, or in shaded areas where air conditioning is impractical.

b. The break area should be equipped to allow employees to loosen or remove protective clothing, and sufficient seating should be available for all employees.

c. If shade is not available, shaded areas must be constructed. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.

d. Cooling measures other than shade (e.g., misting, air-conditioned break areas, and air-conditioned vehicles) can be used in lieu of shade provided it can be demonstrated they are at least as effective in cooling employees.

e. Employees should have access to these rest areas at break times and at any other time when suffering from heat illness or believing a preventive recovery period is needed.

2.2.2 Administrative Controls

a. Employees must:

   i. Review the heat stress exposure control plan within the SH&E plan and/or THAs.

   ii. Confirm a reliable method of communication is in place to allow for contact with supervision.

   iii. Take frequent short breaks in areas sheltered from direct sunlight, frequently eat and drink small amounts, and avoid performing manual labor during breaks (other than paperwork or similar light tasks).

   iv. Avoid strenuous physical activity outdoors during the hottest part of the day.

   v. Avoid sudden changes of temperature.

   vi. Avoid working alone in extreme heat and instead use the buddy system.

   vii. Air out a hot vehicle before getting into it.

   viii. Obtain medical direction if taking diuretics during hot weather (a lower dose may be necessary).

   ix. Perform a self-assessment to evaluate their body's reaction to the heat and work conditions.

b. The Project Manager must:

   i. Develop appropriate work-rest schedules based on recognized technical standards (e.g., those published by National Institute for Occupational Safety and Health [NIOSH], American National Standards Institute [ANSI], and American Conference of Governmental Industrial Hygienists [ACGIH]) or as required by the most stringent applicable local law. Appendix 1– Heat Stress Work-Rest Schedule, adapted from ACGIH guidelines, may be used as a reference where no conflicting local law exists. The frequency and length of work breaks should be based on the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the employees (e.g., acclimated or unacclimated), and protective clothing being used.

   ii. Once a work-rest schedule is established, continually evaluate its effectiveness through observation of employees for signs/symptoms of heat stress such as dizziness, heat cramps, and/or extreme thirst.

   iii. Consider physiological monitoring of each employee's vitals (pulse, blood pressure, and temperature) and engage with SH&E and the Occupational Health Team in support of the assessment and implementation. Physiological monitoring can provide additional information in determining if the schedule is adequate or needs to be adjusted. Physiological monitoring of heat stress may be documented using Heat Stress Monitoring Log – Americas, or equivalent.

      Note: Monitoring of the extent of water loss may be considered. Water loss may be monitored by weighing the Employee at the start and end of each workday. A weight loss exceeding 1.5% of total body weight indicates the need for increased fluid intake.

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iv. Allow for acclimatization when work is performed by new and returning employees (absent 1 week or more) who have not had time to acclimatize, as they may be more susceptible to heat-related illnesses.

1. Minimize workload and gradually increase as tolerance is built up.
2. Allow for more frequent breaks.
3. While acclimatization normally takes approximately 5 to 7 days, heightened monitoring of these employees must be maintained for the first 14 days.
4. When possible, employees should begin hydrating at least 3 days prior to working in high heat conditions.

v. Try scheduling work at night or during the cooler parts of the day.

vi. Have cool (not cold), fresh, potable water available in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

vii. Have dry clothing or towels available to minimize chills when taking breaks.

2.2.3 Personal Protective Equipment (PPE)

a. Auxiliary cooling should be considered when ANY of the following conditions exist:

i. Ambient temperature is over 80°F (26°C).

ii. Employees are wearing impermeable garments (i.e., Tyvek, Saranex, and Chemrel).

iii. It is desirable to have long work shifts with minimum interruption.

b. If cooling devices are worn, only physiological monitoring must be used to determine work activity.

c. Cooling devices should be worn beneath protective garments, but over any underclothing.

d. Heat/flame-resistant gloves or mittens, tested in accordance with legal standards, should be selected when handling extremely hot or cold materials.

2.3 Cold Stress Planning and Prevention

a. Requirements for working in extreme cold may be triggered by regulatory criteria or because of a hazard analysis assessing various contributing factors.

b. Monitor ambient temperatures and implement controls in accordance with the project-specific SH&E plan. Revise the cold stress controls if there are any reports of discomfort due to cold stress.

c. Assess and apply as practicable the hierarchy of controls (ordered by level of effectiveness) to reduce employees' exposure.

2.3.1 Engineering Controls

a. The Project Manager can make shelters or screens available around the work area to provide protection from wind and rain and insulation from the ground. If a shelter is not readily available, consider supplying temporary shelters.

b. Prevent body heat loss by providing appropriate sources of heat (e.g., warm packs and portable heaters) and/or using insulating materials on equipment handles. Adequate protection, such as general ventilation, must be incorporated into any warming shelter design to prevent carbon monoxide poisoning.

2.3.2 Administrative Controls

a. Employees must:

   i. Review the cold stress exposure control plan within the SH&E plan and/or THAs.

   ii. Confirm a reliable method of communication is in place to allow for contact with supervision.

   iii. Get adequate rest and nutrition. Eat high-calorie snacks to maintain body metabolism and replenish energy stores.

   iv. Drink plenty of warm liquids to avoid dehydration.

   v. Limit time of exposure to the cold. Take advantage of heat from the sun and stay out of the wind as much as possible.

   vi. Take frequent short breaks in warm dry areas to allow the body to warm up.

   vii. For a wind chill below 10°F or -12°C, adopt a “buddy system” of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).

   viii. Be informed of the hazards associated with unstable snow or ice build ups.

b. The Project Manager must:

   i. Develop appropriate work-to-warming-break periods based on ambient temperature, wind speed for workers wearing dry clothing, wind chill temperature (refer to Appendix 2– Wind Chill Temperature Index), physical exertion, and acclimatization.

   ii. Confirm appropriate protection measures are in place.

   iii. Confirm walking and working surfaces are cleared of ice and snow to prevent slips and falls.

   iv. Allow for acclimatization when work is performed by new and returning employees (absent 1 week or more) who have not had time to acclimatize, as they may be more susceptible to cold-related illnesses.

   v. Make special provisions to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

   vi. Confirm extra blankets or sleeping bags are on site and provide opportunities for employees to change into dry clothing when heavy work is performed.

   vii. Specify, make available, and confirm supplies are regularly inspected/restocked when necessary, including heating/cooling enclosures, de-icing, traction aids, warm or replenishing drinks, and batteries.

2.3.3 Personal Protective Equipment

a. Wear multiple layers of insulating clothing to help prevent cold stress. When applicable, PPE should include:

   i. An outer layer to break the wind and allow some ventilation.

   ii. Head coverings and gloves or mittens for cold, wet, and windy conditions.

   iii. A hat or hard hat liner.

   iv. Insulated footwear with adequate traction to prevent slips and falls. Traction devices may need to be applied to the soles of work boots if the Employee may be walking on icy surfaces. Confirm the addition of ice cleats or other traction devices do not pose additional hazards.

   v. A change of dry clothing available in case work clothes become wet.

   vi. Eye and face protection when working outdoors in a snow and/or ice-covered terrain.

   vii. Sunglasses (with UVA and UVB protection) and sunscreen when there is a persistent combination of snow and direct sun.

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viii. Special safety goggles to protect against potential eye hazards such as blowing ice crystals, snow, ultraviolet light, and glare.

ix. Face guards to protect skin in cold, windy conditions, including riding in an unshielded vehicle.

b. Avoid cotton, especially blue jeans.

c. Confirm these items are approved and do not introduce additional unacceptable hazards (e.g., insufficient visibility and conductivity).

3. Training

a. All employees potentially exposed to heat or cold stress, including their supervisors, will receive the appropriate training prior to work commencing. Refer to SH&E Training – Americas for additional training requirements.

b. Training will include, but is not limited to:

i. Sources of exposure

ii. Use and impact of protective clothing

iii. Importance of acclimatization

iv. Safe work practices

v. Recognition of heat- or cold-related illness symptoms

vi. Preventive/corrective measures

vii. Weather monitoring

viii. Proper eating and drinking practices

ix. Buddy system

x. Proper use of PPE.

xi. First aid and emergency response procedures for symptoms on heat- or cold-related stress

4. Terms and Definitions

a.	Acclimatization	The process of physiologically adjusting or becoming accustomed to a new climate or environment.
b.	ACGIH	American Conference of Governmental Industrial Hygienists.
c.	Auxiliary Cooling	Cooling devices worn beneath protective garments, but over any underclothing.
d.	BEI	Biological Exposure Index.
e.	Cold Stress	The physiological effects due to cold temperatures and/or wind chill.
f.	Heat Cramps	A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.
g.	Heat Rash	A heat-induced condition characterized by a red, bumpy rash with severe itching.
h.	Heat Stress	The combination of environmental and physical work factors that constitute the total heat load imposed on the body. Symptoms include heavy sweating, headache, dizziness, nausea, and fast heart rate.
i.	Hypothermia	Condition of reduced core body temperature to 95°F (35°C) resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.
j.	TLV	Threshold Limit Value.
k.	Wind Chill	The combined effect of air temperature and wind velocity. Wind chill on exposed skin can cause heat loss.

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5. References

a. SH&E Training – Americas S3AM-003-PR2

b. SH&E Incident Response and Investigation – Americas S3AM-004-PR2

c. Safety Gear – Americas S3AM-208-PR2

d. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

e. Work On, In, Or Near Water – Americas S3AM-315-PR2

6. Records

a. Heat Stress Monitoring Log – Americas S3AM-112-FM1

7. Appendices

a. Appendix 1 – Heat Stress Work-Rest Schedule

b. Appendix 2 – Wind Chill Temperature Index

8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-112-PR2; consolidated portions of the contents from the following retired documents: Cold Stress – Americas S3AM-112-PR1, Temperature Thresholds – Americas S3AM-112-ATT1, Heat Stress – Americas S3AM-113-PR1, and Temperature Thresholds – Americas S3AM-113-ATT1.	All

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Appendix 1 Heat Stress Work-Rest Schedule

a. ACGIH defines heat stress as the net heat load to which a worker may be exposed from the combined contributions of metabolic heat, air temperature, air movement, humidity, radiant energy, and clothing. The ACGIH gives these limits in units of WBGT (wet bulb globe temperature) degrees Celsius (°C), which considers environmental factors such as air temperature, humidity, and air movement (see Table 1). WBGT values are not the same as humidex values. In some workplace situations, solar load (heat from radiant sources) is also considered in determining the WBGT.

Table 1. ACGIH Screening Criteria for Heat Stress Exposure (WBGT values in °C) for 8-Hour Work Day 5 Days per Week with Conventional Breaks

Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	31.0	28.0	--	--	28.0	25.0	--	--
50-75%	31.0	29.0	27.5	--	28.5	26.0	24.0	--
25-50%	32.0	30.0	29.0	28.0	29.5	27.0	25.5	24.5
0-25%	32.5	31.5	30.5	30.0	30.0	29.0	28.0	27.0

Note: Assumes 8-hour workdays in a 5-day workweek with conventional breaks.
Threshold Limit Values (TLVs) assume that workers exposed to these conditions are adequately hydrated, are not taking medication, are wearing lightweight clothing (long-sleeve shirts and pants), and are in generally good health.

Examples of workloads:

Rest – sitting (quietly or with moderate arm movements)

Light work – sitting or standing to control machines; performing light hand or arm work (e.g., using a table saw); occasional walking; driving

Moderate work – walking about with moderate lifting and pushing or pulling; walking at moderate pace; e.g., scrubbing in a standing position

Heavy work – pick and shovel work, digging, carrying, pushing/pulling heavy loads; walking at fast pace; e.g., carpenter sawing by hand

Very heavy – very intense activity at fast to maximum pace; e.g., shoveling wet sand

Source: Adapted from 2024 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists (ACGIH), 2024, pp. 236 and 237.

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b. The ACGIH exposure limits are intended to protect most workers from heat-related illnesses. If you are wearing heavier clothing, then the exposure limit should be lowered per ACGIH recommendations suggested in Table 2.

Table 2. Correction of TLV for Clothing (Values cannot be added when wearing multiple layers)

Clothing Type	WBGT Correction (°C)
Work clothes (long-sleeve shirt and pants)	0
Cloth (woven material) coveralls	0
SMS (Spunbonded – Meltdown – Spunbonded) polypropylene coveralls	+ 0.5
Polyolefin coveralls	+ 1
Double-layer woven clothing	+ 3
Limited-use vapor-barrier coveralls	+ 11

Note: These values are not to be used for completely encapsulating suits. Coveralls assume only modest clothing is underneath, not a second layer of clothing.

Source: Adapted from 2024 TLVs® and BEIs®: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists (ACGIH), 2024, p. 235.

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Appendix 2 Wind Chill Temperature Index

Table 3 gives temperatures for various combinations of wind and air temperature, as well as guidelines on the danger of skin exposure.

Table 3. Wind Chill Temperature Index

Wind Chill Temperature Index
(Frostbite Times Are for Exposed Facial Skin)

Air Temperature (°C)

Wind Speed (km/h)	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
5	4	-2	-7	-13	-19	-24	-30	-36	-41	-47	-53	-58
10	3	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57	-63
15	2	-4	-11	-17	-23	-29	-35	-41	-48	-54	-60	-66
20	1	-5	-12	-18	-24	-30	-37	-43	-49	-56	-62	-68
25	1	-6	-12	-19	-25	-32	-38	-44	-51	-57	-64	-70
30	0	-6	-13	-20	-26	-33	-39	-46	-52	-59	-65	-72
35	0	-7	-14	-20	-27	-33	-40	-47	-53	-60	-66	-73
40	-1	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68	-74
45	-1	-8	-15	-21	-28	-35	-42	-48	-55	-62	-69	-75
50	-1	-8	-15	-22	-29	-35	-42	-49	-56	-63	-69	-76
55	-2	-8	-15	-22	-29	-36	-43	-50	-57	-63	-70	-77
60	-2	-9	-16	-23	-30	-36	-43	-50	-57	-64	-71	-78
65	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79
70	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-80
75	-3	-10	-17	-24	-31	-38	-45	-52	-59	-66	-73	-80
80	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81

FROSTBITE GUIDE

Increasing risk of frostbite for most people in 10 to 30 minutes of exposure

High risk for most people in 5 to 10 minutes of exposure

High risk for most people in 2 to 5 minutes of exposure

High risk for most people in 2 minutes of exposure or less

Source: Adapted from 2024 TLVs® and BEIs®: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati, Ohio: American Conference of Governmental Industrial Hygienists (ACGIH), 2024, p. 226.

Heavy Equipment and Machines

S3AM-309-PR2

1. Purpose and Scope

a. This procedure establishes safety requirements for heavy equipment activities and working near heavy equipment and machines, including but not limited to excavating equipment, cranes, powered industrial trucks, other lifting equipment, and concrete pump trucks and parts (i.e., pump, boom, piping, and hoses).

b. For the purposes of this procedure, unmanned aircraft systems (UAS) are considered machines and managed UAS operations must be completed under a UAS plan approved by the UAS Working Group (UASWG) – refer to the UAS Ecosystem page.

c. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

The following is a list of the minimum required critical controls to be implemented by the Project Manager or Designee to prevent high potential and/or significant incidents:

a. For all field work:

   i. Implement control measures to allow Ground Personnel and third parties to move safely around heavy equipment activities.

   ii. Establish and maintain controlled access into designated areas of heavy equipment activity.

b. For AECOM-managed sites, the Project Manager must confirm the following:

   i. A task hazard assessment (THA – e.g., field level risk assessment [FLRA] in Canada) or equivalent hazard analysis has identified the heavy equipment activity hazards associated with the equipment.

   ii. Lifting operations are planned and executed by Competent Persons.

   iii. Operators may only operate heavy equipment if they are trained, qualified, and authorized for the specific heavy equipment they intend to operate.

   iv. Rigging is certified and inspected by a Competent Person.

   v. The rated load and all required information for equipment used for lifting or hoisting must be legible, clearly visible to the Operator, and on the lifting devices.

   vi. Operator has completed required heavy equipment inspections.

   vii. Stability and ground bearing pressure is for equipment setup and operation has been verified where risk of overturn or damage to services exists.

c. Those involved in any type of heavy equipment activity must follow applicable manufacturer's specifications, technical standards, and regulatory requirements. When the manufacturer's specifications are more stringent than the requirements of this procedure and local law, the manufacturer's instructions or recommendations must apply.

d. Cranes, hoists or other lifting appliances used for lifting or suspending a load must not be loaded beyond their established load limit and the load must be secured for safe transport.

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e. If safety is being compromised during any heavy equipment activity, all employees have the authority and responsibility to stop work without fear of reprisal or retribution. Please refer to Safety Tenets and Stopping Work – Americas.

f. Competent Person(s) completing a lift must:

   i. Properly classify and plan the lift by completing Lift Classification – Americas or equivalent for every lift or series of lifts to determine the type of lift to be conducted.

   ii. When the lift is classified as a critical lift, complete Critical Lift Plan – Americas, or equivalent.

   iii. Complete Personnel Platform Lifting – Americas or equivalent when the lift involves lifting of personnel.

   iv. Supervise the crane, hoist, or lifting device operation within the vicinity of the work area safely distanced from the operation.

g. Operators must be fit for duty and remain distraction free when operating heavy equipment. Refer to Fitness for Duty – Americas.

   Note: Mobile phone use is not permitted when operating or supporting the operation of equipment. Where fitted, seatbelts must be worn.

h. The Project Manager must confirm a diligent approach to planning is implemented and all requirements in this procedure are followed for all managed work involving heavy equipment and lifting operations. Refer to Safety, Health, and Environment (SH&E) Risk Assessment and Planning – Americas for more general planning requirements.

2.2 Heavy Equipment General Requirements

Where AECOM is the controlling entity or directly managing heavy equipment contractors on a project, the Project Manager or qualified designee must confirm the following:

a. The presence and functionality of critical safety devices, such as Roll-Over Protective Structures (ROPS), Falling Object Protective Structures (FOPS), guarding, edge protection, noise attenuation, hose burst protection valves, operational controls, emergency stops, etc.

b. The hazards associated with simultaneous operations have been addressed.

c. The risk of fall from height during heavy equipment activities has been reviewed. Refer to Work at Height – Americas procedure for work at height requirements.

d. Ground disturbance activity with heavy equipment is conducted according to the Ground Disturbance – Americas.

e. Employees keep all extremities, hair, tools, and loose clothing away from pinch points and other moving parts on heavy equipment.

f. Emissions, such as noise and exhaust fumes, have been managed to prevent/minimize harm to people and the environment and to prevent equipment or machines from acting as an ignition.

g. Rubber/pneumatic-tired earthmoving haulage equipment is equipped with fenders on all wheels. Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

h. Steering or spinner knobs are not attached to steering wheels.

i. Operational controls can be locked in an off position to prevent inadvertent energization during cleaning, maintenance, and repair. Refer to Hazardous Energy Control – Americas.

j. The operating zone of heavy equipment was considered with regards to contact with underground and overhead services such as power lines. Appropriate risk control measures must be adopted to protect against inadvertent contact with services. Refer to the Hazardous Energy Control – Americas for further guidance on identifying underground and above ground services.

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k. Operation manuals and other relevant instructions are readily available to operators and any person requiring information on the equipment. Operators must be familiar with the manual(s) and the safe and efficient operation of the heavy equipment.

l. Heavy equipment has required safety equipment such as serviced and inspected fire extinguishers.

2.3 Heavy Equipment Exclusion Zones

a. Heavy Equipment Exclusion Zones (HEEZ) must be implemented on managed sites by the Project Manager or qualified designee AND the Operator with due consideration to operating zones (e.g. swing radius of excavator or crane) and equipment operator blind spots.

b. HEEZ must be implemented such that they eliminate or minimize the likelihood of any inadvertent access to the immediate area where equipment is operating.

c. Where practicable, HEEZ should be physically demarcated using items such as safety cones, caution tape/flagging, rigid barriers, temporary fencing, etc.

d. Ground Personnel are not allowed to enter HEEZ until given permission by the Operator and the equipment has come to a complete stop and/or has been made safe. Employees must never work or pass under the buckets or booms of heavy equipment in operation.

e. When operating conditions are such that the boom of a crane or load swings over facility equipment, trailers, public roads, sidewalks, property lines or operating transportation systems, the owners of adjacent properties or systems must be consulted. A diagram should be prepared detailing the proposed swing paths for the crane.

2.4 Communication and Spotting

a. A reliable means of communication must be established between the Operator and Ground Personnel. The following general principles must be followed:

   i. Maintain constant visual or audio communication between the Operator and any support personnel.

   ii. Identify operator line of sight limitations (blind spots) of the heavy equipment and establish optimal line of sight locations when the equipment is stationary and in-motion.

   iii. Voice communication equipment must be used if line of sight with spotters or signal persons is not possible.

   iv. If communication is interrupted or lost, the Operator must stop moving immediately until re-established.

   v. During any lifting activity with multiple personnel involved, there can be only one designated signal person.

b. Spotters must:

   i. Be used based on risk assessment of the task and the working environment.

   ii. Remain in a position clearly visible to the Operator and establish an agreed-upon means of communication.

   iii. Be properly trained and dedicated to effectively perform their task, especially during set-up and movement of heavy equipment.

c. Equipment Operators and Ground Personnel must be trained on the radio instructions and/or hand signals used to communicate between Operators and Ground Personnel.

d. All heavy equipment with limited visibility operated around people or on a construction site must meet the following requirements:

   i. The operator must warn personnel in the vicinity of the start-up of the equipment using an alarm audible above the existing operations, or other suitable method providing sufficient warning

   ii. Have an audible back-up alarm that functions automatically when the vehicle or equipment is put into rear motion. The alarm must be clearly heard over equipment and other background noise. Reverse signaling lights must be in working order.

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iii. If it is bi-directional equipment, it must be equipped with a horn, distinguishable from the surrounding noise level, which must be operated as needed when the machine is moving in either direction.

iv. If alarms or horns are not feasible, backing up or movement in both directions for bidirectional equipment must occur only when a signal person communicates it is safe to do so.

2.5 Heavy Equipment Inspection, Testing, and Maintenance

a. The Project Manager must request and confirm that equipment inspections and maintenance records are documented, compliant with manufacturers' specifications and regulatory requirements, and readily available for review by the Operator or any person requiring this information.

b. All equipment must be inspected at defined frequencies, with commissioning inspections completed prior to use on the project.

c. A thorough and detailed inspection and assessment is required prior to initial use of equipment assembled or commissioned on-site.

d. The Operator assigned to a specific piece of equipment must carry out daily pre-start inspections as per the equipment's manual.

e. Any deficiencies found during inspection must be corrected, repaired, or mitigated by a qualified person before the item is placed into service. The Operator should approve and sign off on the repairs and mitigating actions prior to use.

f. A logbook must be completed for each piece of equipment or machine and reflect any inspections, repairs, testing, and maintenance completed. The logbook is to remain with the equipment.

g. Cranes must be inspected:

   i. Prior to using a crane for the first time

   ii. At least every 12 months thereafter

   iii. At the start of each shift

   iv. Each month the crane is in service

   v. When the crane has been idle for 3 months or more

h. Wire ropes and hooks of cranes must be inspected:

   i. Visually prior to each shift.

   ii. Monthly.

   iii. At least every 12 months by a Qualified Person.

i. For powered industrial trucks, use the Pre-Operation Powered Industrial Truck Checklist – Americas or equivalent.

j. Mobile elevated working platforms (MEWPs) must be inspected:

   i. Prior to using the MEWP and be documented using the Mobile Elevating Work Platforms (MEWP) Pre-Operation Checklist – Americas, Under Bridge Inspection Unit Pre-Operation Checklist – Americas, and/or equivalent;

   ii. In accordance with the manufacturer's specifications initially and when:

      1. The MEWP has been in service for 3 months or 150 hours, whichever comes first; or

      2. The MEWP has been out of service for more than 3 months, or if environmental conditions require a shorter period; and

   iii. Annually no more than 13 months from the date of the prior annual inspection;

k. The inspection will be made in person by a person qualified as a mechanic on the specific type of MEWP or one having similar design characteristics.

l. For hoists, a qualified person must make a thorough, annual inspection of all hoisting machinery. Additionally, the Operator must test control and safety devices daily before operations commence.

m. Prior to operating heavy equipment, ground conditions and weather conditions must be inspected and assessed.

n. Where applicable, an equipment inventory must be established and maintained.

2.6 Guarding

a. Exposed moving parts on equipment or machines that are a hazard to either the Operator or other employees must be guarded to protect them from the hazard, when possible. Moving parts include belts, gears, shafts, pulleys, sprockets, spindles, drums, fan belts, flywheels, and chains.

b. Platforms, foot walks, steps, handholds, guardrails, and toe boards must be present on machinery and equipment to provide safe footing and access ways.

c. If specific guidance on guard design is available in American National Standards Institute (ANSI) / Canadian Standards Association (CSA) standards and applicable regulations, compliance with the guidance is highly recommended. Commercially available guards should be used when feasible.

d. If possible, a machine guard covering rotating parts should be interlocked with the machine itself so the machine cannot be operated unless the machine guard is in place.

e. If a part will be exposed during proper function it must be guarded as much as is practicable consistent with the intended function of the component.

f. All hot surfaces of equipment, including exhaust pipes or other lines, presenting a possible injury or fire hazard, must be guarded or insulated when possible.

g. All equipment having a charging skip must be provided with guards on both sides and the open end of the skip area to prevent persons from walking under the skip while it is elevated.

h. All haulage equipment/trucks whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, must be adequately shielded (i.e., with a cable shield and/or canopy) to protect the Operator from shifting or falling material. If protection is not available for the Operator, the Operator must leave the vehicle and wait in a designated safe location until it is loaded.

2.6.1 Ground Personnel Requirements

Ground Personnel must:

a. Keep clear of the designated work and travel areas of all heavy equipment and yield to active heavy equipment.

b. Maintain eye contact with operators to the greatest extent possible (always face equipment). Never approach equipment from a blind spot or angle.

c. Only enter a designated area of any operating equipment such as a HEEZ when:

   i. They have attracted the Operator’s attention and established eye contact; and,

   ii. The Operator has idled the equipment down, placed it in neutral, grounded engaging tools, set brakes and communicated entry is permitted.

d. Never stand below buckets or booms or between two pieces of operating heavy equipment or other objects (e.g., steel support beams, trees, buildings, etc.) where a caught-between hazard exists.

e. Stay clear of blind spots around heavy equipment and never assume that the operators are aware of any Ground Personnel nearby. Maintain a distance of at least 2 feet (60 centimeters) between the counterweight of swing machines and the nearest obstacle. If this distance cannot be maintained, a spotter must observe and be in constant communication with the Operator to prevent contact.

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f. Stay away from stacked material that may be knocked over by a swinging load.

g. Never stand directly below heavy equipment located on higher ground.

2.7 Crane and Lifting Device Requirements

2.7.1 General Requirements

When using any type of lifting equipment, the Project Manager must confirm the following:

a. All lifts must be planned and managed under a documented risk assessment.

b. Cranes and lifting devices must not be operated without direct approval from the Project Manager and SH&E Manager.

c. Tag lines are the preferred method to control the load. Evaluate the need for tag lines, and where determined not to be necessary, the Project Manager or qualified designee will approve the decision to omit tag lines. Any additional risks associated with handling a load without tag lines will be addressed in the lift plan. Loads are not permitted to be manipulated by hand.

d. Suspended loads must not be passed over employees, and all parties on site must not work or walk under a suspended load.

e. Workers must never ride on loads being moved by cranes or derricks.

f. Suspended loads must be attended unless they are physically secured to prevent unintended movement.

g. The Operator must not leave the controls when the load is suspended.

h. When loading or unloading trucks, confirm the truck's cab is unoccupied when the crane is lifting loads over it.

i. Any safety devices installed on lifting equipment must be operational.

2.7.2 Critical Lift Operations

a. A lift is critical if it has one or more of the following conditions present:

   i. Lifts made when the load is greater than 75 percent of the rated capacity of the crane in the configuration that the lift will be made;

   ii. Lifts that require the load to be lifted, swung, or placed out of the Operator's view;

   iii. Lifts made with more than one crane or hoisting device;

   iv. Lifts involving non-routine or technically difficult rigging arrangements;

   v. Lifts of long lead time permanent materials;

   vi. Lifts that involve lifting loads over structures or equipment;

   vii. Lifts taking place in a confined or limited access area;

   viii. Hoisting personnel with a crane or derrick; or

   ix. Any lift which the lift Supervisor, Operator, or other management personnel believes should be considered critical.

b. The Project Manager or their delegate must designate lifts meeting any of the conditions that define it as a critical lift. The Project Manager may also designate other lifts that do not meet these conditions as critical, based on consideration of lift sensitivity, risk and/or cost.

c. Preparation for critical lifts must include completing Critical Lift Plan – Americas or equivalent.

d. If the critical lift involves lifting of personnel, Personnel Platform Lifting – Americas or equivalent must be completed.

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2.7.3 Lifting Appliances Other Than Cranes – Incidental Lifts

a. Incidental lifts can present as many, if not more, hazards than critical lifts because they often do not receive the same level of attention. Earthmoving equipment (excavators, backhoes, front-end loaders, etc.), crane trucks (HIABs), overhead gantry hoists, forklifts, telehandlers, piling rigs, etc. must only be used for incidental lifting as they are designed.

b. Where machines require the use of outriggers, they must be always used when lifting.

2.7.4 Lifting and Rigging Equipment

a. The Project Manager must request and confirm that records on all approved lifting and rigging equipment are retained by a Qualified Rigger, compliant with applicable manufacturers' specifications and local law, and readily available for review by the Operator or any person requiring this information.

b. Lifting and rigging equipment must be inspected before use and includes slings, hooks, spreader bars, and all other specialty equipment designated for each lifting apparatus.

c. Hooks, clamps, or other lifting accessories custom designed for hoisting modular structures, panels or other similar materials shall be proof-tested to 125 percent of the rated load and marked with the safe working capacity prior to use.

d. Chain or wire rope slings shall not be shortened with knots or bolts or other makeshift devices. Slings must not be kinked or knotted. Hooks must have safety latches.

e. Lifting and rigging equipment records include the following:

    i. A register of all lifting and rigging equipment that is maintained at each workplace to keep a log of all particulars associated with various gear including serial numbers, manufacturer details, certifications, ratings and inspection history.

    ii. Lifting and rigging equipment inspections

    iii. Copies of the designs and seals of custom lifting devices (including spreader bars and eye pads) which must be on site prior to use and engineered.

    iv. Manufacturer's specifications sheets for each specific lifting device that must be on site.

f. Any defective lifting and rigging equipment must be removed from service immediately and made permanently unusable. Refer to the manufacturer's specifications for determining when lifting and rigging equipment is defective, such as a sling missing a legible load rating. Damaged or defective rigging equipment must be tagged "Out of Service: Do Not Use", rendered unusable and removed from site as soon as practicable.

2.7.5 Modified Equipment

a. Lifting devices and cranes that have modifications or additions that affect the safe operation of the equipment or capacity must be inspected by a Qualified Person after such modifications/additions have been completed and prior to initial use.

b. Prior to initial use, a Qualified Person or a Competent Person who is under the direction of a Qualified Person, must load-test all lifting devices and cranes in which load-sustaining parts have been altered, replaced, or repaired. The replacement of wire rope is specifically excluded from this requirement; however, a functional test of the crane under a normal operating load will be made prior to putting a crane back into service.

c. Modifications or additions that affect the capacity or safe operation of the equipment are prohibited except where the requirements listed below apply.

    i. Manufacturer's review and approval

    ii. The manufacturer approves the modifications/additions in writing.

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iii. The load charts, procedures, instruction manuals, and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.

iv. The original safety factor of the equipment is not reduced.

2.8 Personal Protective Equipment (PPE)

At a minimum, all Ground Personnel and Operators outside of heavy equipment must wear the following:

a. High visibility safety vest (fluorescent background material and retro-reflective striping) visible from all angles and meeting jurisdictional requirements.

b. Hazards may require high visibility garments that cover torso, legs and arms.

c. American National Standards Institute/Canadian Standards Association (ANSI/CSA) - approved hard hat

d. ANSI/CSA-approved safety glasses with side shields

e. Canadian Standards Association or American Society for Testing and Materials (CSA or ASTM) - approved, high-cut (min. 6") impact and compression resistant footwear.

f. ANSI/CSA-approved hearing protection, as needed

g. Appropriate work clothes.

h. Refer to Safety Gear – Americas for any other PPE requirements.

3. Training

Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training requirements.

4. Terms and Definitions

a.	ANSI	American National Standards Institute.
b.	Competent Person	A person capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
c.	Controlling entity	A prime contractor, general contractor, or construction manager, or any other legal entity having the overall planning, quality, and completion responsibility for the construction of the project.
d.	CSA	Canadian Standards Association.
e.	Ground personnel	Personnel performing work around heavy equipment (note: operators are considered ground personnel when outside of the equipment cab).
f.	Guard	A barrier or enclosure that prevents any body part from reaching over, under, around, through, or entry into the point of operation.
g.	Heavy equipment	All excavating equipment, cranes, lift trucks, drills, etc. This includes off-highway trucks.
h.	HEEZ	Heavy Equipment Exclusion Zones.
i.	Machine safeguarding	Employing guards, devices, distance, location, and limited opening to protect employees who may be exposed to moving parts of equipment or machines.
j.	Operator	A person who operates the controls while the heavy equipment is in motion or the engine is running.
k.	Point of operation	That point at which cutting, shaping, boring, or forming is accomplished upon the stock.

l.	Powered Industrial Truck	A mobile, power-propelled truck used to carry, push, pull, lift, stack, or tier materials. Forklifts, pallet trucks, rider trucks, fork trucks, lift trucks, pallet jacks, motorized hand trucks, and skid steer loaders are all types of powered industrial trucks.
m.	Qualified Person	is a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.
n.	UAS	Unmanned Aircraft System - Aircraft without a human pilot aboard. Unmanned aircraft are commonly referred to as a UAS, Unmanned Aerial Vehicle (UAV) or drone. UAS vehicles may be either fixed wing or rotorcraft.
o.	UASWG	Unmanned Aircraft System Working Group - A group of AECOM employees who are responsible for the development of standard procedures, oversight and support for all AECOM UAS operations. The UASWG is comprised of employees from Operations, Insurance, Legal, Safety, Health and Environment, and UAS pilots and aviation pilots.

5. References

a. Safety Tenets and Stopping Work – Americas S3AM-001-PR2

b. SH&E Training – Americas S3AM-003-PR2

c. Fitness for Duty – Americas S3AM-008-PR2

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning– Americas S3AM-209-PR2

f. Hazardous Energy Control – Americas S3AM-302-PR2

g. Ground Disturbance – Americas S3AM-303-PR2

h. Work at Height – Americas S3AM-304-PR2

i. Unmanned Aircraft Systems – Ecosystem page

6. Records

a. Project Managers must confirm the following:

   i. Maintenance records are maintained and available on all heavy equipment, or onsite if unfeasible to keep on equipment. Maintenance records should be maintained for at minimum the duration of the project and in accordance with manufacturer and client requirements.

   ii. Records of all heavy equipment inspections and rigging inspections are retained and are readily available upon request. Documented inspections must be maintained for at minimum the duration of the project and in accordance with manufacturer and client requirements.

   iii. Records of Operator and Qualified Rigger qualifications and training must be provided to the Project Manager upon initiation of the project and maintained for the duration of the project.

b. Equipment manuals must be provided to the Project Manager upon equipment use and onboarding.

c. Training records must be maintained according to SH&E Training – Americas.

d. Records include the following:

   i. Lift Classification – Americas S3AM-309-FM14

   ii. Critical Lift Plan – Americas S3AM-309-FM15

   iii. Personnel Platform Lifting – Americas S3AM-309-FM16

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iv. Pre-Operation Powered Industrial Truck Checklist – Americas S3AM-309-FM17

v. Mobile Elevating Work Platforms (MEWP) Pre-Operation Checklist – Americas S3AM-309-FM18

vi. Under Bridge Inspection Unit Pre-Operation Checklist – Americas S3AM-309-FM19

vii. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-309-PR2; consolidated portions of the contents from the following retired documents: Heavy Equipment – Americas S3AM-309-PR1; Cranes & Lifting Devices – Americas S3AM-310-PR1; Definitions – Americas S3AM-310-ATT1; Rigging – Americas S3AM-310-ATT3; Powered Industrial Trucks – Americas S3AM-324-PR1; Machine Guarding – Americas S3AM-326-PR1; Hoists, Elevators, and Conveyors – Americas S3AM-343-PR1; and Mobile Elevated Work Platforms – Americas S3AM-323-PR1.	All

Life-Preserving Principles

AECOM has adopted nine "Life-Preserving Principles" which guide our global Safety, Health & Environment (SH&E) program, Safety for Life. These Principles advance our commitment to achieve our ultimate objective of incident prevention, and protection of the environment while executing our work.

Demonstrated Management Commitment

Our executive, senior and project managers lead the Safety, Health and Environment improvement process by continuously demonstrating their support, commitment and accountability.

Pre-Planning

Effective hazard control will be employed through Pre-Project and Pre-Task planning to design, plan and build the safety and health protection of our employees, stakeholders and the environment into every project.

Safety Orientation and Training

Appropriate safety training will be provided to all employees and partners to set the expectations of our Safety for Life program and to provide skills enabling proactive hazard identification and control.

Employee Participation

Our employees are empowered to engage in our Culture of Caring and Safety for Life program to actively contribute to the physical, psychological, and social well-being of all affected by our work.

Contractor Management

Our project staff will coordinate with our clients, sub-consultants, subcontractors, contractors and Joint Venture Partners to collectively plan for and maintain a safe and healthy workplace.

Incident Investigation

Our managers and safety staff will investigate all recordable and high potential incidents to identify contributing factors and root causes. Lessons learned will be developed, shared and implemented to prevent reoccurrence.

Budgeting and Staffing for Safety

Our safety staff will be appropriately trained, experienced and qualified to provide technical support to our internal and external clients. A budget will be provided to adequately support safety and health needs.

Recognition and Rewards

Our employees and project participants will be recognized for their commitment to working safely and their positive contribution to our safety efforts.

Fit for Duty

All employees are responsible for reporting fit for the tasks at hand and for remaining so throughout the course of the work period so as not to compromise their health and safety or that of others.

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Life-Preserving Principles (S2-001-WI1)
Revision 7 August 27, 2025
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AECOM

Noise

S3AM-118-PR1

1. Purpose and Scope

a. This procedure establishes requirements for the following:

   i. An effective hearing conservation program.

   ii. Confirming that personal noise exposure remains within acceptable limits.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Critical Controls

The following is a list of minimum mandatory critical controls to be implemented, as applicable, by the Project Manager or Designee to prevent high potential and/or significant incidents:

a. Safety, Health, and Environment (SH&E) plans and task hazard assessments (THAs; e.g., field level risk assessments [FLRAs] in Canada) must identify:

   i. Applicable hazards related to noise exposure via established exposure limits and action levels specified by local law.

   ii. In the absence of specifications, an 8-hour time-weighted average (TWA) of 85 decibels A (dBA) as the action level.

   Note: Refer to SH&E Risk Assessment and Planning – Americas.

b. When processes or areas present potential or actual noise exposures at or above the action level identified by local law, a trained and competent individual must conduct a noise survey and interpret results to measure the extent of the hazard.

c. Resulting documentation (e.g., noise maps, and results of the sound level survey data) must be communicated to affected employees in writing within 15 days from receipt of results, or less where required by local law, and posted or available at the location.

d. Noise assessments must be repeated when there is any change in processes or equipment affecting the noise level or the exposure duration.

e. Eliminate noise sources or use engineering controls to reduce noise levels when practicable prior to implementing hearing protection personal protective equipment (PPE).

f. Where practicable, a clearly visible warning sign must be posted at every approach to an area in the workplace where the sound level regularly exceeds 85 dBA.

2.2 Hearing Protectors

The Project Manager is responsible for confirming the following:

a. At a minimum, hearing protectors must provide a level of protection bringing actual or anticipated exposure below the established exposure limit in accordance with local law.

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b. Hearing protection is mandatory for all employees who:

   i. Work on or near heavy equipment unless personal dosimetry or other techniques have been used to document actual exposure is below the action level;

   ii. Are exposed to 85 dBA or higher at any time; and/or

   iii. Have experienced a standard threshold shift (STS).

c. Hearing protection must be made available at no cost to all employees exposed to the action level.

   Note: At least two types of hearing protectors must be available to employees free of charge, and the type of hearing protector must be suitable to the task and in accordance with local law.

d. Hearing protectors must be used in accordance with manufacturer's specifications to effectively protect hearing.

e. Refer to Safety Gear – Americas for additional information.

2.3 Audiometric Testing

a. Employees with exposure greater than the action level must be enrolled in the medical surveillance program at no cost to the employees, which includes that the enrolled employees receive:

   i. Baseline audiograms within 6 months of the first exposure (consult local law for more stringent timelines).

   ii. Audiograms annually and compared with the baseline exam to determine if the audiogram is valid, and if there is an STS.

   iii. Audiograms during their exit physicals.

b. For more information on medical surveillance, refer to Fitness for Duty – Americas.

c. Audiometric testing and employee notification of results must be in accordance with local law.

2.4 Employee Monitoring

a. When information indicates employees' exposure may equal or exceed the applicable action level, the Project Manager and SH&E Manager must develop and implement a site-specific monitoring program to identify inclusion in the hearing conservation program and enable the proper selection of hearing protectors.

b. Noise surveys must be conducted in a manner reasonably reflecting the exposure of affected employees. Surveys must be conducted under supervision of a competent person.

3. Training

a. All employees with potential exposure above the applicable action levels, or who otherwise utilize any type of hearing protector, must participate in a hearing conservation training program.

b. Training must occur with 30 days of enrollment into the hearing conservation program and address the use of hearing protectors. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training requirements.

c. Hearing protection training must be conducted annually for all affected employees or more frequently for employees who do not properly use hearing protectors or otherwise fail to comply with this policy.

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4. Terms and Definitions

a.	Action Level	May also be referred to as Monitoring Level. An 8-hour, time-weighted average established by local law, measured on the A-scale, slow response. Depending on local law, this can vary anywhere from 74 dBA to 85 dBA, and may additionally be defined as 50% of the allowable noise dose. In the absence of an action level specified by local law, 85 dBA must be used as the default action level.
b.	dB	Decibel – Logarithmic unit of measurement of sound level.
c.	Established Exposure Limit	The maximum regulatory noise exposure to which an individual may be exposed to for an 8-hour time weighted average (TWA). This limit is referred to by different terminology depending upon local law (e.g., Permissible Exposure Limit [PEL], Contamination Limit, Occupational Exposure Limit [OEL], Threshold Limit Value [TLV], etc.). Acceptable methods of adjusting this limit to correspond to a different exposure period (e.g., 10 hours) vary by local law.
d.	PPE	Personal Protective Equipment.
e.	SH&E	Safety, Health, and Environment.
f.	STS	Standard Threshold Shift – When one's hearing threshold has changed (relative to the baseline audiogram) an average of 10 dB or more at 2000, 3000, or 4000 Hz in either ear.
g.	TWA Sound Level	Time-Weighted Average Sound Level – The average noise level a person is exposed to over a specific period of time, usually an 8-hour workday, taking into account variations in the noise level during that time. It considers both noise levels and how long the employee is exposed at each noise level.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. Fitness for Duty – Americas S3AM-008-PR2

c. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

d. Safety Gear – Americas S3AM-208-PR2

6. Records

a. Noise exposure measurement records, surveys, and site-specific hearing conservation plans must be retained at the project or facility for the duration of the project.

b. Audiogram records must be retained in the employee's medical records.

c. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Mar-2016	Initially released as S3NA-118-PR1	
1	31-July-2019	Re-released as S3AM-118-PR1	
2	01-Dec-2025	2025 review; comprehensive revision as part of the Americas SH&E IMS simplification; converted to new IMS Procedure Template and AECOM Style.	All

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Safety Gear

S3AM-208-PR2

1. Purpose and Scope

a. The purpose of this procedure is to define the process and criteria for the selection, issuance, and maintenance of personal protective equipment (PPE) and other safety equipment, including emergency safety equipment.

b. PPE must be used when identified hazards cannot be eliminated through substitution, engineering, or administrative controls or to provide additional protection (see Safety, Health, and Environment (SH&E) Risk Assessment and Planning – Americas).

c. This procedure applies to all AECOM Americas-based employees and operations as well as personnel contractually required to comply with this document's content.

2. Procedure

2.1 Determining the Need for PPE

a. The Project Team must:

   i. Identify necessary PPE-related control measures in task-specific risk assessments. Refer to SH&E Risk Assessment and Planning – Americas for risk assessment requirements.

   ii. Include PPE requirements in the applicable SH&E plan and task hazard assessments (THAs; e.g., field level risk assessments [FLRAs] in Canada).

b. Prior to entering any controlled or restricted work area, employees must review the project-specific SH&E plan and corresponding THA(s) to confirm that they are equipped with the required PPE appropriate to the specific work area's hazards.

c. As required, the Project Team and SH&E Manager should evaluate employee use of PPE and adequacy of PPE protection on a routine basis. This may be documented using Personal Protective Equipment (PPE) Inspection – Americas, or equivalent.

2.2 Minimum PPE Requirements

a. Minimum PPE requirements for employees working at locations outside of an AECOM office include:

- Safety glasses
- Hardhat
- Sleeves that cover the shoulders and long pants or coveralls
- Class 2 high-visibility reflective vests
- Work boots with defined heel and over-ankle support
- Protective gloves, carried on the person

b. PPE must also:

   i. Properly fit the Employee's body, with consideration given to gender-specific gear and sizing.

   ii. Be selected and used in accordance with recognized standards (e.g., applicable American National Standards Institute [ANSI]/Canadian Standards Association [CSA] standards) and provide effective protection. Employees must follow instructions and manufacturers' specifications on the care, use, and storage of PPE.

   iii. Not in itself create a hazard to the wearer.

   iv. Be compatible so one item of PPE does not interfere with another.

v. Be maintained in good working order and in a sanitary condition. Employees must inspect their required PPE prior to use. Worn out, expired, damaged, and/or defective equipment must be removed from service and replaced.

vi. Not be altered in any way.

a. Employees must obtain basic PPE (e.g., safety glasses, hardhat, reflective vest, gloves, and hearing protection) and required specialized PPE (e.g., fall protection equipment and respirators) from AECOM at no charge. Reimbursement approvals for any additional PPE (e.g., prescription safety glasses, safety-toed work boots, etc.) must be in accordance with employee's regional and/or business line policy, and legal requirements.

b. AECOM locations must maintain, or otherwise have readily accessible, a supply of PPE of appropriate types and sizes, such as hardhats, high-visibility vests, safety glasses, gloves, hearing protection, and chemical-resistant clothing as applicable to the nature of their field activities. The Project Manager or designee will be responsible for maintaining this inventory.

c. AECOM locations should review their PPE program on at least an annual basis.

d. Deviation from these minimum requirements may be allowed if the risk assessment deems appropriate and this deviation is approved by the Project Manager and SH&E Manager via the completion of SH&E Management System Variance Request– Americas or equivalent documentation.

2.3 Eye and Face Protection

a. AECOM employees must use appropriate eye and face protection when eye or face hazards are present or there is a potential for flying particles, molten metal, liquid chemicals, acid and caustic liquids, chemical gases or vapors, injurious light radiation, or arc flash when working on or near exposed energized apparatus.

b. The level of eye and face protection will be based on the risk assessment. Refer to Table 1 for several types of eye and face protection to consider.

c. Contact lenses must not be worn in areas where there is potential exposure to a welding arc or in chemical environments as required by the safety data sheet (SDS).

Table 1. Types of Eye and Face Protection

Type of Eye and Face Protection	Specifications and Usages
Safety glasses	The most used form of eye protection is safety glasses. To prevent lateral exposure to impact fragments, safety glasses should be equipped with side shields. Depending on the hazard, side shields can be either a cup-type or flat-folded. The cup-type provides more complete protection. Prescription safety glasses may be provided to employees who require vision correction and are working in areas where eye protection is mandatory. Alternatively, safety glasses designed to go over prescription glasses can be worn, when allowed by law.
Spoggles (foam or rubber lines)	Spoggles are safety glasses that include foam seals on frames to improve sealing against the face. They should be used when there is a potential for flying particles small enough to enter behind standard safety glasses.
Safety goggles (direct, indirect, or non-vent)	Goggles form a complete seal around the eye area, providing more coverage than safety glasses, and are more appropriate for chemical hazards and conducting tasks such as power washing or when working in an area or at a process involving high dust or particulate concentrations.

Type of Eye and Face Protection	Specifications and Usages
Face shields	Face shields should be used when there is danger from impact from flying particles or chemical splash. Face shields are secondary protectors and must be worn over safety glasses or goggles when using welding, cutting, chipping, grinding, or buffing tools. Hazards associated with drilling or operations involving striking should also be assessed for the need for dual eye protection.
Dual eye protection	This may be required to be worn by any employee undertaking or in proximity to a task producing projected particles or material due to hand tool use as determined by the project-specific risk assessment and/or THAs.

2.4 Head Protection

a. The main type of head protector is the hardhat. Hardhats are designed to protect employees from impact and penetration caused by objects hitting their head. The shell of the hardhat is designed to absorb some of the impact. The suspension, which consists of a headband and strapping, not only holds the hardhat in place but is critical for absorbing and distributing impact shock loads. Refer to Table 2 for types of hardhats.

b. Employees must:

   i. Not use bump caps as protection against head injury.

   ii. Use hardhats designed for a face shield attachment for tasks requiring face shields. Some hardhats also include attachment slots for hearing protection muffs.

   iii. Only wear AECOM-approved hardhats (cowboy style are not acceptable).

   iv. Avoid storing a hardhat in direct sunlight (e.g., vehicle back window), as it will be subjected to unnecessary UV exposure.

   v. Wear hardhats in the forward position. A hardhat can be worn backwards with written verification and instructions from the hardhat manufacturer indicating the hardhat has been tested and found compliant.

   vi. Wear hardhats whenever there is a danger of falling objects.

   vii. Avoid any contact of the hardhat with insect repellant. Some insect repellants can degrade hardhat materials.

Table 2. Head Protection Types

Type of Hardhat	Specifications and Usages
Type I	• Provides crown protection from penetration and impact. • Intended to reduce the force resulting from a blow only to the top (crown) of the head.
Type II	• Provides crown and lateral penetration and impact protection. • Intended to reduce the force resulting from a blow received off center or to the top of the head. • Typically lined on the inside with thick, high-density foam.

2.5 Foot Protection

a. Safety-toed (steel or composite) boots with a minimum of 6 inches (15.2 centimeters) of ankle support, an oil-resistant sole, and a distinctive heel must be the minimum footwear requirement of all employees engaged in construction, operation, maintenance, or when hazards to feet are present or have the potential to be present (this includes impact, puncture, cut, electrical, thermal, or chemical hazards).

b. Employees assigned to field projects who are not required to wear specified protective footwear (e.g., steel-toed boots) will wear substantial, high-sided work boots.

2.6 Hand Protection

a. Employees must have gloves in their immediate possession whenever they are on a work site.

b. Employees must use appropriate hand protection when their hands are exposed to hazards such as skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, harmful temperature extremes, high hand vibration, and sharp objects.

c. Gloves must be sized correctly for the Employee.

d. After physical guards, gloves provide the most common hand protection.

e. In most cases there are trade-offs between hazard protection and functional performance of a glove. These factors are equally important. The higher the severity of the hazard, the more important hazard protection is. Table 3 offers additional guidance on key considerations when selecting a glove for certain protection and performance properties.

Table 3. Key Considerations and Selection Criteria for Gloves

Category	Properties	Protection and Performance Needs	Key Considerations and Selection Criteria
Mechanical	Cut Resistance	Protection from sharp edges, blades, and other cutting hazards	**Testing Standard: American Society for Testing and Materials (ASTM) F1790 and ASTM F1970-05** There are 5 levels of cut resistance; 5 is the highest.
	Puncture Resistance	Protection from sharp objects like nails, pins, needles, and wire	**Testing Standard: EN 388:2003** This testing measures the force required to pierce the sample with a standard sized point.
	Abrasion Resistance	Durability and resistance to abrasive objects or materials	**Testing Standard: ASTM D3389-05 and ASTM D3884-09** Abrasion resistance testing measures how well the glove material resists loss of material from rubbing on rough surfaces.
	Shielding	Protection from impact, ricochet, and small projectiles	Some gloves have thick padding or hard guards around the back of the hand or knuckles. These can offer good protection against impact.
Chemical	Degradation & Absorption Resistance	Durability and resistance to breaking down and/or permeating the glove from exposure to chemicals	Identify products/chemicals that present potential exposure risks. Refer to the chemical's SDS and glove manufacturer's specifications for the appropriate glove choice.
Thermal	Heat Resistance	Thermal protection from hot objects or materials	**Testing Standard: ASTM F1060-08** This testing measures the insulation provided by the glove when contacting a hot surface. Higher temperatures reported indicate a glove with greater insulation.
	Cold Resistance	Thermal protection from cold weather, objects, or materials	**Testing Standard: EN 511:1994 (for ambient temperature)** **Testing Standard: International Organization for Standardization (ISO) 5085:1989-1 (for cold surfaces)** Choosing the right glove depends on whether protection is needed from cold weather or cold surfaces.

Category	Properties	Protection and Performance Needs	Key Considerations and Selection Criteria	
Vibration	Anti-Vibration	Vibration reduction from operating certain tools and equipment	**Testing Standard: ANSI S2.73-2002 (R2007)** This testing method measures the vibration transmission of the glove.	
Electrical	Insulation	If performing work on electrical equipment, this must be the top priority	**Testing Standard: ASTM D120-09** Glove protection depends on the maximum voltage of energized components:	
			50 – 480 V	Class 00 with Leather Protectors
			480 – 600 V	Class 0 with Leather Protectors
			600 V and above	Class 0 or higher (depending on maximum voltage) with Leather Protectors
Function	Dexterity	Ability to manipulate objects and control hands in the desired manner	**Testing Method: EN 420:2003** This testing method assesses the wearer's ability to pick up small diameter pins lying on a flat surface with their thumb and forefinger. If high dexterity is needed, and the hazards are relatively low to the forefinger and thumb, consider a glove that is tipless for those two digits.	
	Tactility	Ability to sense objects by touch	There is no standard test. However, a common field test is to determine if the wearer can feel a pulse while wearing the glove. This is affected by the thickness of the glove, presence of liners, glove surface characteristics, and properties of the coating material.	
	Grip	Ability to exert pressure on an object when holding it	**Testing Standard: National Fire Protection Association (NFPA) 1971 (Grip)**	

2.6.1 Hazardous Substances

a. Review SDSs for project or task-specific chemicals to determine appropriate gloves. Consult with an SH&E Manager for assistance, as needed.

b. Review glove manufacturer specifications for both physical and chemical protection.

c. When both chemical and physical protection is of concern, wear the chemical protection gloves (e.g., nitrile) inside the physical protection gloves (e.g., leather, Kevlar®).

d. Nitrile or equivalent chemical-resistant gloves must always be used for protection from hazardous fluids or non-corrosive chemicals.

2.6.2 Cuts, Lacerations, and Punctures

a. If cut or laceration hazards are present, appropriate gloves with the applicable ANSI/CSA cut resistance rating for the task should be selected.

b. Gloves providing cut resistance may be constructed of leather, synthetic materials (e.g., polyester and nylon), high-performance materials (e.g., Kevlar®), or metal mesh.

Note: Not all gloves providing cut/laceration resistance provide equal puncture resistance. Thus, when selecting a glove for puncture protection, review the manufacturer's specifications specific to puncturing.

2.6.3 Abrasions

a. Leather gloves offer some abrasion protection but should only be selected for light abrasion protection. Appropriate activities for leather gloves may include moving light equipment where cuts and lacerations are of minimal concern.

b. Gloves with abrasion-resistant surfaces in high contact areas (e.g., knuckles and palm) should be considered for tasks involving high potential for abrasion hazards (e.g., construction activities).

2.6.4 Vibration

Gloves meeting the applicable ANSI/CSA standard for vibration reduction (also known as anti-vibration gloves) should be selected if performing activities requiring handling of vibrating tools (chainsaw, jackhammer, grinder, etc.). Anti-vibration gloves should completely cover the fingers.

2.7 High-Visibility Apparel

a. "High-visibility safety apparel" means personal protective safety clothing intended to provide conspicuity during both daytime and nighttime usage and meeting ANSI/International Safety Equipment Association (ISEA)/CSA standards. Refer to Table 4 for more information on high-visibility apparel.

b. The color of apparel (orange or lime) may be client or project specific.

c. Work conducted at night may require that the minimum level of safety apparel worn be ANSI/CSA Class 3, and in accordance with local law.

Table 4. High-Visibility Safety Apparel

Class Type	Specification	Usage	Examples of Pedestrian Workers
2	Provides superior visibility for the wearers by the additional coverage of the torso.	• Inclement weather conditions • Complex backgrounds • Work activities near vehicle traffic 0 mph to 25 mph (40 kph)	• Construction managers/inspectors • Survey crews • Bridge inspectors • Utility workers • Environmental samplers • Resident engineers
3	• Offers greater visibility to the wearer in both complex backgrounds and through a full range of body movements. • Visibility is enhanced beyond Class 2 by the enhancement of background and reflective materials to arms and/or legs. • Typically consists of coveralls, jumpsuits, long- or short-sleeved jackets, or long-sleeved shirts with retro-reflective bands.	• High vehicle speeds (50 mph [80 kph] or more) • Reduced sight distances • Worker and vehicle operator have high task loads, clearly placing the worker in danger • The wearer must be conspicuous through a full range of body motions at a minimum of 1,280 feet (390 m)	

d. Other high-visibility apparel includes Class E and headwear:

   i. Class E apparel includes trouserss that are part of a Class 3 apparel ensemble. Frequently a Class 2 vest is paired with Class E trousers, creating an overall ensemble that meets Class 3 apparel requirements. Class E garments are not intended to be worn without Class 2 or 3 garments.

   ii. Headwear is considered an important accessory and compliments the overall visibility of the wearer. High-visibility headwear enhances visibility of the head of a moving worker in daylight and helps define the shape of the human form during nighttime.

2.8 Personal Clothing

a. Employees on a project site must wear full-length trousers and shirts covering shoulders.

b. For personal safety on the job site, do not wear:

   i. Loose or unsecured clothing or loose-fitting cuffs;

   ii. Greasy or oily clothing, gloves, or boots;

   iii. Torn or ragged clothing; or

   iv. Jewelry (e.g., rings, bracelets, neck chains) when working around moving parts.

c. Long hair must be tied back or otherwise confined when there is a risk of entanglement with moving parts.

d. Cotton or wool fabrics are recommended for general use.

e. Shoes made of leather, canvas, tennis, deck, or other types of non-protective material, including sandals and high-heeled shoes, are not allowed on field project sites. Refer to Section 2.5 for requirements.

2.9 Specialized PPE

In addition to basic PPE, additional specialized PPE may be required to provide appropriate protection to the Employee. Protective equipment must be of heat-, fire-, chemical-, and/or electrical-resistive material when conditions require protection against such hazards. Refer to applicable law, related SH&E procedures, and the SH&E Manager for additional information on PPE requirements.

2.9.1 Temperature Extremes

Refer to the Heat and Cold Stress – Americas for detailed requirements related to temperature extremes.

2.9.2 Chemical-Resistant Clothing

a. The Project Team must consult the SDS of the material(s) being handled, as well as the SH&E Manager and subject matter experts (e.g., Certified Industrial Hygienist), as needed, to appropriately select chemical-resistant clothing, gloves, and boots.

b. The objective of chemical-resistant clothing is to separate the person from a hazardous material. Whenever there is a potential for chemical exposures, chemical-resistant clothing (e.g., latex or nitrile gloves, Tyvek coveralls or aprons, and chemical-resistant boots) should be considered during the risk assessment.

c. Consideration must be given to allergies, and alternatives must be provided if necessary.

2.9.3 Fall Protection

a. Selection and use of fall arrest equipment/systems must be planned and established by a competent person as defined in applicable local law, code of practice, or standards. Personal fall protection equipment and systems (to include fall arrest, positioning, and restraint) must be used when a person is working at heights and/or exposed to a fall hazard. Integral chinstraps should be worn when working overhead.

b. Refer to Work at Height – Americas for detailed requirements related to fall protection and arrest system requirements.

c. Confined space hazards may necessitate the use of specific harnesses attached to retrieval lines to facilitate rescue. Refer to Confined Spaces – Americas.

2.9.4 Respiratory Protection

a. Respiratory protection must be selected based on the contaminant and concentration to which the Employee will be exposed. The use of respirators is required when occupational exposure levels approach or exceed Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs), and engineering or administrative exposure controls are not feasible to implement.

b. For specific requirements, refer to Respiratory Protection – Americas, the task- or project-specific hazard assessments, and the applicable SDSs.

2.9.5 Hearing Protection

a. Noise levels in the work environment that cannot be eliminated or reduced to acceptable levels by elimination or engineering controls require employees to be protected from exposure. Hearing protection devices must be able to attenuate noise to acceptable levels (i.e., 85 dBA for continuous [steady-state] noise). If necessary to hear audible warnings, hearing protection devices should not attenuate hearing levels below an individual's hearing threshold.

b. Dual hearing protection (i.e., earplugs and a second method such as earmuffs worn concurrently) must be based on the attenuation of the specific hearing protection. Generally, double hearing protection should be used whenever employees are exposed to continuous noise greater than 115 dBA.

c. The attenuation of the specific hearing protection must be determined using the National Institute for Occupational Safety and Health (NIOSH) de-rating scheme. Ear insert devices, to include disposable, pre-formed, or custom-molded earplugs, must be fitted to the exposed individual. Plain cotton is not an acceptable hearing protection device.

d. Refer to Noise – Americas for additional information.

2.9.6 Protection from Drowning

Whenever there exists the possibility of falling into water, personnel must wear personal flotation devices (PFDs) or life jackets. Refer to Work On, In, or Near Water – Americas for requirements on PFDs and related PPE.

2.9.7 Fire-Resistant Clothing (FRC)

a. Fire-resistant clothing (FRC) is required to be worn by all personnel under the following circumstances:

   i. Where they are exposed to hot work in hazardous areas unless deemed unnecessary through risk assessment.

   ii. Where there is a risk of exposure to an electrical arc flash (e.g., work in electrical substations).

   iii. FRC use is mandated by the client or site owner/operator.

b. FRC should be worn as the outermost layer of clothing.

2.9.8 Electrical Safety

a. Work on or around electrical utilities and equipment should only be done in accordance with Hazardous Energy Control – Americas.

b. PPE must be appropriate for the level of electrical hazard present based on a risk assessment conducted according to the applicable standard (e.g., National Fire Protection Association [NFPA] 70E Standard for Electrical Safety in the Workplace and Canadian Standards Association [CSA] Z462 Workplace Electrical Safety Standard), which also specify PPE requirements based on hazard risk classifications.

c. Synthetic clothing must not be worn; synthetic clothing includes acetate, nylon, polyester, and rayon (either alone or in blends with cotton).

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d. Gloves made from layers of flame-resistant material provide the highest level of protection.

e. Leather glove protectors should be worn over voltage-rated rubber gloves.

f. Dielectric overshoes are required where electrically insulated footwear is used for protection against step and touch potential.

g. Safety shoes/boots must be in good condition with no evidence of exposed metal such as steel toe-caps.

2.9.9 Limb Protection

a. Employees must wear the appropriate chainsaw chaps when operating a chainsaw and snake chaps if potentially exposed to snake bites. Protective leg chaps must meet ASTM specifications.

b. Limb and body protection should not be modified without manufacturer's approval, as the protective qualities may be compromised.

c. Boots providing metatarsal protection provide above-the-toe protection from rolling or crushing hazards, as well as punctures or cuts from equipment such as chainsaws.

2.10 Emergency Safety Equipment

2.10.1 First Aid Supplies

a. All AECOM locations must maintain an adequate amount of first aid supplies in an easily identifiable and accessible location. All locations must be equipped with a complete first aid kit appropriate to the number of staff, location of work, and site hazards, according to applicable law.

b. First aid kits must be inspected to confirm the contents meet legal requirements given the number of staff, work location, and potential hazards prior to being placed in the determined location or sent to a job site and, as a minimum, monthly thereafter.

c. An inventory (listing required and approved items) and inspection form must be included with each first aid kit. Any items not listed on the inventory (listed as required or approved for the kit) will be removed during the inspection unless specifically approved by a health care professional for inclusion and added to the inventory.

d. At no time will over-the-counter medications such as antacids, aspirin, cold or cough drops, or other sundry items be stored in the kits without the prior approval of a health care professional (where permitted by local law) and inclusion in the kit's listed inventory.

e. Each item in first aid kits must be individually sealed to protect the contents from contamination. The first aid equipment and supplies must be maintained in a clean, dry, and serviceable condition, contained in a material that protects the contents from the environment, and clearly identified as first aid equipment and supplies.

2.10.2 Automated External Defibrillator (AED)

a. While locations are not mandated to acquire AEDs, an AED should be considered based on the number of employees, response time of local Emergency Medical Services (EMS), and access to other AED units (e.g., those provided by the office building management).

b. The selection of AED equipment will be based on the most current listing of approved AED manufacturers as provided by the American Heart Association, Heart and Stroke Foundation of Canada, or country equivalent.

c. Local law may require notification to EMS of AED locations. This allows the servicing or responding agency to know that an AED is at a particular location.

d. AEDs should be placed in a location that optimizes the fastest response time for an individual walking at a rapid pace to reach the victim. A general rule of thumb by the American Heart Association is that it should take no longer than 3 minutes to retrieve an AED and return to the victim. The AED should be in an easily accessible position with the location well-communicated to all staff.

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e. To confirm readiness for use and integrity of the device, AEDs must be inspected monthly, and maintained, cleaned, serviced, and tested according to manufacturer's specifications. All documentation (e.g., inspections, service records) will be delivered to the Designated Individual and maintained in the applicable project/location files.

f. AEDs must be used in conjunction with cardiopulmonary resuscitation (CPR) according to training and the equipment's operating directions when a victim is unresponsive and not breathing.

2.10.3 Eyewash and Body Flush (Shower) Facilities

a. If corrosive, irritating, or otherwise hazardous materials are used, review applicable SDSs to assist in determining whether eyewash and body flush (shower) facilities must be provided. This may include permanent or portable eyewash stations.

b. Employees who may be exposed to corrosive, irritating, or otherwise hazardous materials must be instructed in the location and proper use of emergency eyewash units and body flush (shower) facilities.

c. Eyewash and body flush (shower) facilities must be assembled and installed in accordance with the manufacturer's specifications.

d. These facilities must be readily available and should be highly visible, clearly identified, and, if possible, within 10 seconds of the hazard. The water source / flushing fluid must be tepid, pressure controlled, and maintained to prevent freezing and contamination of the fluid.

e. All eyewash and body flush (shower) equipment must be inspected for compliance with applicable ANSI and CSA standards, as well as the manufacturer's specifications.

2.10.4 Fire Extinguishers

a. Portable fire extinguishers must be selected, located, inspected, maintained, and installed in accordance with local law and building and fire life safety code.

b. Fire extinguishers must be readily available wherever the potential for fire exists, properly maintained, regularly inspected, and promptly recharged and replaced immediately after use.

c. Class B (or ABC) fire extinguishers must also be available in locations where flammable or combustible liquids are stored, handled, or used.

d. In the event of a fire, follow the emergency response plan (ERP) outlined in the applicable SH&E plan to contact the appropriate firefighting personnel (e.g., local fire department, plant fire crew). Refer to SH&E Risk Assessment and Planning – Americas for ERP and SH&E plan requirements.

e. Only trained employees should use a fire extinguisher, and only if operation does not endanger the user.

f. Portable extinguishers must be of suitable types and sizes. Refer to Table 5 for the different fire extinguisher classifications and what types of fires they are meant for.

Table 5. Fire Extinguisher Classifications

Classification	Type of Fire
Class A	Combustible materials
Class B	Flammable liquid, gas, or grease
Class C	Electrical equipment
Class D	Combustible metal

g. The use or discharge of any fire extinguisher by an AECOM employee must be immediately reported to the Supervisor and in accordance with SH&E Incident Response and Investigation – Americas.

h. Extinguishers must be inspected monthly to ensure that they are still in the proper location, have not been used or tampered with, are still properly charged, and have no obvious external damage. The initials of the inspector and the date of inspection must be noted on the tag attached to the extinguisher.

i. A thorough inspection will be performed annually by personnel specifically trained in the inspection (e.g., extinguisher supplier).

3. Training

a. If PPE is planned to be used for a high-risk task, the person approving the purchase and issue of PPE must consult with the SH&E Manager. The SH&E Manager must provide or arrange for appropriate training.

b. Where training on the use and maintenance of specific PPE has been identified, the PPE must only be used by employees who have undergone training or have been assessed as competent by holding the relevant certification.

c. Training and demonstrated competency is mandatory prior to using any specialized PPE.

d. Employees will receive adequate instruction on the correct use, limitations, and assigned maintenance duties for the equipment to be used. The following information, at a minimum, will be covered during PPE training:

   i. What, when, and why PPE is required.

   ii. How to properly don, doff, adjust, and wear the PPE described.

   iii. The limitations of the PPE, including its expected useful life.

   iv. How to properly care for, maintain, and dispose of the PPE.

e. Retraining may be required as applicable (e.g., observed non-compliance, changes in procedure).

f. Employees must confirm they have reviewed and understand the manufacturer's specifications for the relevant PPE before work commences.

g. For training on the use of first aid supplies, AEDs, and fire extinguishers, refer to SH&E Incident Response and Investigation – Americas and Assessment of SH&E Training Requirements– Americas.

4. Terms and Definitions

a.	ANSI	American National Standards Institute
b.	ASTM	American Society for Testing and Materials
c.	CSA	Canadian Standards Association
d.	NFPA	National Fire Protection Association
e.	PPE	Personal Protective Equipment
f.	SDS	Safety Data Sheet
g.	SH&E	Safety, Health, and Environment
h.	THA	Task Hazard Assessment

5. References

a. SH&E Incident Response and Investigation – Americas S3AM-004-PR2

b. Heat and Cold Stress – Americas S3AM-112-PR2

c. Noise – Americas S3AM-118-PR1

d. Respiratory Protection – Americas S3AM-123-PR1

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

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f. Confined Spaces – Americas S3AM-301-PR1

g. Hazardous Energy Control – Americas S3AM-302-PR2

h. Work at Height – Americas S3AM-304-PR2

i. Work On, In, or Near Water – Americas S3AM-315-PR2

j. NFPA 70E – U.S. Standard for Electrical Safety in the Workplace

k. CSA Z462 – Canadian Standard for Electrical Safety in the Workplace

6. Records

a. Personal Protective Equipment (PPE) Inspection – Americas S3AM-208-FM2

b. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

c. SH&E Management System Variance Request – Americas S3AM-215-FM2

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-208-PR2; consolidated portions of the contents from the following retired documents: Personal Protective Equipment – Americas S3AM-208-PR1, Eye & Face Protection – Americas S3AM-208-ATT1, Head Protection – Americas S3AM-208-ATT2, Foot Protection – Americas S3AM-208-ATT3, Hand Protection – Americas S3AM-208-ATT4, Limb & Body Protection – Americas S3AM-208-ATT5, High Visibility Safety Apparel – Americas S3AM-208-ATT6, Fire Protection – Americas S3AM-011-PR1, Portable Fire Extinguishers – Americas S3AM-011-ATT1, First Aid – Americas S3AM-012-PR1.	All

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Safety Tenets and Stopping Work

S3AM-001-PR2

1. Purpose and Scope

a. The intent of this procedure is to promote a company embracing safety as a core value and a culture committed to the establishment and maintenance of workplaces free from recognized hazards.

b. This procedure establishes safety tenets (ground rules) for personnel to stop any task or company operation if they believe there is an Imminent Danger as described within this procedure.

c. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 Safety Tenets – General

A safety tenet is defined as a work procedure or safety requirement which, if not followed, may result in catastrophic loss, or expose employees, project-associated personnel, or members of the public to Imminent Danger. The safety tenets listed below must be followed. If a violation of a safety tenet is observed, the associated work activity must be stopped immediately, and corrective action must be taken.

a. Use Stop Work Authority immediately upon observation of Imminent Danger. Refer to 2.2 on Stop Work Authority.

b. Keep the worksite free of hazards that could cause slips, trips, and falls. For work at height, refer to Work at Height – Americas.

c. Obtain authorization before entering a confined space - refer to Confined Spaces – Americas.

d. Confirm safety precautions are in place for ground intrusive work - refer to Ground Disturbance – Americas.

e. Take precautions to prevent falling into a body of water when working on, in, and near water - refer to Work On, In, or Near Water – Americas.

f. Do not work alone when performing tasks with High Potential (HiPo) Risks or remote work - refer to SH&E Risk Assessment and Planning – Americas.

g. Only work on or near a roadway with proper traffic safety controls in place - refer to Highway and Road Work – Americas.

h. Only foul a railroad track with appropriate approvals, proper training, and train protection - refer to Railroads – Americas.

i. Wear a seatbelt and never use mobile communication devices or other devices while driving - refer to Driving – Americas.

j. Assess risk for all work and changes to scope of work - refer to SH&E Risk Assessment and Planning – Americas.

k. Complete SH&E training required to perform identified tasks - refer to SH&E Training – Americas.

l. Conduct site-specific safety orientation for all first-time visits - refer to SH&E Training – Americas.

m. Use the required personal protective equipment - refer to Safety Gear – Americas.

n. Only use equipment that is maintained in a safe condition and appropriate to the work performed - refer to Heavy Equipment and Machines – Americas and Hand and Power Tools – Americas.

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o. Report for work fit for duty - refer to Fitness for Duty – Americas.

2.2 Stop Work Authority – General

a. All employees have the authority and responsibility to issue a Stop Work Order for work activities deemed to present an Imminent Danger or when the control of an SH&E risk is not clearly established or understood. Employees issuing a Stop Work Order must do so without any fear of retaliation or form of intimidation.

b. All Stop Work Orders must be immediately reported to and reviewed/investigated by the applicable Project Manager or Supervisor, SH&E Manager, and any other parties necessary (this may include the Employee who started the stoppage of work) to determine whether work can be resumed safely.

c. The AECOM Safety Red Card is a key component of stopping work. Although not required to enforce the procedure, the Safety Red Card is a physical tool reinforcing the Stop Work Authority mindset. General approaches to issuing Stop Work Orders by contract type are provided in sections below.

2.2.1 AECOM Self-Performed Work / Direct Subcontractors / AECOM Contractual Safety Oversight

a. Imminent Danger – If the Imminent Danger involves AECOM self-performed work, direct subcontractor work, or Contractor-controlled work for which AECOM has contractual safety oversight, employees can initiate a Stop Work Order. The Stop Work Order process consists of:

   i. Immediately notifying the involved individuals to stop the activity (or leave the area). A Stop Work Order can be issued for a portion of the work area(s) or for an entire work area when unacceptable risks exist.

   ii. Advising the Project Manager or Supervisor on the nature of the concern. If the Project Manager or Supervisor are not readily available, the work stoppage must remain in place until they, or an equal or greater level of authority, are notified.

   iii. Communicating the stop work actions taken with any other organizations involved and the applicable client/customer representative(s).

   iv. Enabling the responsible individuals on site to determine a safer course of action in accordance with established guidance or law.

   v. Establishing, documenting, and monitoring of corrective actions related to the Stop Work Order with required follow-up once completed.

   vi. Restarting only when the responsible organization resolves the problem(s), brings the work area(s) to satisfactory conformance, and all affected organizations deem corrective actions satisfactory.

b. Repeat Non-Imminent Danger Deviations – When there is continued or repeated deviation from an applicable client or legal requirement regarding a Non-Imminent Danger, the following steps must be taken:

   i. The Employee must first make one reasonable attempt to remove, mitigate, or isolate the hazard in collaboration with the Project Manager, Contractor, and/or client.

   ii. Details of this interaction must be documented in writing and maintained in the Project Management Information System.

   iii. Should any party be dissatisfied with the response or proposed mitigation measure, a formal Stop Work Order must be issued to the responsible organization.

2.2.2 Contractor-Controlled Work without AECOM Contractual Safety Oversight

Where employees or managed subcontractors identify an Imminent Danger related to a contractor for which AECOM does not have specific contractual safety oversight, as applicable:

a. Employees should remove themselves from the situation.

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b. Employees should immediately report the situation to the Contractor, employee's Site Representative, and AECOM management.

c. Management will then promptly communicate with the client representative(s).

d. While employees may not be authorized contractually to stop client-/customer-directed work, employees must decline to participate in work until the Imminent Danger is mitigated to an acceptable level or removed.

2.3 Enforcement Procedures

a. The success of AECOM's SH&E program is dependent on employees' strict compliance with established safety tenets, rules, laws, policies, and procedures.

b. Project managers and supervisors are responsible for bringing any safety violations to the attention of the appropriate level of AECOM management.

c. Any safety violations may result in corrective and/or disciplinary action in accordance with the location's employee handbooks – refer to the Employee Handbooks Ecosystem page.

3. Training

a. Employees will each be provided with a Safety Red Card, trained in how to exercise stop work authority, and informed of the measures AECOM management will take as a result of a work stoppage.

b. SH&E training needs may be identified through individual risk assessments, incident investigations, observed non-compliance, when procedures change, or through the annual staff appraisals process. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training requirements.

4. Terms and Definitions

a.	Contractual Safety Oversight	AECOM has contractually agreed with the client to the specified roles and responsibilities of oversight of Contractor-controlled work for the given project.
b.	Direct Subcontractor	A person or business that has a contract directly with AECOM to provide work or services.
c.	HiPo Risk	High Potential Risk – Assessed of a risk rating of 10 or above using the AECOM Risk Matrix. Refer to SH&E Risk Assessment and Planning – Americas for an explanation of the AECOM Risk Matrix and examples of HiPo Risk tasks.
d.	Imminent Danger	Any act and/or condition violating an established law, policy, or contract specification that carries a consequence rating of Catastrophic or Critical as defined in SH&E Risk Assessment and Planning – Americas.
e.	Non-Imminent Danger	Any act and/or condition violating an established law, policy, or contract specification with a consequence rating of Minor, Moderate, or Major as defined in Risk Assessment and Planning – Americas.
f.	Safety Red Card	The Safety Red Card is derived from its use in football (soccer), where circumstances are such that a referee must stop the play, similar to an Imminent Danger on a project site. Although not required for stopping work, the Safety Red Card is a physical tool reinforcing the Stop Work Authority mindset.
g.	Safety Tenet	A work procedure or safety requirement that, if not followed, may result in catastrophic loss or place employees or members of the public at significant risk.
h.	Safety Violation	Not following verbal or written safety policies, rules, and procedures (e.g., horse play, failure to wear selected Personal Protective Equipment [PPE]).
i.	Self-Performed Work	AECOM is directly performing the work with employees.
j.	SH&E	Safety, Health, and Environment.

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k.	Stop Work Order	A proactive measure to eliminate exposure, prevent an incident, and/or improve performance through identifying shortcomings, causes, and solutions. Stop Work Orders should be accomplished in a positive and constructive, not punitive, manner.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. Driving – Americas S3AM-005-PR2

c. Fitness for Duty – Americas S3AM-008-PR2

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

f. Confined Spaces – Americas S3AM-301-PR1

g. Ground Disturbance – Americas S3AM-303-PR2

h. Work at Height – Americas S3AM-304-PR2

i. Hand and Power Tools – Americas S3AM-305-PR2

j. Highway and Road Work – Americas S3AM-306-PR1

k. Heavy Equipment and Machines – Americas S3AM-309-PR2

l. Work On, In or Near Water – Americas S3AM-315-PR2

m. Railroads – Americas S3AM-329-PR1

n. Employee Handbooks – Ecosystem page

6. Records

a. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

b. All Stop Work Orders and associated corrective action reports must be documented in Vector EHS Management (a.k.a. IndustrySafe) and stored in the applicable project files.

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-001-PR2; consolidated portions of the contents from the following retired documents: Safe Work Standards & Rules – Americas S3AM-001-PR1, Safety Rules – Americas S3AM-001-ATT1, Stop Work Authority – Americas S3AM-003-PR1, and Stop Work Authority Table – Americas S3AM-002-ATT1.	All

SH&E Incident Response and Investigation

S3AM-004-PR2

1. Purpose and Scope

a. This procedure establishes requirements for the timely reporting, notification, investigation, recordkeeping, and injury management of Safety, Health, and Environment (SH&E) incidents.

b. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

c. For cybersecurity incidents, refer to the Cyber Defense Ecosystem page.

2. Procedure

2.1 Initial Response to an SH&E Incident

a. If any suspected work-related SH&E Incident occurs, even if employees believe it is a minor incident or it does not require medical attention, employees must immediately do the following:

   i. Confirm the scene is safe. Do not enter the area and immediately initiate Emergency Response to secure the situation:

      1. In Canada follow the Incident Reporting Flowchart available on the Canada SH&E Ecosystem page.

      2. Refer to Section 2.1.1, Emergency Response, for response requirements regarding emergency illnesses/injuries, evacuations, fires, or spills.

      3. Refer to Section 2.2, Vehicle Incidents, for response requirements regarding vehicle incidents.

   ii. Contact the following, regardless of the time of day or day of the week:

      1. Design & Consulting Services (DCS) – Contact the DCS Incident Reporting Hotline at 800-348-5046 to provide basic information regarding the incident.

      2. Construction Management (CM) – Notify the SH&E Manager and contact the Occupational Health Team using the AECOM-dedicated line at 512-419-5016.

   iii. Notify their Project Manager and affected Manager/Supervisor of:

      1. The incident

      2. The circumstances involved

      3. The nature and extent of injury/illness if any; and

      4. Whether medical treatment may be required.

b. For a non-emergency injury or illness, the affected Employee must:

   i. Obtain first aid care on site as appropriate. Refer to Safety Gear – Americas for general requirements on first aid supplies. The following items address first aid care:

      1. Employees certified in First Aid must be readily available to assist injured workers as required by local law, AECOM procedure, and/or an SH&E Director/Manager.

      2. If First Aid Providers are present during an injury and/or illness, they can respond to an injury and assist to the extent they are trained.

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3. In an event where there is a life-threatening injury and/or illness requiring assessment/treatment beyond the capabilities of the on-site First Aid Providers, immediately initiate emergency response as described in Section 2.1.1, Emergency Response.

ii. Discuss their injury/illness status with the following before obtaining further medical treatment:

1. Supervisor
2. SH&E Manager; and
3. Occupational Health Team (OHT)

iii. Consult with the OHT if off-site medical attention may be needed.

c. If the OHT determines the affected Employee requires a medical professional's evaluation:

i. The OHT must assist in engaging the clinic and provide the necessary Workers' Compensation authorization for the visit.

ii. The affected Employee must:

1. Obtain a work status report from the medical provider indicating whether they can return to work as usual, if they can return to work but have restrictions, or if they must not work, and whether they have been prescribed medication.
2. Provide the work status report to their Supervisor, SH&E Manager, Workers' Compensation Claims Manager, and OHT with an update immediately after the medical provider visit.
3. For follow-up medical appointments, provide the work status report to their Supervisor, SH&E Manager, and Workers' Compensation Claims Manager.

d. The Project Manager and SH&E Manager must:

i. Identify the preliminary cause(s) of the incident and immediate corrective actions needed to avoid recurrence; and

ii. Confirm all regulatory required notifications are made within prescribed timeframes in accordance with local law.

2.1.1 Emergency Response

For emergencies, employees must:

a. Immediately initiate emergency response and use the appropriate local emergency phone numbers in accordance with their site-specific emergency response plan (ERP). Each ERP must be included in its applicable SH&E plan. Refer to SH&E Risk Assessment and Planning – Americas for ERP requirements.

Note: For critical injuries or illnesses, seek immediate medical care by calling the local medical emergency phone number. Affected employees must not drive themselves to obtain medical care.

Note: If an Automated External Defibrillator (AED) was used, leave the AED attached to the victim until instructed to remove it by Emergency Medical Services (EMS) personnel or higher medical authority.

b. For CM, the site's Project Executive, Safety Lead, or Lead Superintendent must also call the Rapid Response number 1-877-AECOM-07 (1-877-232-6607). Rapid Response is CM's 24-hour emergency notification system that quickly and effectively alerts the crisis team (e.g., leadership, SH&E, legal, and communications) in the event of an emergency so appropriate action can be determined and taken.

c. Take direction from the emergency responders and brief on-site and off-site responders in the event of an emergency.

d. If qualified and instructed to do so, take the immediate corrective actions required to make the scene safe in accordance with their site-specific ERP. This must be done in the safest possible manner, using appropriate personal protective equipment (PPE) and precautions.

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e. Immediately secure emergency areas, when appropriate, to prevent unauthorized access or the possibility of further risk to employees, property, or the public.

2.2 Vehicle Incidents

a. The Employee(s) involved in a collision must:

   i. Assess the situation to confirm everyone is safe and remove any vehicle occupants from harm's way if safe to do so.

   ii. Turn on the vehicle's flashers to warn other motorists.

   iii. Call or have someone else call the appropriate local emergency phone number (e.g., 911) immediately when necessary.

   iv. As appropriate, remain at the scene of a collision for police to arrive. If the scene is unsafe, immediately leave to a safe place of refuge proximate to the incident.

   v. As applicable, consider moving the vehicle out of the traffic flow if it is safe to do so. Do not operate a damaged vehicle if it is:

      1. safety is questionable

      2. operating condition is illegal per applicable local law; or

      3. condition is such that further damage would likely result from its operation.

   vi. Obtain:

      1. Names, phone numbers, and addresses of owner(s), driver(s), and occupants of the other car(s) involved.

      2. Other party's insurance company's name, address, phone number, policy number, and insurance agent.

      3. Names, phone numbers, and addresses of all witnesses.

      4. Photographs of the accident scene when safe to do so.

   vii. Do not discuss liability (e.g., who is at fault), agree to pay for damage, or sign a document related to an incident except as required by local law.

   viii. If requested, provide information to the police. Obtain the officer's jurisdiction, name, and badge number, as well as a copy of the police report.

   ix. If contacted by a third party, do not answer any questions. Immediately report this contact to the Project Manager and AECOM Legal.

b. Drug and alcohol testing must be determined and performed in accordance with Substance Abuse Prevention – Americas.

c. In the event law enforcement or other first responders administers field and/or laboratory impairment testing, AECOM reserves the right, as permitted, to obtain copies of such testing results for inclusion in the SH&E Incident Report and for consideration in subsequent investigation.

d. For moving violations and parking citations incurred while driving a vehicle on AECOM business:

   i. The Employee is personally responsible for:

      1. Payment of fines for moving violations and parking citations incurred while driving a vehicle on AECOM business; and

      2. Reporting such incidents to their Manager/Supervisor.

   ii. The Project Manager is responsible for notifying AECOM Legal.

e. If an employee receives a citation resulting in their license being suspended from driving or has their driver's license revoked, the Employee must notify their Manager/Supervisor prior to the start of the following workday. Failure to do so may result in disciplinary action up to and including termination.

2.3 Evacuation Response

a. Employees who determine a situation requires an evacuation must:

   i. Immediately initiate an emergency response in accordance with Section 2.1.1 and the site-specific ERP.

b. If a situation requires an evacuation or emergency muster/assembly, the pre-determined alarm must be initiated.

c. All personnel (e.g., employees, consultants, visitors) in the building or site requiring evacuation must immediately assemble at the designated muster point, assembly point, or shelter-in-place as determined by the alarm or communication.

d. Employees accompanying visitors working directly with AECOM must escort the visitors to the muster point.

e. Elevators must not be used unless pre-arranged due to known circumstances.

f. The Site Supervisor or designee must proceed through their assigned areas confirming all personnel have exited.

g. The Site Supervisor or designee must take action to account for all personnel, including visitors (i.e., head count or roll call).

h. Upon evacuation or dismissal, only authorized or essential employees are allowed access to the facility or project area during an emergency. Personnel must await further instruction from the Site Supervisor or designee (e.g., all clear and re-entry or further evacuation).

2.4 Fire Response

If a fire is detected, the person detecting the fire must:

a. Alert others in the area of the fire.

b. Sound the alarm or confirm applicable notification system is initiated.

c. All personnel must vacate the building or site and proceed to the muster point. DO NOT use elevators.

d. The Site Supervisor or designee must proceed through their assigned areas confirming all personnel have exited.

e. Employees are not expected to extinguish a fire. However, if the fire is small enough to be contained and if trained to do so, employees can decide to attempt to extinguish a fire. Properly extinguishing a fire includes the following steps:

   i. Use the correct type of extinguisher for the type of fire to be extinguished and never use water on an electrical fire.

   ii. Implement PASS:

      1. P – pull the pin.

      2. A – aim the hose at the base of the fire.

      3. S – squeeze the handle.

      4. S – sweep from side to side until the fire is out or the extinguisher is empty.

   iii. Apply all fire extinguisher contents from upwind.

f. Employees must:

   i. Retreat and call the local fire department if the fire cannot be contained or there is any concern of an extinguished fire reigniting. Give directions to the location; stay on the line until information is verified.

   ii. Never face away from a fire. Always back away until at a safe distance.

   iii. Stay low and close to the floor if smoke and heat are strong.

   iv. Never return a discharged fire extinguisher to its normal location. Take it out of service, tag the extinguisher for recharging, and replace it with a fully charged unit.

g. The Site Supervisor or designee must take action to account for all personnel, including visitors (i.e., head count or roll call).

h. A designated individual should be positioned to direct the fire truck to the fire location.

i. Personnel must await further instruction from the Site Supervisor or designee (e.g., all clear and re-entry or further evacuation).

2.5 Workplace Violence

a. If an employee becomes aware of an active workplace violence incident posing a threat to AECOM employees, contractors, or visitors, the Employee must immediately contact local emergency services using the appropriate emergency number. If the Employee is in the vicinity of the incident, they must evacuate the area if it is safe to do so or seek shelter where possible.

b. All AECOM employees are responsible for reporting any information related to potential workplace violence. Reports should be made to their manager, Human Resources (HR), or through the AECOM Ethics and Compliance Hotline.

c. The Workplace Violence Procedure – Americas outlines the company's zero-tolerance policy toward workplace violence. It defines what constitutes workplace violence, details employee responsibilities, explains reporting mechanisms, and describes the procedures followed during investigations and follow-up actions.

d. For Canada, refer to Workplace Violence and Harassment Policy – DCS – Americas – Canada and Employee Handbook – DCS – Americas – Canada.

2.6 Hazardous Material Spill or Release Response

a. If an employee determines a hazardous material spill or release is an emergency, they must immediately retreat and initiate an emergency response in accordance with the site-specific ERP.

b. Employees are not expected to participate in rescues or respond to chemical releases beyond the initial discovery of the release and immediate mitigation actions. Mitigation actions can include closing a valve, placing absorbents, and notifying the client and/or public emergency response system.

c. For smaller, non-emergency spills or releases, employees must secure the spill area as quickly as possible and prevent the migration of exterior spilled materials or substances to drains or other openings.

d. During spill response, the Project Manager must coordinate with AECOM emergency responders and convey their communications to employees and others in the affected area. The SH&E Manager or designee must provide technical guidance and, when required, report any spills or releases into the environment to regulatory agencies within the applicable timeframe.

2.7 Regulatory Inspections

When a regulatory inspection is conducted on a worksite and employees are required to participate in the process, the following steps must be taken:

a. Verify the officer's credentials. A legitimate regulatory compliance officer must have a government-issued ID with a photo and employee number.

b. Immediately notify the Project Manager and the SH&E Manager.

c. Escort the officer to a conference room, or other available and suitable location, for the opening meeting and, attempt to include all the following people in the meeting either in person or virtually:

   i. The Project Manager

   ii. Any site safety representatives (where applicable)

   iii. The client

   iv. The SH&E Manager

d. Do not let the meeting start before all available parties are represented, as appropriate.

e. At the opening meeting, determine the reason for the inspection. Reasons include complaint-based, fatality-based, targeted, media-based, or random. If complaint-based, get a copy of the complaint.

f. Limit the scope of the inspection. Establish and define the areas the officer needs to see and confine the visit to those areas. Never offer a plant/facility tour. The regulatory agency can cite any violations in "plain view," regardless of the purpose of the inspection.

g. Allow the inspector to view any requested documentation, electronic or printed; however, the inspector must submit a formal (written) request to AECOM before documentation can be turned over.

h. Confirm the officer has the correct PPE and training to be in the area of the inspection.

i. During the inspection and as instructed by Legal:

   i. Take a picture of everything the regulatory officer takes a picture or video of during the inspection.

   ii. Document all inspections, interviews, discussions, and actions taken.

   iii. Take thorough and detailed notes; include exact locations, names, equipment, etc. the inspector observes or otherwise records.

   iv. Do not speak during videos. Anything you say is admissible in any court proceeding.

   v. Debrief employees following interviews.

   vi. If any items can be "fixed," ask the person responsible for the item to fix it immediately.

   vii. Do not fix any items yourself. Make sure the responsible party corrects the item.

j. At the closing conference:

   i. Include the Project Manager, any site safety representatives (where applicable), the Client, and a SH&E Manager in the closing conference.

   ii. Be a good listener and take notes on all the specific alleged violations identified by the compliance officer.

   iii. Never argue with the regulatory officer. This is an opportunity to promote the company's safety pr ograms and commitment to safety and health.

   iv. If any Notice of Violations (NOV) were given, contact/update the Project Manager and the SH&E Manager who must then notify Legal.

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2.8 Notification

a. If an incident occurs on a client-controlled site, management must confirm appropriate client notifications are made within the required time frames. These notification requirements must be documented in project-specific planning documents.

b. All written business notifications about the incident must be communicated by a Regional SH&E Director, or designee, to the stakeholders listed in Table 1, as appropriate.

   i. The Regional SH&E Director, or designee, must:

      1. For all incidents, notify the Tier 1 Level of every SH&E Incident involving an employee, managed subcontractor, or third party (proximate).

      2. For High Potential/Significant Incidents, notify the Tier 2 Level of every SH&E Incident involving an employee, managed subcontractor, or third party (proximate).

      3. For security-related incidents, notify AECOM's Global Security & Resilience (GSR) group.

Table 1. Communications Tree for SH&E Regional Directors

DCS Americas		CM	
Tier 1 - All Incidents	**Tier 2 - High Potential/Significant Incidents**	**Tier 1 - All Incidents**	**Tier 2 - High Potential/Significant Incidents**
Project Manager	Business Line Director of Operations	Project Executive	Business Line President / Executive Vice Presidents / Officers in Charge
Department Manager Client Account Manager	Regional Chief Operating Officer	Project Staff	Communications
Business Line Lead	US and LATAM Chief Operating Officer	Safety	Legal
Occupational Health Team	Regional Executive		Human Resources
Drug and Alcohol Program Coordinator	Global SH&E		Risk
Human Resources			Safety
Claims			
Legal			

c. The Affected Employee must submit an initial SH&E Incident Report using the online incident management system, Vector EHS Management (a.k.a. IndustrySafe), within 4 hours of a significant incident and within 24 hours for all other SH&E incidents.

   i. If the injury/illness prevents the affected Employee from completing the report, the Supervisor is responsible for completing the Vector EHS Management (a.k.a. IndustrySafe) report.

   ii. If an employee does not have internet access, a hardcopy of the SH&E Incident Report Form – Americas must be completed and submitted to the SH&E Manager.

   iii. The person who submits the report must also include any applicable documentation with the report such as a police report, photographs of the incident scene, witness statements, and regulatory forms, if any.

d. The SH&E Manager must manage open incidents in Vector EHS Management (a.k.a. IndustrySafe) until closure.

e. As requested, employees should complete the SH&E Incident Statement Form – Americas with as much detail as possible and submit it to the SH&E Manager along with the accompanying SH&E Incident Report Form – Americas.

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f. When applicable, the reporting requirements for incidents (e.g., severe injuries and/or fatalities) set by regulatory authorities (e.g., U.S. Occupational Safety and Health Administration [OSHA] and Mine Safety and Health Administration) must be followed. All communications to regulatory authorities must be reviewed and approved by the SH&E Manager, with consultation from AECOM Legal counsel, before submission; refer to SH&E Communication and Consultation – Americas.

2.9 Investigation

a. Investigations will be performed at the discretion of Operational Leadership, SH&E, and Legal. Local law and/or client requirements may also require certain incidents to be investigated.

b. The investigation may require that an investigation team be assembled. The responsible Project Manager must assemble the appropriate investigation team, as advised by SH&E, potentially consisting of, but not limited to, Operations, HR, Legal, and/or Occupational Health.

c. The responsible SH&E Manager must lead the investigation and be trained in investigation techniques and root-cause analysis. For Canada Region the responsible Project Manager (for project related incidents), Site Lead (for office related incidents), or a delegate as appointed by the Regional Business Line Leader or Director of Operations must lead the investigation. The SH&E Manager may use SH&E Incident Investigation Report – Americas to share with clients.

d. The investigation process must involve collecting and/or preserving evidence, including but not limited to:

   i. Interviews with those involved or those directly witnessing the event (witness statements)

   ii. Photographs

   iii. Documentation (Safe Work Plan, hazard assessment, training records, inspections, etc.)

   iv. Environmental conditions (weather, noise, lighting, etc.)

   v. List of site personnel, equipment, and materials.

e. Evidence should be stored in a secured location.

f. Investigation teams should only reference specific site information, locations, or involved employees if they are necessary to accurately investigate the incident and develop appropriate corrective actions.

g. Investigations must be documented. Investigation reports must identify the critical factors involved in the incident and develop direct and contributing causes to identify the root cause(s) of an incident. Investigators must evaluate causes associated with human activities, physical causes, and systems causes. The report must identify corrective actions and assign a responsible party and due dates.

h. The responsible Project Manager (or designee) should complete a Lessons Learned document in a timely manner (no longer than 21 days from the incident). Refer to the Safeguard Moments / Lessons Learned Library Ecosystem page and SH&E Communication and Consultation – Americas for further guidance. After the SH&E team reviews and approves the submitted Lessons Learned, it is posted on the Ecosystem page for employee access.

i. For High Potential or Significant incidents (assessed using Table 1, Communications Tree for SH&E Regional Directors), and at the discretion of the Responsible SH&E Manager, a Business Incident Review (BIR) (Major consequence) or Executive Incident Review (EIR) (Critical or Catastrophic consequence) is required.

j. BIR/EIRs must be held after a formal investigation process (e.g., Fault Tree, 5-Whys) has been followed to determine root causes and contributing factors. The Project Manager must present each BIR/EIR.

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2.10 Injury and Illness Recordkeeping

a. OSHA recordkeeping standard must be followed for all workplace injuries/illnesses regardless of location. Although OSHA does not apply outside of the United States, AECOM applies the OSHA recordkeeping regulations globally to maintain a level of consistency with reporting. OSHA recordkeeping requirements include but are not limited to the following:

   i. All recordable illnesses or injuries must be recorded on the OSHA 300 Log within 7 calendar days of receiving information that the injury occurred.

   ii. The OSHA 300A Summary must be signed by a company official and posted in a place visible to employees from February 1st through April 30th.

   iii. Recordkeeping forms must be maintained for 5 years.

b. SH&E may establish a Recordability Review Committee (RRC) with the intent to review the relevant facts surrounding an uncertain final recordability determination. The decisions must be documented with a summary placed in Vector EHS Management (a.k.a. IndustrySafe). Recordability Review Form – Americas may be used for the summary documentation.

c. Reviews can include, but are not limited to:

   i. Finalized investigations and facts/information unavailable at the original time of determination.

   ii. Current information from the workers' compensation claims adjuster.

   iii. Current information from applicable licensed health care practitioners.

   iv. Related analyses of the OSHA recordkeeping handbook, letters of interpretation, and settlement agreements.

d. If an employee is seconded (daily supervision is not provided by AECOM) and the recordable injury/illness is the responsibility of another party (e.g., client/contractor), the other party's acknowledgement of the requirement to place the injury on their OSHA 300 logs must be verified by AECOM. If approval has not been verified, the injury must be recorded on AECOM's OSHA log.

2.11 Injury Management

a. It is AECOM's goal to provide support to an employee during their recovery time, to promote wellness, and to return the Employee to full wage-earning capacity.

b. Supervisors can use Supervisor Injury Management Checklist – Americas to support the effective management of employee injuries.

c. Operations and the AECOM Claims Manager must work together with employees and their treating medical provider to establish a recovery program to minimize the Employee's total days away from work. AECOM Operations must accommodate transitional work requirements for employees recovering from work-related injuries whenever possible. "Transitional work" is described below and further defined in Section 4.

d. Refer to the SH&E Americas Claims Management Site Ecosystem page for process flowcharts of people manager and employee responsibilities, as well as a micro-training on the flowcharts.

e. If an employee must be off work or is given restricted work for an injury or illness of any kind, the Employee must notify their Supervisor, HR, and the SH&E Manager immediately.

f. If a medical provider has indicated a follow-up appointment is needed, the Employee must:

   i. Attend the appointment even if the Employee is feeling better or having no symptoms

   ii. Obtain an updated work status report at every appointment with the treating physician; and

   iii. Provide the updated work status report to their Supervisor and the SH&E Manager.

g. After every medical provider visit (whether the Employee is off work, on restricted work, or is just having a follow-up), the Employee must contact the AECOM Claims Manager to provide an update as to the medical provider visit and plan of care. The AECOM Claims Manager must confirm the Employee is getting the appropriate care in a timely manner and that the medical provider is being reimbursed accordingly.

h. Transitional work may take many forms, such as reduced hours of work; flexible work hours to accommodate treatment programs; assistance performing a task an employee may have been performing independently prior to an injury; reduced limits for lifting, climbing, or operating of equipment; reduced periods of standing or sitting, etc.

i. Each employee with a need for transitional work assignments must adhere to the modified duty program and medical provider's restrictions.

j. The Supervisor and the AECOM Claims Manager must review the position description and the Employee's work restrictions with the Employee. Transitional work must be made available unless an exception is authorized by the executive in charge of the operation.

k. The Employee must report any changes to their work status or restrictions and when they revisit their treating medical provider. This is required until the treating medical provider releases the Employee from care.

l. Under no circumstances must individuals be permitted to return to full or modified duty status without appropriate documented medical clearance such as a written return-to-work statement signed by the treating medical professional.

2.12 Legal Considerations

a. Employees must not:

   i. discuss the incident with members of the news media or legal representatives (except AECOM Legal counsel or your personal legal advisor) unless directed to do so by AECOM management; or

   ii. make statements pertaining to guilt, fault, or liability.

b. If there is a concern about potential liability, AECOM Legal should be notified of the SH&E Incident. The email should be directed to an AECOM in-house counsel in the "to" line, and the body of the email should be addressed to the AECOM in-house counsel. The subject line of the email should include, "Privileged & Confidential Attorney-Client Communication." The end of the email should state, "Please advise of Legal' s recommendations because of the information included above."

c. If any other emails regarding the SH&E Incident need to be sent out before Legal responds to this initial email, they should be marked as "Privileged & Confidential Attorney-Client Communication," and should include "Legal" in the "To" line.

d. If Legal recommends the policies associated with Attorney-Client Privilege be implemented, the following should apply moving forward:

   i. When corresponding internally, use "Privileged & Confidential Attorney-Client Communication" language at the beginning of an email and in the subject header. This helps expeditiously segregate potentially privileged communications.

   ii. Start a new email each time you update the recipients about the matter. Similarly, you should not reply more than twice to the same email. This is to keep information organized and minimize the transfer of stale information. Always include Legal in such emails.

   iii. In no event should you forward or discuss the advice contained in an email with these precautions to any outside third party (e.g., non-AECOM employee, contractor, client, expert, or any non-AECOM attorney, etc.) without checking with an AECOM attorney in Legal. This is to protect any applicable privileges that may attach to the communication(s).

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3. Training

a. First Aid Providers must possess a valid certificate in First Aid, CPR, and AED training from the American Red Cross or approved equivalent agency (e.g., American Heart Association, St. John's Ambulance), verified by documentary evidence, and be readily available to assist injured employees. AEDs must only be used by a First Aid Provider with current and proper training.

b. Employees involved in operations for which a fire extinguisher could be expected to be used (e.g., fixed facilities and project sites, fire watch, etc.) must be trained in its use. Training must allow employees to familiarize themselves with the general principles of fire extinguisher use and the hazards involved with incipient stage fire-fighting. Training must be renewed annually if applicable to the Employee's anticipated tasks and/or required by local law.

c. Specific training may also be considered for such topics as wilderness survival and rescue for employees performing work in remote locations where access by an Emergency Medical Technician (EMT) is limited by extreme terrain. Employees should provide no care beyond which they have been trained.

d. If there is potential for occupational exposure to bloodborne pathogens, refer to Biological Hazards – Americas.

e. If AECOM employees are to participate in the response to a chemical release beyond the initial reaction, there must be a contractual provision for this response, and the employees must be specifically trained for this response.

f. The person leading the investigation must be trained in investigation techniques and root-cause analysis.

g. AECOM GSR has a Field Security Briefing and Office Security Briefing available to offices and projects through Teams. Topics included in both trainings are situational awareness, active shooter awareness, tips on how to identify someone who could be a threat, and tips on how to de-escalate a situation. Active Shooter Awareness training is also available on AECOM University. Contact GSR@aecom.com for details or to schedule the training.

h. Employees who sustain an injury or illness that involves claims management must complete the micro-training titled "Injury and Illness Claims Management Flow" through AECOM University.

i. Refer to SH&E Training – Americas and its associated Assessment of SH&E Training Requirements – Americas for additional training requirements on first aid, CPR, AED, fire extinguishers, bloodborne pathogens, and other topics related to incident response.

4. Terms and Definitions

a. **AED** — Automated External Defibrillator – A portable electronic device used in the resuscitation of a patient in full cardiac arrest. AEDs automatically diagnose potentially life-threatening cardiac arrhythmias of ventricular fibrillation and ventricular tachycardia in a patient and treat them through defibrillation.

b. **CM** — Construction Management.

c. **CPR** — Cardiopulmonary Resuscitation:
   i. An emergency procedure in which the heart and lungs are made to work by:
      1. Manually compressing the chest overlying the heart, or
      2. Both manually compressing the chest and performing rescue breaths to force air into the lungs.
   ii. CPR is applied to a victim in respiratory distress and/or to maintain circulation when the heart stops pumping (cardiac arrest).

d. **Critical Injuries/Illnesses** — Injuries or illnesses that require immediate professional medical attention. Examples include, but are not limited to, any potential work-related injury and/or illness that involves the following:
   i. Loss of consciousness
   ii. Chest pain/breathing difficulty
   iii. Uncontrollable bleeding
   iv. Suspected internal injuries

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		v. Multiple injuries resulting in trauma vi. Suspected exposure to chemical/biological hazard vii. Major thermal or chemical burns viii. Amputation or partial amputation ix. Electrocution x. Spinal cord injury or traumatic brain injury xi. Severe eye injuries resulting in loss of vision xii. Unexplained change in mental state following an injury (may indicate shock or other internal injuries)
e.	Days Away from Work	For recordability purposes, the number of calendar days the Employee was unable to work as a result of the injury or illness, regardless of whether or not the Employee was scheduled to work on those day(s). Weekend days, holidays, vacation days, or other days off are included in the total number of days.
f.	DCS	Design and Consulting Services.
g.	EMS	Emergency Medical Services.
h.	EMT	Emergency Medical Technician.
i.	Environmental Incident	An incident with a negative environmental impact, e.g., an oil spill.
j.	First Aid Incident	A minor occupational injury (work related) requiring first aid treatment only with the Employee returning to normal duties on the same day or at the start of the next scheduled shift.
k.	First Aid Provider	A first aid-, CPR-, and AED-trained employee who provides emergency first aid or treatment (including performing CPR and applying an AED) to someone who is injured or suddenly ill, before EMS arrives. This is a voluntary action and not an occupational duty assigned by AECOM. They may use a limited amount of equipment to perform initial assessment and provide immediate life support and care while awaiting arrival of EMS.
l.	GSR	Global Security & Resilience.
m.	High Potential/Significant Incident	An incident with potential or actual consequences assessed at a severity level of Major, Critical, or Catastrophic using the Severity Table found in SH&E Risk Assessment and Planning – Americas.
n.	High Risk Task	In the context of this procedure, a work-related task with the potential to cause critical injuries/illnesses or immediate life-threatening conditions.
o.	HR	Human Resources.
p.	Lessons Learned	A communication intended to share a safety-related incident, the outcome or potential outcome, and lessons, to be considered in future actions and behaviors. Incidents are events that result, or could result, in personal injury, illness, or property or environmental damage. The Lessons Learned will contain only basic facts; will be without reference to a site, location, or employee; and will be developed solely for the purpose of conveying lessons learned to prevent recurrence.
q.	Medical Services Provider	Provides support for non-critical work-related injuries and illnesses.
r.	Medical Treatment	Any medical treatment beyond first aid as defined by OSHA.
s.	Modified Duty	Modification of an employee's position allowing for the Employee to carry out their work safely within their capabilities and without causing injury or aggravating an existing injury.
t.	Near Miss	An incident that has the potential to cause harm but resulted in no injury, loss, or damage.

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u.	Non-Critical Injuries/Illnesses	Any work-related injury or illness not requiring immediate professional medical attention. Examples include, but are not limited to, the following: i. Mild sprains/strains ii. Mild bruising iii. Minor cuts and scrapes iv. Minor insect bites v. Muscle/joint pain or soreness
v.	Non-work (Not related to work) Incident	Non-work-related injuries or illnesses are those that are deemed to have occurred outside of the course of employment.
w.	OSHA	Occupational Safety and Health Administration.
x.	PPE	Personal protective equipment.
y.	Property Damage	Equipment or property is damaged, but no injury occurs.
z.	Recordable Injury (Lost Time Case)	Any occupational injury that results in at least 1 full day absent from work beyond the day or shift in which it occurred (does not include time traveling off site for injury diagnosis).
aa.	Recordable Injury (Medical Treatment Beyond First Aid)	Any occupational (work-related) injury requiring medical intervention by a doctor (or equivalent) on or off site that allows the worker to return to normal duties on the same day or at the start of the next scheduled shift.
bb.	Regulatory Agency Visit	Any non-routine announced or unannounced visit or inspection of an AECOM office or project site by a regulatory agency involved with Occupational Health and Safety and Environmental laws and regulations.
cc.	Report Only Incident	Non-AECOM injury/illness/accident with potential for future compensation or general liability claim.
dd.	Restriction of Work	Occurs when an employee, after the initial day of the work-related injury or illness, meets any of the following conditions: i. Is assigned to another job on a temporary basis. ii. Works at their permanent job less than full time. iii. Works at their permanent job but cannot perform all duties normally performed at least once per week. iv. Performs light duty work at the direction of a physician.
ee.	Security Incident	Any security-related incident associated with an AECOM employee in the course of duty or any security-related incident that could affect an AECOM facility, project site, or property.
ff.	SH&E	Safety, Health and Environment
gg.	SH&E Incident	An unplanned situation or event in which harm or damage was experienced or was a potential, including injury, ill health, fatality, environmental damage, or other loss. The following events or situations as applied to AECOM employees, AECOM-managed subcontractors, and/or third parties (e.g., injury to public) proximate to AECOM-related events are considered SH&E Incidents: i. Environmental ii. First Aid iii. Near Miss iv. Non-Work (not related to work) v. Property Damage vi. Recordable Injury (Lost Time Case) vii. Recordable Injury (medical treatment beyond first aid) viii. Regulatory Agency Visit ix. Report Only x. Security xi. Vehicle

hh.	Transitional Work	Transitional work is defined as temporary modified or light-duty work that covers the time from the injury until the release to full duty from the medical provider.
ii.	Vehicle Incident	Incidents involving vehicles (e.g., collisions, driving violations, citations, and/or revocation of a driver's license).
jj.	Work-Related	As defined by OSHA.
kk.	Work Status Report	Documentation received after a clinic visit in which the treating medical professional indicates the Employee's work status such as off work, specific work restrictions/limitations, or full duty return to work with no restrictions/limitations.

5. References

a. SH&E Training – Americas S3AM-003-PR2

b. SH&E Communication and Consultation – Americas S3AM-006-PR2

c. Fitness for Duty – Americas S3AM-008-PR2

d. Substance Abuse Prevention – Americas S3AM-019-PR1

e. Safety Gear – Americas S3AM-208-PR2

f. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

g. Biological Hazards – Americas S3AM-313-PR2

h. Workplace Violence Procedure – Americas H2AM-001-PR1

i. Workplace Violence and Harassment Policy – DCS – Americas – Canada H3[DCS]AM(CA)-001-PR1

j. Employee Handbook – DCS – Americas – Canada H3[DCS]AM(CA)-001-PR1

k. Safeguard Moments / Lessons Learned Library – Ecosystem

l. Cyber Defense – Ecosystem

m. Canada Incident Reporting Flowchart available on the Canada SH&E – Ecosystem

6. Records

a. Documentation of first aid supplies and equipment inspections must be maintained in the office/location/project files.

b. Incident reports (including recordable injuries) and supporting documentation must be maintained in Vector EHS Management (a.k.a. IndustrySafe).

c. If a hardcopy SH&E Incident Report – Americas is completed, it should be scanned and kept in Vector EHS Management (a.k.a. IndustrySafe).

d. Records relating to occupational injury and incidents must be kept for up to 30 years (or per legal requirements), depending on the classification of incident.

e. Records associated with medical treatment and return to work orders must be filed and maintained by Occupational Health with strict confidentiality.

f. The following must be documented and retained in the project files:

   i. SH&E Incident Report Form – Americas S3AM-004-FM1

   ii. SH&E Incident Investigation Report – Americas S3AM-004-FM3

   iii. Recordability Review Form – Americas S3AM-004-FM5

   iv. SH&E Incident Statement Form – Americas S3AM-004-FM6

g. Supervisor Injury Management Checklist – Americas S3AM-004-FM7

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h. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

i. SH&E Americas Claims Management Site – Ecosystem

7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-004-PR2; consolidated portions of the contents from the following retired documents: Incident Reporting, Notifications & Investigation – Americas S3AM-004-PR1, Injury & Illness Recordkeeping – Americas S3AM-017-PR1, Injury & Claims Management – Americas S3AM-018-PR1, and Return to Work Policy – Americas S3AM-018-ATT1.	All
1	30-Jan-2026	Changed “must” to “can”.	Section 2.11.b

SH&E Training

S3AM-003-PR2

1. Purpose and Scope

a. This procedure establishes the minimum Safety, Health, and Environment (SH&E)-related orientation and training requirements for employees to identify and control SH&E risks in their work, dictated by the work each employee performs (or is expected to perform), and the geographic area(s) where the Employee performs these activities.

b. This procedure outlines the process and minimum requirements for classifying an AECOM employee as a "Competent Person" to oversee and/or self-perform work activities. Local law may contain alternate definitions for Competent Person, and it is the responsibility of the Project Manager, in conjunction with an SH&E Manager/Director to determine and resolve conflicts, if any, existing between AECOM and applicable regulatory definitions.

c. This procedure defines recordkeeping requirements, aims to maintain consistency in SH&E training content, and provides a framework to assess participant competency and understanding.

d. This procedure applies to all AECOM Americas-based employees and operations, as well as contracted personnel required to comply with this document's content.

2. Procedure

2.1 New Employee SH&E Orientation

a. Employees must complete the required SH&E training assigned through Learning Management System (LMS) – AECOM University (AECOM U) or other approved platform.

b. Employees must complete a "new hire" SH&E orientation on the AECOM SH&E systems including hazard reporting, risk management, and accessing procedures/resources.

c. Employees must also be provided with a local office-specific orientation to include information on safety reporting, emergency response plans, and other office-specific SH&E topics.

d. Orientation should be completed within 1 week, but no longer than 1 month, from the employee's hire date and must be completed prior to undertaking any field work.

e. New Employee SH&E Orientation – Americas form or equivalent may be used to document new employee SH&E orientation progress. For Canada, refer to New Employee SH&E Orientation – DCS – Americas – Canada.

2.2 Project- / Site-Specific SH&E Orientation

a. Employees must complete a relevant project- and/or site-specific orientation provided by AECOM, the controlling contractor, and the client, where applicable, within the specified timeframes of the project and before initiating site work.

b. Staff and AECOM-managed subcontractors must not enter a site unless they have received the relevant orientation.

c. The Project Manager is responsible for confirming that the on-site orientation for AECOM employees and AECOM-managed subcontractors has been completed prior to the commencement of work.

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d. Orientation requirements can be outlined in the project-specific SH&E Plan / Safe Work Plan (SWP) / Task Hazard Assessment (THA ; e.g., Field Level Risk Assessment [FLRA] in Canada) and should, at a minimum, cover the following items:

   i. Scope of work / project overview;

   ii. Key personnel;

   iii. Local law, client, and any other requirements;

   iv. Incident reporting and management process including the importance of near miss and observation reporting to enhance safety awareness and culture - refer to SH&E Incident Response and Investigation – Americas;

   v. Communication and consultation arrangements, including the safety escalation and resolution process - refer to SH&E Communication and Consultation – Americas;

   vi. Site-specific safety procedures and rules (as applicable) regarding minimum personal protective equipment (PPE) requirements, alcohol and drugs policy, smoking areas, parking, deliveries, visitors, exclusion zones, permits, hours of work and fatigue policy, etc. - refer to SH&E Risk Assessment and Planning – Americas and Safety Gear – Americas;

   vii. Risk management processes, such as critical risks and critical controls, SH&E plans/SWPs/THAs (e.g., FLRAs in Canada), and 4-Sight - refer to SH&E Risk Assessment and Planning – Americas;

   viii. Red Card – Stop Work Authority - refer to Safety Tenets and Stopping Work – Americas;

   ix. Key workplace hazards/risks and control requirements;

   x. Emergency management;

   xi. Environment, community, and stakeholder requirements; and

   xii. Safety observations.

e. The Project Manager must maintain a record (e.g., acknowledgement page of the SH&E Plan, orientation sign-off page) of all site orientations conducted (including AECOM-managed subcontractors) in the project folder.

2.3 Risk-Based Approach to SH&E Training

a. Assessment of SH&E Training Requirements – Americas should be used as a guideline for providing SH&E training to employees per the requirements of their role, in relation to the specific risks posed by their work activity, and in accordance with legal, client, and industry requirements. Other applicable region-, business line-, or project-specific training assessments should also be consulted.

b. In Canada, new employee training is identified and listed in New Employee SH&E Orientation – DCS – Americas – Canada, and project-specific training is identified and listed in the Project-Specific SH&E Plan – DCS – Americas – Canada.

c. All employees who will perform work outside of the office setting must discuss and develop their training needs with their direct supervisor within 1 week of hire and annually thereafter. Employees should review their SH&E training requirements in conjunction with their annual performance review.

d. SH&E training needs may be identified through individual risk assessments, incident investigations, observed non-compliance, when procedures change, or through the annual staff appraisals process. As required, appropriate training must be arranged and may be provided through LMS – AECOM U courses, safety meetings, and/or classes delivered by internal or external providers.

e. All personnel who are required to fulfill a designated emergency response role must be trained in their responsibilities and be well-versed in the specific Emergency Response Plan for the workplace. Minimum training requirements are detailed in Assessment of SH&E Training Requirements – Americas.

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f. All workers and visitors at AECOM-controlled workplaces must be trained (workers) or briefed (visitors) on emergency evacuation and response protocols during the orientation process and must be required to participate in any emergency-related training as required (e.g., evacuation drills and simulated response exercises).

g. For larger scale projects, a site-specific training matrix can be developed to identify specific training requirements, including competency, licensing, and qualifications, for specific project personnel including contractors if applicable. It is the responsibility of the Project Manager to confirm that this document is maintained.

h. Project managers must review the relevant training and certification records of all employees on their projects prior to mobilization into the field to confirm that they have current and appropriate training.

2.4 Visitors and Delivery Drivers

a. Where visitors to project sites are required to enter operational work areas, it is recommended that they receive a brief site-specific orientation and always be supervised by fully orientated and safety trained site personnel while on site.

b. Where delivery drivers are required to enter an operational project zone, it is recommended they participate in a brief delivery driver orientation to familiarize themselves with the site specifics.

c. Where regular deliveries are expected on the project, the Project Manager should make early contact with the transport companies involved to arrange for orientation to be programmed well in advance of deliveries commencing.

2.5 Short Service Employees (SSE)

a. An employee is designated as an SSE if they are undertaking work in the field and have less than 6 months of experience working in the industry of the work to be performed.

b. An employee is not considered an SSE if they have more than 6 months of fieldwork experience in a similar industry and can demonstrate competency in AECOM's safety management system and processes.

c. Former employees who return to AECOM within 12 months and are placed into the same job assignment may not be designated as SSEs.

d. Specific circumstances may warrant the extension of the SSE designation, reduction of the required time identified in the schedule, or an exemption. Project managers must consult the Regional SH&E Manager with any SSE schedule variance or exemption requests, if applicable. Refer to SH&E Management System Variance Request – Americas.

e. SSEs must receive all required training and certification prior to being mobilized into a field environment. Until training has been provided, SSEs may only attend work sites under the direct supervision of a trained employee who is competent to perform the work activity. This supervision must continue until the SSE has received training and is deemed competent to undertake the task.

f. Where specific training is not immediately required, a training plan must be established. The training plan should outline the schedule for the required training to be achieved prior to the SSE being mobilized into a field environment.

g. SSEs must not be assigned to field projects unless they are supervised on site by safety oriented and trained personnel. It is the responsibility of the Project Manager to ensure that all new employees are suitably supervised by a Competent Person in all situations where they may be exposed to harm and while performing high risk work, until such time as they have had sufficient training and/or have demonstrated competence.

h. SSEs are not permitted to work alone or away from their field team at any time.

i. As required, project managers must notify the client and/or host facility when an SSE will be working at their site.

j. An identification system (e.g., green hard hats) to readily differentiate SSEs from other employees must be implemented when required by the client and/or local law.

2.6 Competency

a. A designation of Competency may be required for certain tasks. The competencies required for a particular employee must be established by the Employee's Supervisor at the time of orientation and whenever new equipment or tasks are introduced to the workplace.

b. The Competent Person Designation – Americas form or equivalent must be used for documenting Competent Person designations. Documentation must be filled out completely and updated as necessary. Project-specific competency designation requirements may be defined in the SH&E Plan, SWP, and/or THA (e.g., FLRA in Canada).

c. Employees are not allowed to carry out high-risk work unless they have the required certificates/licenses for the type of work being conducted (refer to the SH&E Manager for further information). High-risk work license/training records must be available for review.

d. Where competency is not yet established, the Supervisor or Project Manager must confirm that gaps are documented on the training plan. The Employee must be provided with sufficient instruction and an opportunity to undertake the task under supervision by a Competent Person until their competency is established.

e. All training records, work licenses, and certificates must be maintained by each Supervisor or Project Manager in the project files.

2.7 Safety Training – General Requirements

a. Training Competency Levels

   i. Awareness Level: The primary goal of awareness-level training is to transfer basic knowledge to enable employees to recognize and avoid hazards. Additionally, employees must learn what precautions are necessary when they are exposed to hazards, and the precautions may necessitate additional training. Training typically takes the form of instructor-led discussions, presentation of related video content, and/or self-directed e-learning modules. Comprehension may be assessed through discussion of the training topic with the participants and/or a simple quiz.

   ii. Performance Level: Performance-level training must build upon the awareness-level training for certain high-risk tasks. The goal of performance-level training is to have employees successfully demonstrate they can apply the knowledge discussed during training and perform the desired skills necessary to perform higher-risk tasks. Training materials are provided and discussed and must incorporate a demonstration of the skills to be completed. The instructor must gauge the level of understanding through interactive discussion with participants and a pass/fail designation of demonstrated skills by the employees. A test or quiz of moderate difficulty must be provided followed by the successful demonstration of the desired skill to receive certification.

b. Training Delivery

   i. Internal Training: Internal training is performed by AECOM's internal resources and may include online webinar and classroom-based training. Peer-reviewed AECOM training materials must be used for training whenever they are available to facilitate consistency in content and duration of training. AECOM-based training materials can be supplemented as appropriate with content specific to the program, project, customer, office, or geographic unit. Trainers should be approved by an SH&E Manager. Training format and material must be appropriate to the topic and audience. Course content must be periodically reviewed and updated as appropriate, or multiple versions of training may be developed for rotating use to provide participants with new learning materials and avoid stagnation or to meet specific regulatory requirements.

   ii. External Training: External vendors must be pre-approved by an SH&E Manager to conduct training not available through internal training sources. This training may be classroom, web seminar, or online training.

c. Training Evaluation

   i. At the conclusion of a training event, participants should be provided with the opportunity to anonymously evaluate the training session. Instructors must review evaluations at the conclusion of training, and information from the evaluations must be considered when revising training content.

d. Ongoing Training Maintenance

   i. Training should be tracked electronically using LMS – AECOM U or Workday whenever possible.

   ii. Training may expire in accordance with requirements specified in applicable local law or policy.

   iii. If training required by AECOM or local law expires, employees must be disqualified from performing associated tasks until training has been renewed.

   iv. Refresher training may be provided in the following circumstances if:

      1. an employee is observed working or operating equipment in an unsafe manner
      2. an employee is involved in an incident
      3. an employee is assigned a new task or type equipment; or
      4. a condition in the workplace changes in a manner affecting personal safety or the safe operation of equipment.
      5. As required by local law.

3. Training

Individuals administering LMS – AECOM U SH&E training are required to undertake LMS training from the implementation team.

4. Terms and Definitions

a.	Competent Person	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 that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
b.	LMS – AECOM U	Learning Management System – AECOM University – An electronic training delivery and data management system utilized to implement and document the SH&E training program.
c.	SH&E	Safety, Health, and Environment.
d.	SSE	Short Service Employee – SSEs are those who have been newly hired or transferred to a different position in the company (e.g., one with new and possibly unfamiliar hazards and safe operating procedures).

5. References

a. Safety Tenets and Stopping Work – Americas S3AM-001- PR2

b. SH&E Incident Response and Investigation – Americas S3AM-004-PR2

c. SH&E Communication and Consultation – Americas S3AM-006-PR2

d. Safety Gear – Americas S3AM-208-PR2

e. SH&E Risk Assessment and Planning – Americas S3AM-209-PR2

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6. Records

a. Records include the following:

   i. Assessment of SH&E Training Requirements – Americas S3AM-003-FM1

   ii. SH&E Training Sign-In Sheet – Americas S3AM-003-FM2

   iii. New Employee SH&E Orientation – Americas S3AM-003-FM6

   iv. Orientación de seguridad y salud para nuevos empleados – Américas S3AM-003-FM6(ES)

   v. New Employee SH&E Orientation – DCS – Americas – Canada S4[DCS]AM(CA)-003-FM1

   vi. Competent Person Designation – Americas S3AM-003-FM7

   vii. Daily Safety Meeting – Americas S3AM-209-FM5

   viii. Project-Specific SH&E Plan – DCS – Americas – Canada S4[DCS]AM(CA)-209-FM1

   ix. SH&E Management System Variance Request – Americas S3AM-215-FM2

b. Completion of the orientation provided by AECOM must be documented, initialed, or signed by the orientee and stored in the project folder or in a local (office) folder.

c. On or prior to completion of the orientation, copies of the orientee's safety training certificates must be collected as appropriate to their scope of work. Employees are also required to keep copies of certificates and provide these as requested by the SH&E team, their supervisors, or project managers.

d. Companywide training must be captured and recorded through LMS – AECOM U. LMS - AECOM U can also be used to deploy and track local courses as required.

e. External training must be tracked through use of LMS – AECOM U where an applicable course code has been established, or it is acceptable to capture this through business line or other local training registers or in Workday. These must be reviewed periodically for accuracy.

f. Courses denoted in Assessment of SH&E Training Requirements – Americas or commonly required training must be tracked in LMS – AECOM U when completed. Employee training tracked in LMS – AECOM U must be retained for the duration of the Employee's employment.

g. Classroom training must be documented using an attendance record and course agenda. SH&E Training Sign-In Sheet – Americas can be used to document attendance.

h. For training provided by customers/vendors, training documentation must be entered into a training database, and documentation must be maintained by the Employee.

i. In some cases, objective evidence of comprehension is required (passing a test), and this information may be tracked in addition to the course information.

j. Attendance sheets, agendas, course evaluations, completed tests, and copies of certificates must be maintained and filed in program or project training files by course.

k. Locations, projects, and programs must maintain records on any project-, program-, location-, or site-specific training requirements.

l. Managers should verify that employees have the required training prior to assigning or authorizing specific roles and responsibilities to each employee.

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7. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	01-Dec-2025	Initial release as S3AM-003-PR2; consolidated portions of the contents from the following retired documents: SH&E Training – Americas S3AM-003-PR1, Newly Hired or Transferred Employees – Americas S3AM-015-PR1, and Competent Person Designation – Americas S3AM-202-PR1.	All
1	22-Jan-2026	Added reference of New Employee SH&E Orientation – DCS – Americas – Canada and related content.	Sections 2.1.e., 2.2.b., and 6.a.iv.
2	06-Mar-2026	Updated hyperlink for New Employee SH&E Orientation – DCS – Americas – Canada and added reference to SH&E Training Sign-In Sheet – Americas with its reinstatement into the program.	Sections 2.1.e., 2.3.b., and 6

Appendix B– FAP

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Field Activities Plan

338 Broadway, Kingston, NY (Site No. 356058)

New York State Department of Environmental Conservation

Project number: 60781325

May 2026

Prepared for:

New York State Department of Environmental Conservation
625 Broadway
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Appendix A Scope of Work
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1. Introduction

AECOM USA, Inc. (AECOM) has prepared this Field Activities Plan (FAP) for Site No. 356058 located at 338 Broadway, Kingston, Ulster County, New York (**Figure 1**). The Site is comprised of four parcels in the City of Kingston, Ulster County, New York located at 338 Broadway (Tax ID: 56.26-11-46), 17 Jansen Avenue (Tax ID: 56.26-11-45), 15 Jansen Avenue (Tax ID: 56.26-11-44), and 334 Broadway (Tax ID: 56.26-11-12). This work was performed for the New York State Department of Environmental Conservation (NYSDEC) under Contract D009803 Work Assignment 63.

The data gathering effort outlined in this FAP includes advancement of direct push borings, analysis of subsurface soil samples, installation of temporary overburden monitoring wells and the analysis of groundwater samples from the newly installed wells. This information will be necessary to further characterize subsurface impacts, and investigate the potential source and extent of detected Chlorinated Volatile Organic Compounds (CVOCs) and other Site contaminants. Data collected will be compiled into a Comprehensive Site Characterization Investigation Report (SCR). At the request of NYSDEC, AECOM will review and evaluate the information generated by Aztech Environmental Technologies, Inc. (Aztech) during prior investigations and determine whether this information can be incorporated into the Comprehensive SCR to be issued by AECOM. Upon determination that the Aztech data can be included, the Comprehensive SCR will include both Aztech and AECOM data.

This FAP is designed to provide typical procedures for the field activities on work assignments (WAs) issued under NYSDEC Contract D009803. It will serve as the field procedures manual for all AECOM personnel. Adherence to these procedures will ensure the quality and defensibility of the field data collected. In addition to the field procedures outlined in this document, all personnel performing field activities must do so in compliance with: (1) the Quality Assurance/ Quality Control (QA/QC) measures outlined in the Quality Assurance Project Plan (QAPP); (2) the appropriate Health and Safety guidelines found in the Health and Safety Plan (HASP); (3) the scope of work outlined in the comprehensive Site Characterization Work Plan (SCWP); and (4) the time schedule outlined in the SCWP.

1.1 Work Assignment Objectives

The objectives of the work assignment has been established in the WA issued by NYSDEC under contract D009803-63 and documented in the Scope of Work (SOW); refer to **Appendix A**.

The scope of work chosen for this SCWP is to target data gap areas and provide data for the assessment of the lateral and vertical extents of soil and groundwater contamination within overburden soils, to re-evaluate the surface and subsurface characteristics of the Site, including topography, stratigraphy, hydrogeology and depth to groundwater, assess and evaluate potential migration pathways, establish a clearer contaminant gradient to assist in identifying the sources(s) of contamination in environmental media within overburden, and compile the information into a comprehensive SCR. Data gap areas include previously inaccessible interior locations within 338 Broadway where historical drycleaning equipment was located, the parking area on the south side of the Site where borings were not extended to the confining layer, and to the north of Bob's Auto at 336 Broadway.

Field activities are planned and conducted in general accordance with NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010), and the United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988).

The FAP is intended to be a companion document to the site-specific Work Plan prepared for the WA. This site-specific FAP has been prepared using the NYSDEC Generic FAP as a guideline and is included as an Appendix to the site-specific Work Plan for this WA to address site-specific conditions and project-specific requirements.

The scope of work to be completed on site consists of:

1. Geophysical utility location services and soil boring/sub-slab vapor point clearance will be performed by an AECOM subcontractor.
2. Soil borings will be advanced by an AECOM subcontractor down to an estimated depth of approximately fifteen (15) feet (ft.) below ground surface (bgs) and approximately 1 foot into the clay confining layer. All locations will be hand cleared to five feet bgs. Borings will be advanced using a direct push technology (DPT) drill rig (e.g., Geoprobe®). Soil samples will be visually described and classified, assessed for signs of contamination, and screened with a photoionization detector (PID) for the presence of organic vapors by the supervising AECOM geologist. Samples will be collected from direct-push soil cores soil samplers with 5 foot sections of Macro MC5 polyvinyl chloride (PVC) liners for off-site laboratory chemical analysis.
3. Three soil samples will be collected from each of the four soil boring locations; one from the shallow subsurface (0-2 ft. bgs), one from the top of saturated zone (approximately 8 ft. bgs) and one at the confining layer (approximately 14 ft. bgs), for a total of twelve soil samples. Soil samples will be analyzed for Total Compound List (TCL) Volatile Organic Compounds (VOCs) by EPA Method 8260D (via a NYSDEC call-out laboratory).
4. All four soil borings will be converted to temporary monitoring well sampling points. The monitoring wells will be constructed with 10-feet of 1-inch ID #10 slot PVC screen (straddling the water table) attached to a 1-inch ID, Schedule 40 PVC riser to the ground surface and a PVC bottom plug. Based upon previous subsurface investigations performed at the Site, bedrock is not anticipated to be encountered at the target depth of approximately 15 feet bgs. However, if bedrock is encountered below the water table, drilling will cease, and the well shall be screened at a depth that straddles the water table above the bedrock interface, as directed by the AECOM geologist. A #2 size sand pack will be installed from the bottom of the well screen up to 2 feet above the top of each of the well screens. A minimum 2-feet thick bentonite seal will be installed above the sand pack, hydrated and allowed to sit for 30 minutes prior to the placement of the cement/bentonite grout (neat cement). The grout will be placed from above the bentonite seal to an elevation of 1-foot below grade via a tremie pipe. Each well shall be equipped with a locking expandable plug (J-plug) and lock.
5. Each new well will be developed by pumping until the discharged water is relatively sediment free (<10 NTU if possible) and the indicator parameters (pH, temperature, and specific conductivity) have reached steady state.
6. Prior to collecting groundwater samples, a comprehensive round of water levels will be collected from the new monitoring wells.
7. Groundwater samples will be collected from the newly installed temporary monitoring wells using low-flow sampling procedures. Groundwater samples will be analyzed for TCL VOCs by EPA Method 8260D via a NYSDEC call-out laboratory.
8. All soil spoils, decontamination fluids, and purge water will be drummed for off-site disposal. The drums will be staged in a secure location on-site until transport and disposal are arranged.
9. One solid and one aqueous sample will be collected for disposal parameters as required by the disposal facility to complete the waste profiles for the Investigative derived waste (IDW) transportation and off-site disposal.
10. The laboratory analyses will be performed by a NYSDEC call-out laboratory. The proposed sampling program is presented in **Table 1**.

11. A limited data validation (Stage 2B) will be performed and a Data Usability Summary Report (DUSR) for each matrix will be prepared following the guidelines provided in NYSDEC DER-10, Appendix 2B, Guidance for Data Deliverables and the Development of Data Usability Summary Reports, May 2010. Data validation will be performed by a qualified AECOM chemist independent of the data collection activities.
12. Location and elevation survey of the borings and monitoring wells will be performed by an AECOM subcontractor.

1.2 Site Description and Background Information

The Site is comprised of four (4) parcels in the City of Kingston, Ulster County, New York located at 338 Broadway (Tax ID: 56.26-11-46), 17 Jansen Avenue (Tax ID: 56.26-11-45), 15 Jansen Avenue (Tax ID: 56.26-11-44), and 334 Broadway (Tax ID: 56.26-11-12). **Figure 1** presents the Site Location Map.

The entirety of the Site spans 1.72 acres across the four parcels; 338 Broadway (0.23-acre), 334 Broadway (0.11-acre), 15 Jansen Avenue (0.69-acre) and 17 Jansen Avenue (0.69-acre). The Site is located within an urban area and is surrounded in all directions by a mix of commercial, single-family residential and multi-family residential properties.

The 338 Broadway parcel consists of a single three-story building divided into multiple units. One of the two ground-floor units is currently occupied by a retail business, Anajpati Asian Grocery Store, while the other is unoccupied, and the upper floors contain occupied residential apartments. A detached garage structure is located at the rear of the property that connects to 334 Broadway. 334 Broadway is occupied by an inactive auto body shop, Bob's Automotive Repair, and includes a paved area at the front of the building. 15 Jansen Avenue contains an occupied two-story, single-family residence. 17 Jansen Avenue is vacant, contains no structures and is used as a parking area.

1.2.1 Site Use History

Based upon historical property information provided by NYSDEC and historical Sanborn Fire Insurance (Sanborn) maps from previous environmental reports, dry cleaning operations were conducted at 338 Broadway as early as 1950 and continued through circa 1971. The earliest information available about the on-site buildings and their historic use is from an 1887 Sanborn map, which depicts a building on-site that shares a partially similar but non-identical footprint to the current Site building. The use is listed as a store and dwelling, and the use is updated to a saloon and dwelling in the following Sanborn map dated 1899. Subsequent Sanborn maps dated 1950 and 1957 depict a building labeled “dry cleaners” more closely resembling the current building footprint. The label “dry cleaners” is not present in the following Sanborn map dated 1972. The dry-cleaning business appears to have ceased operations at that time, with activities possibly resuming in 1986 based on the SC Addendum prepared by Environmental Assessment & Remediations (EAR) for NYSDEC in 2024. The date of the subsequent closure is not documented; however, municipal records indicate that between 1992 and 2014 the property was occupied intermittently by various commercial tenants, including a tattoo parlor, a clothing store and other retail businesses.

Sanborn maps depict the 334 Broadway property as glass shop from approximately 1972 to the final available Sanborn map dated 1987. Prior to 1972, the building at 334 Broadway is depicted as a residence.

The Sandborn maps depict the 15 and 17 Jansen Avenue properties as residences from the first depiction in 1887 to the final Sanborn map in 1987.

1.2.2 Previous Investigations

The SCWP submitted to NYSDEC by Aztech (2020) stated that no records of previous investigation work specific to 338 Broadway were available for review. However, prior off-Site subsurface investigations at 322 Broadway (occupied by a Burger King), by AECOM had documented the presence of CVOCs including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE) in groundwater samples. Aztech conducted a SC at the 338 Broadway and additional surrounding parcels to further assess the existence and extent of chlorinated solvent contamination identified at the 322 Broadway property.

- Initial Site Characterization - Aztech (2020 – 2022)

Aztech was contracted by NYSDEC in 2020 to perform a Site Characterization (SC) to inform a decision on the Site's classification within the NYSDEC State Superfund Program. The Site is classified as a "P-Site," indicating that the Site may have contamination present that makes it eligible for consideration for placement on the Registry of Inactive Hazardous Waste Disposal Sites.

Between September 2020 and April 2022, Aztech performed an initial SC of the Site. This work included a ground penetrating radar (GPR) survey, collection of four (4) surface soil samples, advancement of six (6) soil borings completed as groundwater monitoring wells (MW-1 through MW-6), gauging and low-flow groundwater sampling of the installed monitoring wells (October 2020); installation and sampling of twenty (20) soil vapor probes during two events, VP-1 through VP-10 (October–December 2020) and VP-11 through VP-20 (August–September 2021). In March 2021, a soil vapor intrusion investigation was also conducted inside the buildings at 322, 336, 338, 344, and 342 Broadway, and 15, 17, and 25 Jansen Avenue.

- Supplemental Site Characterization - Aztech (2023)

In May 2023, additional investigation activities were performed at the Site and additional properties to the west by Aztech to supplement the initial SC preformed between 2020 and 2021. Additional GPR scanning was performed within the area of investigation, an anomaly indicative of an underground storage tank was reported to have been observed within the interior of the property located at 336 Broadway (occupied by Bob's Automotive). Eight (8) soil borings were advanced and completed as temporary groundwater monitoring wells. Four (4) borings, SB-7 through SB-10, were located within the building interior of 336 Broadway, and four (4) borings, SB-10 through SB-14, were installed in the exterior, at the rear of the property. The temporary monitoring wells were gauged and low-flow sampling was performed in May of 2023.

The initial SC identified varying concentrations and distributions of CVOCs PCE, TCE cis-1,2-DCE, methylene chloride, as well as perfluorooctane sulfonic acid (PFOS) across soil, groundwater, and soil vapor at the Site and additional properties to the west.

- Site Characterization Addendum - EAR (2024)

In August of 2024, EAR submitted a Site Characterization Addendum to the NYSDEC for the report prepared by Aztech in November of 2023. Additional figures were created summarizing concentrations of detected VOCs, SVOCs, pesticides, PFAs and select metals. In addition, NYSDEC requested a record review of the properties immediately to the north and west of 338 Broadway to determine if there is potential PCE sources upgradient to 338 Broadway.

No final Site Characterization Report approved by NYSDEC was issued by Aztech.

1.2.3 Site Geology

The Site is located within the Hudson–Mohawk Lowlands of New York State, situated in the Hudson River Valley south-southeast of the Catskill Mountain foothills. The topography of the Site and the surrounding area is generally flat, with a gentle slope downward toward the Hudson River to the southeast. Review of the Surficial Geologic Map of New York, Lower Hudson Sheet published by the University of the State of New York, the State Education Department, dated 1989, indicates that the Site is underlain by glaciolacustrine sands and clays, and till of variable extent. The area to the southeast of the Site, in the direction of the Rondout Creek and Hudson River include recent floodplain deposits and bedrock that is exposed or present within 1 meter of the surface. Review of the Geologic Bedrock Map of New York, Lower Hudson Sheet published by the University of the State of New York, the State Education Department, dated 1970, indicates that the Site is underlain by the Onondaga limestone.

Subsurface soil conditions encountered during prior investigation of the Site have been reported in a draft SCR submitted by Aztech (Aztech SCR) to NYSDEC in November of 2023. The report states subsurface conditions typically consist of loose brown fine to medium sand with varying amounts of silt from just beneath the surface and ranging to approximately 10 to 14 feet below ground surface (bgs). The predominant sand and silt soils were found to overlay a confining layer of gray silt and clay. The silt and clay confining interval was generally firm and encountered below the observed water table. The silt and clay layer extended to the maximum investigation terminal depth 20 feet below ground surface (bgs). During the prior investigations, boring advancement did not exceed the confining layer of silt and clay. The average terminal depth of borings during Aztech's 2023 investigation was 16.6 feet bgs. Bedrock was reportedly not encountered during prior investigations at the Site.

1.2.4 Site Hydrology

During prior Site investigations, groundwater was reported to have been encountered within soil borings between 8 and 14 feet bgs (Aztech, 2023). Based upon the water levels collected during the October and December 2020 well gauging event, Aztech reports stated the groundwater flow direction at the Site was determined to be in a southeasterly direction with the average groundwater gradient within the measured well network ranging from 0.005-0.006 ft/ft between both gauging events. The Rondout Creek is located approximately 0.75 miles southeast of the Site and serves as an eastward flowing tributary to the Hudson River. The Hudson River itself lies approximately 1.5 miles to the east-southeast of the Site. The presumed groundwater flow direction in the vicinity of the Site is to the southeast and groundwater discharges into the Hudson River and/or its tributary.

2. General and Preparatory Field Activities

The scope of work will be established in the work assignment as documented in the site-specific Work Plan.

The work assignment may include a variety of field activities intended to obtain site-specific data pertaining to the extent of contamination and the extent to which releases or potential releases from the site pose a threat to human health and the environment. Typical project objectives include:

- Characterize site geology;
- Characterize site hydrogeology;
- Evaluate areal and vertical extent of contamination, including transport mechanisms;
- Assess the source(s) of contamination and determine if this source(s) has impacted the existing on-site building, off-site properties or sensitive receptors; and
- Collect additional data to support further site characterization and/or inform remedial actions.

To accomplish these objectives, the field subtasks described in this FAP may be utilized. Additional methodology information will be provided in the QAPP. Unless otherwise noted, it is assumed that all field work will be completed at Level D personal protection in accordance with the HASP. Field activities will be monitored by a qualified AECOM representative(s).

2.1 Mobilization

Following authorization to proceed with the field investigation from NYSDEC, AECOM and its subcontractors will mobilize necessary materials and equipment to the site. Due to the intrusive nature of the work being performed Cascade as the subcontractor performing the work, will place a call to DigSafely New York for utility mark out. Utility clearance is detailed in Section 2.3.

Site preparation will be performed by AECOM's drilling subcontractor, Cascade, under direction by AECOM.

Site preparation activities include:

1. Construct a temporary decontamination pad on an existing concrete slab for decontamination of tools and equipment. The temporary decontamination pad will be lined with plastic sheeting so wash water can be collected, containerized, and properly disposed. Following field work, the temporary decontamination pad will be disassembled and removed from the Site.
2. Establish an IDW staging area on an existing concrete slab.

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 and emergency contingencies and other field procedures.

2.2 Health and Safety

It is anticipated that the work to be completed at typical sites will be performed in Level D personal protection with the potential to upgrade to Level C. 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 threat to field personnel or warrant an 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 AECOM's regional safety manager. AECOM subcontractors will perform all work in accordance with the Site-specific HASP for this WA.

2.3 Utility Clearance: Callout

Intrusive activities will be conducted during a typical site investigation including hand cleaning/soft-dig of proposed soil borings and monitoring well installations. Prior to the start of intrusive activities, Cascade Drilling will place a call to New York DIG SAFE CALL CENTER at Dig Safely New York (for all areas north of New York City) 811 (http://www.digsafelynewyork.com) or 1-800-962-7960 for utility mark outs to minimize the risk of encountering subsurface utilities.

2.4 Geophysical Surveys

Geophysical surveys will be conducted by Enviroprobe, Inc. to screen for and identify the presence of underground utilities or any anomalies (e.g., underground storage tanks) within the work areas in the interior and on the exterior of the on-site buildings where direct push drilling will be conducted. The subcontractor will use both ground penetrating radar (GPR) and electromagnetic conductivity (EMC) methods necessary to confirm utility clearance. Subsurface utilities and/or anomalies shall be identified and marked in the field with spray paint as they are located and a report that summarizes the findings of the survey shall be submitted seven calendar days after completion of the survey.

Ground-Penetrating Radar (GPR)

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.

2.5 Utility Clearance: Hand Tools and Air Knife

Excavation with hand tools allows for excavation near subsurface utilities with reduced chance of impacting the utilities. Hand clearing will be conducted for all soil boring locations by AECOM's drilling subcontractor, Cascade Drilling, under the direction of AECOM.

Procedure:

1. Excavate a two-foot square by approximately five-foot deep area manually using post-hole diggers, pry bars, and/or hand digging equipment. An air knife will be used as needed to advance through areas of dense overburden.
2. After the location is cleared for drilling, the hole will be backfilled flush with the ground surface using the excavated spoils (small rocks and debris removed).
3. Excavated material not returned to the hole will be drummed along with the monitoring well boring spoils for proper disposal.

2.6 Community Air Monitoring

Community air monitoring will be performed as outlined in the NYSDOH Generic Community Air Monitoring Plan (CAMP), unless some of the provisions of the CAMP are not appropriate for a specific work assignment. AECOM's approach to implementing the Generic CAMP is provided in Section 7.0 of this FAP. The CAMP is also provided in Appendix E of the SCWP – Community Air Monitoring Plan.

2.7 Site Survey

Project surveying performed by AECOM subcontractor, MJ Engineering and Land Surveying, Inc. will provide data necessary to plot the temporary groundwater monitoring wells on the existing base map. All surveying will be performed under the supervision of a New York State licensed land surveyor, following the requirements of the Scope of Work and HASP.

The horizontal positions will be tied into the North American Datum 1983 and UTM Zone 18N coordinate system. The vertical positions will be tied to the North American Vertical Datum 1988 (NAVD88). The measuring point 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 supplied in a digital CAD format (i.e., .dwg or .dxf files in the cited coordinate systems).

2.8 Green and Sustainable Remediation

The work to be completed will comply with NYSDEC guidance documents including DER-31: Green Remediation (2010b) as it applies to site investigation and characterization. To ensure compliance with DER-31, the work will be completed using the best management practices (BMPs) and techniques described below. In addition to the items discussed in Section 8.0 – Field Records and Documentation, specific reporting methods relative to DER-31 are further described in the following subsection.

2.8.1 Best Practices and Techniques

DER-31 provides some examples of BMPs that could be applied during the investigation stage and all phases of remediation (see Attachment 1 of the DER-31 policy). Additional resources to identify potential BMPs and techniques applicable to this work include:

- United States Environmental Protection Agency CLU-IN Green Remediation (www.clu-in.org/greenremediation/);
- Interstate Technology & Regulatory Council Green and Sustainable Remediation (www.itrcweb.org/teampublic_GSR.asp);
- NAVFAC Green and Sustainable Remediation (www.ert2.org/t2gsrportal/);
- Air Force Center for Engineering and the Environment Sustainable Remediation (www.afcee.af.mil/resources/technologytransfer/programsandinitiatives/sustainableremediation/index.asp); and
- Sustainable Remediation Forum (www.sustainableremediation.org).

Lastly, NYSDEC expects that the BMPs identified below will be implemented at sites unless a site-specific evaluation demonstrates impracticability or favors an alternative green approach:

- Reduce vehicle idling;
- Use of Low Sulfur Diesel Fuel (LSDF) or alternate fuels (i.e., biodiesel or E85);
- Sequence work to minimize double-handling of materials
- Schedule work tasks to reduce fuel consumption
- Use carpooling for workers when practical; and
- Use energy efficient systems and office equipment in the job trailer.

Prior to initiating any field work, the AECOM and NYSDEC Project Managers will identify applicable BMPs to be used for each work assignment.

2.8.2 Reporting

All Green and Sustainable BMPs employed during field activities will be discussed within the field log books described in Section 8.0 – Field Records and Documentation. Specifically, the field log books will acknowledge that the practices and techniques identified for the site work were taken each day (if applicable). In addition, the following information will be recorded within the field log books at the close of each day:

- The estimated quantity of fuel consumed by onsite vehicles and equipment;
- The estimated distance traveled by trucks and equipment delivering goods or removing waste; and
- The estimated water use during onsite activities.

The information will be compiled and presented to NYSDEC in a form suitable to the site-specific work completed.

3. Drilling Procedures

Drilling activities for a maximum of four (4) soil borings and the installation of four (4) temporary overburden monitoring wells will be conducted according to the SOW and will utilize DPT drilling.

Procedures for specific sampling activities are described below. The procedures proposed for this investigation are discussed in this section and will be implemented by a subcontractor under the direct supervision of an AECOM employee.

3.1 Direct Push Drilling Procedures

Locations of four (4) soil borings have been preliminarily identified on Figure 2. Locations for soil borings have been pre-determined by NYSDEC and are only subject to change based upon the presence of subsurface anomalies or underground utilities as identified by the GPR scanning and field conditions at the Site when commencing the work. If the soil boring location required significant adjustment based on the previously described conditions, AECOM will notify NYSDEC and discuss the soil boring location prior to installation. Soil borings will be installed in areas where there is a data gap (due to sampling access constraints encountered during prior investigations at the Site or due to borings not being extended to the confining layer) and/or additional definition of contaminant distribution to help determine possible source areas.

Procedure:

1. All direct push tooling, including rods, core barrels, and sample liners, will be decontaminated prior to advancing each boring in accordance with the project decontamination procedures (see Section 6).
2. Soil borings will be advanced using DPT. A core sampler (typically advanced in 4- to 5-foot increments) will be attached to the direct push rig, and a new, unused acetate liner will be placed inside the sampler prior to advancement.
3. The sampler will be advanced using a combination of the rig's static weight and percussive force to the targeted depth interval to permit continuous or near-continuous soil sampling, where practicable.
4. Upon completion of each sampling interval, the sampler and associated rods will be withdrawn to the ground surface, and the acetate liner containing the soil sample will be removed from the sampler.
5. Soil samples will be visually classified, split lengthwise as needed, and screened using a PID to evaluate the presence of volatile organic vapors.
6. Soil characteristics, PID readings, recovery, sample depths, and observations (see Section 5.1) will be documented in the field notebook and on the Soil Boring Log (Appendix B).
7. A new, unused acetate liner will be installed, and the direct push sampling process will be repeated until the target depth is achieved or refusal is encountered.

Reference: American Society for Testing and Materials (ASTM) D6282/D6282M-25 (2025).

4. Groundwater Investigation Tasks

A groundwater investigation will be conducted as part of the Comprehensive Site Characterization Investigation. Field activities that will be implemented as part of a groundwater investigation include (but are not limited to) the following:

- Groundwater Elevation Survey
- Monitoring Well Installation
- Groundwater Sampling from Monitoring Wells

4.1 Groundwater Elevation Survey

To better understand the hydrogeologic conditions, synoptic water level readings will be collected by AECOM prior to groundwater sampling.

Water levels in monitoring wells scheduled to be sampled during the field work will be measured using an electronic water level indicator. Initially, measurements when the well has recovered to anticipated static conditions.

Water level measurement procedures are presented below.

Procedure:

1. Clean the water level probe and the lower portion of cable following standard decontamination procedures (Section 6.0) and test water level meter to ensure that the batteries are charged.
2. Lower the probe slowly into the monitoring well until the audible alarm indicates water.
3. Read the depth to the nearest hundredth of a foot from the graduated cable using the V-notch on the riser pipe as a reference point.
4. Repeat the measurement for confirmation and record the water level.
5. Remove the probe from the well slowly, drying the cable and probe with a clean "Chem Wipe" or paper towel.
6. Replace the well cap and lock protective cap in place.
7. Decontaminate the water level meter (Section 6.0) if additional measurements are to be taken.

Reference: ASTM D4750-87(2021).

4.2 LNAPL/DNAPL Water Level Survey Procedures

When conducting groundwater measurement from monitoring wells, the presence and thickness of Light Non-Aqueous Phase Liquids (LNAPL) and Dense Non-Aqueous Phase Liquids (DNAPL) will be monitored, as appropriate. The following procedure will be used to determine the presence and thickness of LNAPL and DNAPL. LNAPLs are typically measured using an oil/water interface meter.

Procedure:

1. To meet safety requirements and protect electronics from damage, always ground the meter by attaching the ground clamp to the metal well casing.
2. Before beginning any measurement, check the electronics and battery condition by pressing the ‘START/OFF’ button. A brief tone and red light indicate the meter is functional. A flashing

green light indicates the meter is on. NOTE: The meter will automatically shut off after 10 min to conserve battery life and will have to be turned back on.

3. Lower the probe end into the well and slowly lower until water or LNAPL is contacted. A steady tone and light indicate a non-conductive liquid (e.g. product). An intermittent tone and light indicate a conductive liquid (e.g. water).
4. For floating product (LNAPL), take the air/product interface measurement on the way into the liquid and the water/product interface on the way up. When passing through product into water, some product may adhere to the probe sensors due to surface tension. Therefore, when water is detected below the product, the probe should be raised and lowered rapidly in a short vertical motion to remove any product that may have been carried down with the probe.
5. The water/product interface should then be measured as the probe is raised very slowly back up. Once the interface is detected the probe can be raised and lowered in small increments to precisely determine the interface.
6. Repeat measurements to confirm water/product interface.
7. To determine the thickness of product, subtract the water/product interface from the product/air interface.
8. To determine if there is any sinking product (DNAPL) in the well, continue lowering the probe slowly. If steady signals activate, determine the top of the sinking layer by reading directly from the tape. Continue lowering the probe slowly until the tape slackens when the well bottom is reached. Read the level directly from the tape and subtract one from the other to determine thickness.
9. Upon completion of readings clean the tape and the probe.

4.3 Monitoring Well Installation

The approved number and proposed locations of temporary monitoring wells are shown in Figure 2 – Proposed Soil Boring Locations. The actual location and number of monitoring wells will be determined by the on-site supervising AECOM geologist and/or NYSDEC Project Manager.

Prior to advancing augers, the geophysical survey will be performed, and the borings will be hand cleared to five feet bgs. A maximum of four (4) borings will be advanced to the target depth of approximately fourteen (14) feet bgs past/to the confining layer, or until bedrock is encountered.

The default method for advancing overburden borings for monitoring well installation will be using DPT drilling. The hollow probe rods will be advanced to the target depth for well installation.

The default method for advancing overburden borings for monitoring well installation will be using 2.25-inch hollow probe rods with an expendable point. The rods will be advanced to the target depth for well installation (15 ft. bgs) or to approximately one foot past where the confining layer is encountered. Rods will be removed while keeping the borehole open and the assembled well will be lowered into the open borehole.

Subsurface soil samples will be obtained in accordance with Section 5.0 and logged in accordance with Section 8.0. Soil cuttings will be screened for organic vapors using a PID.

4.3.1 Overburden Monitoring Well Construction Procedures

Four (4) overburden temporary monitoring wells will be installed during this Site Characterization at a target depth of approximately 15 feet bgs, or at least one foot into the clay confining layer. The screen will be installed at a depth where it will straddle the water table. The wells will be constructed with 10-foot-long, 1-inch inside diameter #10 slot PVC screen attached to a 1-inch inside diameter

Schedule 40 PVC riser to the ground surface and a Schedule 40 PVC bottom plug below the screen section.

The groundwater monitoring wells will be installed during this investigation using the procedures described below.

Procedure:

1. Advance subsurface boring to the desired depth by means of direct push drilling using hollow probe rods with expendable points.
2. While boring, collect soil core samples on a continuous basis to geologically log the boring.
3. Remove hollow rods and verify borehole depth using weighted measuring tape.
4. Add washed and graded medium sand as needed to base of borehole.
5. Insert the well screen and riser pipe with bottom plug into the borehole. Cap the riser to prevent well construction materials from entering the well.
6. Add #2 sand to screen section of well. Sand pack should extend at least two feet above the top of the screen section. Measure with a tape.
7. Slowly add bentonite pellet seal to borehole as augers are slowly removed. The bentonite seal should extend at least two feet above the top of the sand pack section. Measure with tape.
8. Note: The rate of removal of the hollow rod from the borehole should closely follow the rate that the sand pack and bentonite pellets fill the borehole.
9. If bentonite seal is placed above the groundwater level within the borehole, add water to the borehole to hydrate the bentonite pellets. Allow pellets to hydrate for at least 30 minutes.
10. Mix cement/bentonite grout per manufacturer's specifications.
11. Add grout to borehole through tremie pipe or hose from the top of the bentonite seal to the ground surface.
12. Top off grout in borehole. Grout should extend to approximately two feet below ground surface.
13. Cut well-riser pipe to about three feet above the ground surface.
14. Backfill the remaining two feet of the borehole with concrete.
15. Document well construction in the field notebook and on a Well Construction Detail diagram (Appendix B).

Reference: ASTM D5092/D5092M-16 (2024).

4.4 Groundwater Sampling from Monitoring Wells

Groundwater sampling will be performed to evaluate the extent of groundwater contamination. The four (4) temporary overburden monitoring wells (with no measurable free product) will be sampled for TCL VOCs (by EPA Method 8260C).

The proposed locations of soil borings/ monitoring wells can be found on Figure 2 – Proposed Soil Boring Locations, Table 2 – Monitoring Well Sampling Plan, and in the QAPP.

4.4.1 Low-Flow Sampling Technique

Groundwater sampling will be done 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).

Monitoring well purging will be completed using the low-flow purging technique as follows:

1. The expansion plug will be carefully removed to avoid having any foreign material enter the well. The interior of the riser pipe will be monitored for organic vapors using PID. If a reading of greater than 5 ppm is recorded, the well will be vented until levels are below 5 ppm before purging begins.
2. Using an electronic interface probe/water level detector, the water level below top of casing will be measured. The depth of the well will be measured to determine the volume of water in the well. The bottom of the well will also be checked for DNAPL using the interface probe/water level indicator. The end of the probe will be decontaminated between wells.
3. Calibrate field instruments (e.g., pH, specific conductance, PID, turbidity).
4. Purge the required water volume (i.e., until stabilization of pH, temperature, specific conductivity, and turbidity) using a low-flow pump (e.g., Solinst or Geopump) and dedicated HDPE tubing. New dedicated tubing will be used for each well.
5. Purge the well until the water quality parameters have stabilized. The stabilization criteria are: specific conductivity – +/- 3% full-scale range; pH – +/- 0.10 pH unit; dissolved oxygen – +/- 10%, Turbidity – +/- 10% and oxidation/reduction (redox) potential – +/- 10 units.
6. Purging of three well volumes is not necessary if the indicator parameters are stable. However, at least one (1) well volume must be purged before sampling can begin. During purging, it is permissible to by-pass the flow cell until the groundwater has cleared.
7. Indicator parameters of pH, conductivity, dissolved oxygen, oxidation/reduction (redox) potential, turbidity, and temperature must be measured continuously using the flow cell.
8. Well purging data are to be recorded in the field notebook and on the Low Flow Purge Log (Appendix B).

4.4.2 Sample Collection Procedures

Procedure:

After well purging is completed, a sample will be collected into the appropriate containers.

1. Direct water flow toward the inside wall of the sample container to minimize volatilization. Fill volatile sample containers so no headspace (air bubbles) is present. If containers are pre-preserved, do not overfill sample containers. Note if effervescence is observed.
2. All sample bottles will be labeled in the field using a waterproof permanent marker (Section 8.4).
3. Samples will be collected into sample bottles (containing required preservatives) and placed on ice in coolers for processing (preservation and packing) prior to shipment to the analytical laboratory. A chain-of-custody record will be initiated. The analytical laboratory will certify that the sample bottles are analyte-free prior to shipping.
4. Remove pump and disconnect valves and tubing, as necessary. If a submersible pump was used, it must be decontaminated prior to and between each use. Clean pump by flushing 10 gallons of potable water through the pump. Rinse with deionized water after flushing the pump.
5. Well sampling data are to be recorded in the field notebook and on the Well Purging Log (Appendix B).

4.4.3 Sampling Through LNAPL

Procedure:

1. Measure the depth and thickness of the LNAPL layer per Section 4.2.
2. The groundwater sample from below the product will be collected through a 1-inch ID tremie pipe immersed below the LNAPL layer.
3. Insert a slip cap or similar device (i.e., J-plug) to plug the end of the 1” ID PVC pipe and attach a tether to the device so it can be retrieved from the well after sampling is complete. The pipe will be lowered into the well and additional sections of 1” ID PVC pipe will be added, as necessary.
4. Lower the 1” ID PVC pipe into the well with the slip cap/J-plug inserted in the bottom of the pipe. The bottom of the pipe should be lowered through and at least 2’ below the bottom of the LNAPL layer.
5. Brace the 1” ID pipe at the surface so it cannot fall further into the 2” well casing.
6. Smaller diameter rods or a weighted section of steel pipe attached to a rope will be used to push the slip cap off the end of the 1” ID PVC pipe. The attached tether will allow retrieval of the J-plug when the 1” tubing is retrieved from the well at the conclusion of sampling.
7. Proceed with sampling the well by inserting purging and sampling tubing through the 1” tubing.
8. When sampling is finished, remove the 1” tubing and slip cap from the well. The 1” ID PVC pipe will be partially coated with LNAPL and should be discarded. The slip cap can be decontaminated or discarded.

4.4.4 Sampling LNAPL or DNAPL

When conducting groundwater sampling from monitoring wells, LNAPL and DNAPL may be collected. The following procedure will be used to collect samples of LNAPL and DNAPL (if present):

1. Measure the depth and thickness of the LNAPL/DNAPL layer per Section 4.3.
2. Using a disposable Teflon or Teflon lined bailer attached to disposable poly twine, lower the bailer so the bottom of the bailer is at the same depth as the bottom of the LNAPL/DNAPL layer.
3. Upon reaching its target depth, raise the bailer with the LNAPL/DNAPL product and place the product in the laboratory supplied containers.
4. Repeat steps 2 and 3 until the laboratory supplied containers are full or there is no more product to remove.
5. Upon completion of the sampling, place the used bailer and twine in a 1A2 open head 55-gallon steel drum.

4.5 Monitoring Well Decommissioning

1. Monitoring well decommissioning will be performed in accordance with NYSDEC Policy CP-43, using the following steps:
2. Each well will be tremie grouted from the bottom of the well to within five feet of the ground surface to ensure a continuous grout column. Grout slurry composition should be the following:

1.5 to 3.0 percent by weight - Bentonite (Quick Gel)

40 to 60 percent by weight - Cement (Portland Type I)

3. 40 to 60 percent by weight - Water
4. The well riser will be removed at a depth of five feet below grade (if possible).
5. A metal marker (PK Survey Spike) will be embedded in the top of the grout to indicate the location of the former monitoring well.
6. The uppermost five feet of the borehole will be filled with approved/clean backfill or topsoil.
7. The surface of the borehole will be restored to the condition of the area surrounding the borehole (crushed stone, asphalt, etc.). If the surrounding surface is a concrete sidewalk flag, that flag will be replaced in accordance with applicable regulations/standards.
8. The solid waste should be handled in accordance with Section 6.2 of this plan.
9. Document well construction details in the field notebook and transfer the data onto the Well Decommissioning Record form (Appendix B).

Reference: ASTM D5299/D5299M-18 (2018)

Reference: NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009.

4.6 Plugging/Abandoning Borehole and Grout Mixing

If any boreholes are not completed as monitoring wells, they will be sealed (plugged) prior to abandonment to prevent downhole contamination. In addition, the annular space in monitoring wells need to be sealed after the installation of the sand pack and bentonite seal to prevent any downward migration of surface water into the well. Sealing can be achieved by backfilling the borehole with bentonite below the water table (hole plug or pellets) and/or with a cement/bentonite grout above the water table. The backfill material will be introduced from bottom to top using either a tremie pipe or the drill rods. Shallow borings will be sealed with bentonite (hole plug or pellets) the entire length of the boring.

Procedure:

1. Determine most suitable seal materials. Grout specifications generally have mixture ratios as follows:

   Grout Slurry Composition (Percent Weight)

   1.5 to 3.0 percent - Bentonite (Quick Gel)

   40 to 60 percent - Cement (Portland Type I)

   40 to 60 percent - Water

2. Calculate the volume of the borehole based on the bit or auger head diameter plus 10 percent and determine the volume of grout to be emplaced. Generally, the total mixed volume is the borehole volume plus 20 percent.
3. Identify the equipment to be used for preparing and mixing of the grout. Ensure the volume of the tanks to be used for mixing has been measured adequately. Document these volumes.
4. Identify the source of the water to be used for the grout and determine its suitability for use. In particular, water with high sulfate or chloride levels, or heated water, should not be used. These types of waters can cause operational difficulties or modify the set-up for the grout.

5. Identify the equipment to be used for emplacing the grout. Ensure that the pump to be used has adequate pressure to enable complete return to surface.
6. Identify the volumes to be pumped at each stage or in total if only one stage is to be used.
7. Prepare the borehole plugging plan and discuss the plan and activities with the drilling contractor prior to beginning any mixing activities.
8. Begin mixing the grout to be emplaced.
9. Record the type and amount of materials used during the mixing operation. Ensure that the ratios are within specification tolerance.
10. Begin pumping the grout through the return line bypass system to confirm that all pump and surface fittings are secure.
11. Initiate downhole pumping. Record the times and volumes emplaced on the form.
12. Document the borehole is completely filled with grout.
13. Clear and clean the surface near the borehole. Level the ground to about the pre-existing grade. Add grout or cement as necessary to the area near the borehole.

Note: On occasion, there may be some settling of the grout, which takes place over several days. If this settling occurs, the natural soil from the immediate vicinity is used to put the level at grade. A follow-up check at each site should be made within one week to 10 days of completion. Document the visit and describe any action taken.

5. Soil Sampling Activities

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

5.1 Subsurface Soil Sampling

Borings will be advanced at a maximum of four (4) approved locations. All borings will be hand cleared to five (5) feet bgs, and advanced to bedrock using 4¼ I.D. HSAs. Split spoon samples will be collected continuously and logged using standard penetration techniques from the ground surface to the target depth of 25 feet bgs, or refusal/bedrock, if encountered.

5.1.1 Direct Push Borings Sampling Procedures

Direct push boring samples will be collected during boring advancement at continuous 5-foot intervals. All soil samples will be visually described and classified, inspected for signs of contamination, and screened with a PID for the presence of organic vapors by the supervising AECOM geologist. Soil samples will be collected from the shallow surface (0-2 ft bgs), the top of the saturated zone (approximately 8 ft bgs) and at the confining layer (approximately 14 ft. bgs) and cooled on ice to be sent for laboratory analysis.

Soil samples collected from the four proposed (4) soil borings (to be subsequently converted to temporary monitoring wells) will be analyzed for TCL VOCs (by EPA Method 8260D) (via a NYSDEC call-out laboratory [Pace Analytical]).

Procedure:

1. Inspect the sampling equipment to ensure proper working conditions.
2. Insert dedicated disposable acetate liner into the sampler and select additional components for the sampler as required (i.e., leaf spring core retainer for clays, or a sand trap for non-cohesive sands).
3. Lower the sampler to the ground surface, or bottom of the hole previously made by the sampler and check the depth against length of the rods and the sampler.
4. Attach the drive head assembly to the sample rods.
5. Push the sampler in increments up to 5 feet into the subsurface up to the desired depth with a hydraulic press.
6. Rotate the sampling rods clockwise and remove the sampler.
7. Split the sample lengthwise and screen the soil with a PID for volatile organic vapors.
8. Document all properties and sample locations in the field notebook, and on the Direct-Push Log form (Appendix B).

Reference: ASTM D6282/D6282M-25 (2025).

Unified Soil Classification System

Soils are classified for engineering purposes according to the Unified Soil Classification System (USCS) adopted by the U.S. Army Corps of Engineers and U.S. Department of the Interior Bureau of Reclamation. Soil properties that form the basis for the USCS are:

- Percentage of gravel, sand, and fines;

- Shape of the grain-size distribution curve; and
- Plasticity and compressibility characteristics.

According to this system, all soils are divided into three major groups: coarse-grained, fine-grained, and highly-organic (peaty). The boundary between coarse-grained and fine-grained soils is taken to be the 200-mesh sieve (0.074 mm). In the field the distinction is based on whether the individual particles can be seen with the unaided eye. If more than 50% of the soil by weight is judged to consist of grains that can be distinguished separately, the soil is considered to be coarse-grained.

The coarse-grained soils are divided into gravelly (G) or sandy (S) soils, depending on whether more or less than 50% of the visible grains are larger than the No. 4 sieve (3/16 inch). They are each divided further into four groups:

W: Well graded; fairly clean (<5% finer than 0.074 mm)
P: Poorly graded (gap-graded); fairly clean (<5% finer than 0.074mm)
C: Clayey (>12% finer than 0.074mm); plastic (clayey) fines. Fine fraction above the A- line with plasticity index above 7.
M: Silty (>12% finer than 0.074 mm); non-plastic or silty fines. Fine fraction below the A- line and plasticity index below 4.

The soils are represented by symbols such as GW or SP. Borderline materials are represented by a double symbol, as GW-GC.

The fine-grained soils are divided into three groups: inorganic silts (M), inorganic clays (C), and organic silts and clays (O). The soils are further divided into those having liquid limits lower than 50% (L), or higher than 50% (H).

The distinction between the inorganic clays (C), the inorganic silts (M), and organic soils (O) is made on the basis of a modified plasticity chart. Soils CH and CL are represented by points above the A-line, whereas soils OH, OL, and MH correspond to positions below the A-line. Soils ML, except for a few clayey fine sands, are also represented by points below the A-line. The organic soils O are distinguished from the inorganic soils M and C by their characteristic odor and dark color.

Reference: ASTM D2487-17 (2025).

5.1.2 Visual Identification

Soil samples collected during boring advancement will be visually identified. Soil properties required to define the USCS classification of a soil and other observed characteristics normally identified in describing a soil are defined below:

a. Color
b. Moisture conditions
c. Grain size:
    i. Estimated maximum grain size
    ii. Estimated percent by weight of fines (material passing No. 200 sieve)
d. Gradation
e. Grain shape
f. Plasticity

g. Predominant soil type
h. Secondary components of soil
i. Classification symbol
j. Other features such as:
    i. organic, chemical, or metallic content;
    ii. compactness;
    iii. consistency;
    iv. cohesiveness near plastic limit;
    v. dry strength; and
    vi. source - residual, or transported (aeolian, water borne, glacial deposit, etc.)

Reference: ASTM D2488-26 (2026).

6. Decontamination and Management of Investigation Derived Waste

6.1 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 the site-specific FAP. Field equipment rinsate blanks are generated and analyzed to monitor the effective of field decontamination procedures.

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

6.1.1 Decontamination Procedures

A decontamination pad will be constructed on the site by AECOM's drilling subcontractor, Cascade Drilling.

The pad will be sized to be large enough to handle the equipment used on site (e.g., drill rig). Additionally, the pad will be used for small equipment decontamination as well as personnel decontamination.

6.1.2 Small Equipment Decontamination

Small equipment decontamination for non-disposable equipment will be accomplished using the following procedures:

- Liquinox® (or equivalent) and potable water wash;
- Potable water rinse;
- Distilled/deionized water rinse;

Solvents will not be used in the field decontamination of such equipment. Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g. Liquinox®) 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.

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.

Electric submersible pumps (such as a Grundfos Redi-Flow II) will be decontaminated using the above steps followed by running a large volume (several gallons) of potable water through the pump, followed by an analyte-free water rinse. Tubing will not be re-used (new tubing will be used for each well). Submersible pumps and supporting lines and cables will be placed in a plastic bucket filled with Liquinox and potable water and then run for several minutes (to decontaminate both exterior and interior parts). The process will be repeated with potable water. Submersible pumps will also be given a final analyte-free water rinse of both interior and exterior parts.

If bladder pumps are used, the pump will be disassembled and cleaned after each used. A new bladder will be used for each sample. Small parts, such as screens and gaskets will be replaced after each use. Dedicated airline tubing and high-density polyethylene (HDPE) sample tubing will be used at each monitoring well. The pump will be cleaned using the following steps:

- Liquinox (or equivalent) and potable water wash;
- Potable water rinse;
- Distilled/deionized water rinse;
- Solvent (reagent or pesticide grade) rinse if samples are collected for organic analysis;
- Dilute (10%) nitric acid rinse if samples are collected for metals analysis; and
- Distilled/deionized rinse, air dry.

6.1.3 Heavy Equipment Decontamination

Drilling equipment will be decontaminated before the first use, between boreholes and prior to demobilization using high-pressure steam. Decontamination will be conducted at a dedicated decontamination pad constructed for the project or at an alternate location as indicated in the site-specific Work Plan. Decontamination fluids will be containerized (drummed) for subsequent characterization or disposal.

6.1.4 Personnel Decontamination

Wash buckets and potable water will be set up at the decontamination pad or alternate location as indicated in the site-specific Work Plan, or HASP. This includes washing hands and a boot wash. Details of the personnel decontamination procedures will be provided in the HASP.

6.2 Management of Investigation Derived Waste

IDW management will be performed in accordance with section 3.3(3e) 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.

IDW generated during field activities include, but is not limited to, the following:

- Purged water;
- Poly sheeting;
- PPE; and
- Drill cutting and soil boring spoils.

This IDW must be placed in 1A2 open head 55-gallon steel drums pending shipment off site for disposal.

Procedure:

Segregation

- Drummed IDW is to be divided into the following categories:
  - Drill cuttings and soil boring spoils (see Section 3.0);
  - Purgewater from monitoring well sampling and DNAPL/LNAPL product; and,
  - Solid waste other than drill cuttings and boring spoils (i.e., spent poly tubing, PPE, etc.).

Generator ID

- Any IDW generated is assigned USEPA Generator ID Number TBD.

Hazardous/Non-Hazardous Classification

- AECOM will collect characterization samples to classify the IDW as either hazardous or non-hazardous.

Shipment/Disposal

- Drummed IDW must be staged at its point of origin until it is shipped off site on the same day it is generated or staged in a designated and secured area until it can be shipped off site at a later date.
- All IDW must be shipped off site by a permitted contractor to a permitted facility and may be disposed of at a facility licensed to accept hazardous waste, if necessary.

Manifests

- Waste manifests must accompany the IDW during shipment off site for disposal. For non-hazardous waste, a non-hazardous waste manifest must be completed. For hazardous waste, a Uniform Hazardous Waste Manifest (USEPA Form 8700-22) must be completed, along with a Land Disposal Restriction Notification Form 1. IDW manifests can be signed by AECOM personnel as agents for the generator (NYSDEC).

7. Community Air Monitoring Program

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 CAMP (May, 2010; Appendix 1A to DER-10 [NYSDEC, 2010]) which is typically utilized by NYSDEC as guidance for work conducted under these contracts.

7.1 Monitoring

Real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter and surrounding community of the work area may be necessary. 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 will be determined by NYSDEC and AECOM and specified in the site-specific Work Plan and site-specific FAP.

7.1.1 Continuous Air Monitoring

Continuous monitoring for VOCs and particulates may be required for ground intrusive activities associated with the site, including, but not limited to, hand digs, the installation of soil borings and groundwater monitoring wells. A total of two (2) CAMP units will be present; one (1) in a down-wind location and one (1) in an up-wind location.

VOC monitoring will be conducted at the downwind perimeter of the immediate work area on a continuous basis. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish Action Levels based upon background conditions. VOC monitoring will be performed using a MiniRAE 2000 or equivalent, which is appropriate to detect a wide range of contaminants typically encountered. The MiniRAE 2000 will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The MiniRAE 2000 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 Thermo MIE pDR-4000 DataRam or equivalent. The Thermo MIE pDR-4000 DataRam 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. The Thermo MIE pDR is equipped with an audible alarm to indicate exceedance of the action level. In addition to using the Thermo MIE pDR-4000 DataRam, 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.

7.1.2 Periodic (As-Needed) Air Monitoring

Periodic or as-needed air monitoring for VOCs may be required during non-intrusive activities associated with the site-specific Work Plan. Non-intrusive activities may include the collection of soil samples and the collection of groundwater samples from existing monitoring wells. Periodic air monitoring during sample collection will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location.

7.1.3 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.

7.1.4 Volatile Organic Compounds

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (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. Additionally, daily reporting of the CAMP data for VOCs will be provided to NYSDEC and NYSDOH including CAMP monitoring station location sketches.

7.1.5 Particulates

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 techniques 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 techniques, 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 included in daily reports for NYSDEC and NYSDOH personnel to review, including CAMP monitoring station location sketches.

8. 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 Log Books and Standard Forms. Standard Forms are provided in Appendix B.

8.1 Field Log Books

Field log books will be prepared and maintained throughout the course of the investigation. Only bound, weatherproof field log books will be used by personnel working on NYSDEC projects. The log books will be turned in for copying/filing/tracking when complete.

Each log book will be labeled on the front cover in indelible ink with the following designation: “338 Broadway/Site Characterization,” NYSDEC Work Assignment D009803-63, AECOM Project Number 60781325.”

Entries will be recorded in indelible, waterproof ink. If errors are made in any field log book, field record (form), Chain-of-Custody Record, 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 this FAP to facilitate the collection of consistent data (see Appendix B). This will preclude detailed documentation of, for example, lithologic descriptions in the field log book. A reference, however, to use of each specific form must be made in the log book.

The date will be placed at the top of every page in the left-hand corner of the right page. The time of entry recordings will be in columnar form down the left-hand side of the right page. If an entry is made in a non-dedicated log book, then the date, project name, and project number will be entered left to right, respectively, along the top of the right 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 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 on notebook loose leaf paper. The sample collection equipment (where appropriate), field analytical equipment, and equipment used to make physical measurements will be identified in the field log books. Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment will also be recorded, 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. Notes will be updated as field work progresses.

On a periodic basis (i.e., daily, weekly, etc.), or at the end of each field event, the pages that were filled out during that time will be scanned into PDF format. The resulting PDF files will then be uploaded to the project folder located on the office server.

The field notes will be submitted to the AECOM project manager for final cataloging and filing. The field notes will be stored in the Project File. Copies of specific sections will be made available to personnel upon request.

8.2 Standard Forms

All non-bound field records (e.g., drilling logs, well construction forms, sampling logs, etc.) 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 a USB flash drive, and/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. Examples of forms typically used are provided in Appendix B of this FAP.

On a periodic basis (i.e., daily, weekly, etc.), or at the end of each field event, the field forms that were completed during that time will be scanned into PDF format. The resulting PDF files will then be uploaded to the project folder located on the office server.

8.3 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
SW	Surface water
SD	Sediment
IA	Indoor air
OA (or AA)	Outdoor (or ambient) air
SV	Soil vapor
FB	Field (Rinsate) Blank
N + 50	Field Duplicate (e.g., field duplicate of MW-3S will be MW-53S)
TB	Trip Blank
MS/MSD	Matrix Spike/ Matrix Spike Duplicate

Field blanks and tip 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
MW-101D	Deep monitoring well MW-101D

SB-02-0406	Soil sample from 4 to 6 ft interval from boring SB-02.
SS-01	Surface soil sample from location SS-01.
FBW110502	Field blank associated with water samples collected on 5/2/11
TB110503	Trip blank associated with samples shipped 5/3/11.

8.4 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.

8.5 Sample Shipping

Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody procedures. Chain-of-custody procedures are essential for presentation of sample analytical chemistry results as evidence in litigation or at administrative hearings held by regulatory agencies. Chain-of-custody procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures should follow the chain-of-custody guidelines outlined in NEIC Policies and Procedures, prepared by the National Enforcement Investigations Center (NEIC) of the U.S. Environmental Protection Agency Office of Enforcement.

Procedure:

1. The chain-of-custody (COC) record (Appendix B) should be completely filled out, with all relevant information.
2. The original COC goes with the samples. It should be placed in a Ziploc bag and taped inside the sample cooler. The sampler should retain a copy of the COC.
3. Place inert cushioning material such as vermiculite or bubble-wrap in the bottom of the cooler.
4. Place the bottles in the cooler in such a way that they do not touch (use cardboard dividers or bubble-wrap).
5. Wrap VOA vials securely in bubble-wrap and tape. Place them in the center of the cooler.
6. With the exception of Summa® canisters, pack the cooler with ice in doubled Ziploc plastic bags.
7. Pack the cooler with cushioning material.
8. Tape the drain shut.
9. Wrap the cooler completely with strapping tape at two locations securing the lid. Do not cover any labels.

10. Place the lab address on top of cooler. For out-of-town laboratory, add the following: Put "This side up" labels on all four sides and "Fragile" labels on at least two sides. Affix numbered custody seals on front right and left of cooler. Cover seals with wide, clear tape.
11. Summa® canisters are shipped in the same boxes the laboratory used for shipping.
12. Ship samples via overnight carrier the same day that they are collected. Samples (except Summa® canisters) must be maintained at 4 degrees Celsius (C) ± 2ºC throughout the shipping duration.

9. References

American Society for Testing and Materials (ASTM) D1452/D1452M-16, *Standard Practice for Soil Exploration and Sampling by Auger Borings*

ASTM D2487-17 (2025). *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)*.

ASTM D2488-17 (2018). *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*.

ASTM D4750-87 (2001). *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*.

ASTM D5092/D5092M-16 (2024). *Standard Practice for Design and Installation of Groundwater Monitoring Wells*.

ASTM D5299// D5299/M-18 (2018). *Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.*

ASTM D6282/ D6282M-25 (2025). *Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations.*

Aztech Environmental Technologies (LaBella), 2020. Site Characterization Work Plan. March 3, 2020.

Aztech Environmental Technologies (LaBella), 2023. Supplemental Site Characterization Workplan. February 10, 2023.

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Cadwell, D.H., Connally, G.G., Dineen, R.J., Fleisher, P.J., Fuller, M.L., Sirkin, L., & Wiles, G.C. (1989). *Surficial Geologic Map of New York: Lower Hudson Sheet* (Map and Chart Series No. 40, scale 1:250,000). New York State Museum.

Environmental Assessment & Remediation, 2024. 338 Broadway Kingston, Ulster County NY Site ID 356058 -Site Characterization (SC) Addendum. August 30, 2024.

Fisher, D.W., Isachsen, Y.W., & Rickard, L.V. (1970). *Geologic Bedrock Map of New York: Lower Hudson Sheet* (Map and Chart Series No. 15, scale 1:250,000). The University of the State of New York, The State Education Department.

NYSDEC, 2011. DER-31 / *Green Remediation*, Issued August 11, 2010.

NYSDEC, 2010. DER-10 Technical Guidance for Site Investigation and Remediation. May 3, 2010.

United States Environmental Protection Agency (USEPA), 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final. USEPA Office of Emergency and Remedial Response. EPA/540/G-89/004. October.

USEPA, 1998. Region II Sampling SOP - Ground Water Sampling Procedure Low Stress (Low Flow) Purging and Sampling. March 16, 1998.

USEPA, 2002. Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers. OSWER. Douglas Yeskis and Bernard Zavala. EPA 542-S-02-001. May 2002.

USEPA, 2016. *Green Remediation Best Management Practices: Site Investigation and Environmental Monitoring.* Office of Land and Emergency Management EPA 542-F-16-002. September.

Figures

0 2000 4000

APPROXIMATE SCALE IN FEET
SCALE= 1:24000

BASEMAP SOURCES:

USGS 7.5-minute Series Topographic Map 2023
East Kingston, NY Quadrangle, Ulster Co. New York
USGS 7.5-minute Series Topographic Map 2023
West Kingston, NY Quadrangle, Ulster Co. New York

Title:	SITE LOCATION MAP
Location:	FORMER DRY CLEANER 338 BROADWAY KINGSTON, NEW YORK SITE ID: 356058
Client:	NYSDEC

AECOM

Drafter: CLS	Date: February 2026
Drg. Size: 8.5 x 11	Job No.: 60781325

FIGURE 1

D:\Kingston Walgreens\February 2026\Figure 1 Site Location NYSDEC SITE ID # 356058 February 2026.dwg User:carrie.szczeponski Feb 18, 2026 - 10:27am

LEGEND

- SITE BOUNDARY
- PROPOSED BORING LOCATIONS
- APPROXIMATE FOOTPRINT OF FORMER DRYCLEANING EQUIPMENT

NOTES

1. BORINGS MAY BE SUBJECT TO CHANGE BASED UPON FIELD CONDITIONS OR FINDINGS OF THE GEOPHYSICAL SURVEY.
2. ALL LOCATIONS AND SCALE ARE APPROXIMATE.

BASEMAP SOURCES:
ORTHOIMAGERY ACCESSED FROM GIS.NY.GOV ORTHOIMAGERY CLEARINGHOUSE. ORTHOIMAGERY DATED 2021.

0 30' 60'

1" = 30'

FORMER DRY CLEANER 338 BROADWAY NYSDEC SITE ID: 356058
334 BROADWAY, 338 BROADWAY, 15 JENSEN AVENUE AND 17 JENSEN AVENUE
Kingston, New York
Project No.: 60781325 Date: 2026-05-14

PROPOSED SOIL BORING LOCATIONS

AECOM

Figure: 2

Tables

Table 1
Soil Boring Overview
Field Activities Plan
338 Broadway, Kingston, NY (Site No. 356058)

Boring ID	Boring Type	Location	Purpose	Depth (ft)
SB-13	Direct Push	Exterior; South of 334 Broadway building	Collection of Soil Samples/Conversion to Monitoring Well	15*
SB-14	Direct Push	Interior; 338 Broadway building; South of footprint of possible former dry-cleaning equipment	Collection of Soil Samples/Conversion to Monitoring Well	15*
SB-15	Direct Push	Interior; 338 Broadway building; North of footprint of possible dry-cleaning equipment	Collection of Soil Samples/Conversion to Monitoring Well	15*
SB-16	Direct Push	Exterior; North of 334 Broadway building	Collection of Soil Samples/Conversion to Monitoring Well	15*

Notes:
*Depth is estimated

Table 2
Monitoring Well Sampling Plan
Field Activities Plan
338 Broadway, Kingston, NY (Site No. 356058)

Monitoring Well ID	Analytes								
	VOCs (8260D)	SVOCs (including 1,4-dioxane) (8270D/8270 SIM)	Metals (6010C)	Mercury (7470A)	Cyanide (9010)	PCBs (8082A)	Herbicides (8151A)	Pesticides (8081B)	PFAS (1633A)
MW-13	X								
MW-14	X								
MW-15	X								
MW-16	X								

Appendix A Scope Of Work

Schedule 1 - Scope of Work

AECOM Work Assignment No. D009803-63

338 Broadway Site, Kingston, Ulster County, NY

Site Characterization

Site No. 356058

Task 1: Preliminary Activities

This task includes the preparation of the budget estimate in Schedule 2.11 format, subcontractor procurement, the preparation of the cover letter, the development of this scope of work, the completion of the work assignment checklist, and the preparation of the M/WBE and SDVOB Utilization Plans. Additionally, this task includes review of site background information, file review, preparation of the project schedule, as well as preparation of a site-specific Field Activities Plan (FAP), site-specific Quality Assurance Project Plan (QAPP), and site-specific Health and Safety Plan (HASP). It also includes an on-site meeting (February 13, 2026) with the New York State Department of Environmental Conservation (NYSDEC) project manager (PM). After the site visit, AECOM prepared subcontractor scopes of work. This task includes administrative hours for the entire work assignment (WA). Green and Sustainable Remediation (GSR) principles, Best Management Practices (BMPs) and techniques will be implemented to the extent feasible in the performance of this work assignment as per NYSDEC's DER-31 Green Remediation guidance.

Task 2: Field Work/ Field Investigation

A draft Site Characterization Work Plan will be prepared for review by NYSDEC and the New York State Department of Health (NYSDOH). Comments from NYSDEC and NYSDOH will be addressed in a revised work plan to be approved prior to commencement of field activities. The FAP, QAPP, and HASP will be included as appendices to the Site Characterization Work Plan. NYSDEC will take on primary coordination responsibilities with the property owner(s) and arrange access agreements. At least two AECOM staff will be on-site during collection of soil and groundwater samples. The estimated duration of approximately one week to complete the field work assumes that there will be clear access to the sampling locations.

AECOM prepared subcontractor scopes of work for drilling activities to advance four (4) soil borings and convert these borings into four (4) temporary overburden groundwater monitoring wells as part of the site characterization work. This task also includes a geophysical survey for utility clearance, soil and groundwater sampling, transportation and off-site disposal of investigation-derived waste (IDW), and survey of site features, monitoring wells and sampling locations. The field work includes the following elements:

- Geophysical utility location services and soil boring clearance will be performed by an AECOM subcontractor;
- Soil borings will be advanced by an AECOM subcontractor to an estimated depth of approximately 15 feet below ground surface (bgs) and approximately 1 foot into the clay confining layer. Locations will be hand cleared to 5 feet bgs. Borings will be advanced using a direct push technology (DPT) drill rig (e.g., Geoprobe®). Soil samples will be visually described and classified, inspected for signs of contamination, and screened with a photoionization detector (PID) for the presence of organic vapors by the supervising AECOM geologist. Samples will be collected from Macro-Core® (MC5) soil samplers with 5-foot sections of Macro MC5 polyvinyl chloride (PVC) liners for off-site laboratory chemical analysis.
- Three soil samples will be collected from each of the four soil boring locations; one from the shallow subsurface (0-2 feet bgs), one from the top of saturated zone (approximately 8 feet bgs) and one at the confining layer (approximately 14 feet bgs), for a total of twelve soil samples. Sample intervals may be adjusted in consultation with NYSDEC PM based upon field conditions and/or elevated PID

readings of screened soils (if encountered). Soil samples will be analyzed for Total Compound List (TCL) Volatile Organic Compounds (VOCs) by EPA Method 8260D (via a NYSDEC Call out laboratory).

- The four soil borings will be converted to temporary monitoring well sampling points. The temporary monitoring wells will be constructed with 10-feet of 1-inch ID #10 slot PVC screen (straddling the water table) attached to a 1-inch ID, Schedule 40 PVC riser to the ground surface and a PVC bottom plug. Based upon previous subsurface investigations performed at the Site, bedrock is not anticipated to be encountered at the target depth of approximately 15 feet bgs. However, if bedrock is encountered, drilling will cease, and the well shall be screened at a depth that straddles the water table above the bedrock interface, as directed by the AECOM geologist. A #1 size sand pack will be installed from the bottom of the well screen up to 2 feet above the top of each of the well screens. A minimum 2-feet thick bentonite seal will be installed above the sand pack, hydrated and allowed to sit for 30 minutes prior to the placement of the cement/bentonite grout (neat cement). The grout will be placed from above the bentonite seal to an elevation of 1-foot below grade via a tremie pipe. Each well shall be equipped with a locking expandable plug (J-plug) and lock.
- Each new well will be developed by pumping until the discharged water is relatively sediment free [<10 Nephelometric Turbidity Units (NTU) if possible] and the indicator parameters (pH, temperature, and specific conductivity) have reached steady state.
- Prior to collecting groundwater samples, a comprehensive round of water levels will be collected from the new monitoring wells. If non-aqueous phase liquid (NAPL) is encountered in a monitoring well, groundwater will not be sampled. NAPL depth and thickness will be measured and documented, and the finding will be promptly communicated to the NYSDEC Project Manager to determine next steps.
- Groundwater samples will be collected from the newly installed temporary monitoring wells using low-flow sampling procedures. Groundwater samples will be analyzed for TCL VOCs by EPA Method 8260D via a NYSDEC call-out laboratory.
- Soil spoils, decontamination fluids, well development and purge water are assumed to be non-hazardous and will be contained in New York State Department of Transportation (NYSDOT) approved 55-gallon drums for off-site disposal. The drums will be staged in a secure location on site until transport and disposal are arranged by a licensed hauler subcontracted by AECOM.
- One solid and one aqueous sample will be collected for disposal parameters as required by the disposal facility to complete the waste profiles for the IDW transportation and off-site disposal.
- The laboratory analyses will be performed by a NYSDEC call-out laboratory. The proposed sampling program is presented in Table 1 below.
- A limited data validation (Stage 2B) will be performed and a Data Usability Summary Report (DUSR) for each matrix will be prepared following the guidelines provided in NYSDEC DER-10, Appendix 2B, Guidance for Data Deliverables and the Development of Data Usability Summary Reports, May 2010. Data validation will be performed by a qualified AECOM chemist independent of the data collection activities.
- Location and elevation survey of the borings and monitoring wells will be performed by an AECOM subcontractor.

Task 3: Site Characterization Report

The Site Characterization Report will be submitted as a draft report within 90 days after fieldwork has been completed and data have been received and validated. A final version of the report will be submitted within two weeks after the Department's comments on the draft report are received by AECOM. The report for this task will include the following:

- A description of field activities conducted by AECOM;
- A summary of previous investigations;

- A site location map;
- Figure(s) depicting the site layout soil borings, monitoring wells, and key site features;
- Figures depicting sample locations and New York State (NYS) standards, criteria, guidance (SCG) non-compliance values from the soil and groundwater data collected during site work;
- A discussion of analytical results;
- Tables and figures depicting groundwater elevation and NAPL contours, and NAPL thickness (as applicable);
- Data summary tables of detected compounds with NYS SCGs listed, and non-compliance values highlighted;
- Field notes and/or daily activity logs;
- Photographs taken at the site during field activities;
- Soil boring logs;
- Monitoring well construction logs;
- Monitoring well development logs with water quality measurements;
- Monitoring well purge logs with water quality measurements;
- Manifests and/or bills of lading signed by the disposal facility documenting the proper disposal of IDW;
- Survey field notes and site sketches;
- DUSR (including Form 1s) containing only data from the current field work; and
- Conceptual Site Model and Site Characterization Assessment.

This task includes EQuIS submittals to the NYSDEC for analytical data from samples collected by AECOM during the investigation.

Subcontractor Procurement Details

Utility Clearance/Geophysical Survey

Quotes were received from three geophysical survey subcontractors: Advanced Geophysical Services, LLC., Enviroprobe Service, Inc, and Hager-Richter Geoscience. Radar Solutions, Inc. (WBE) and GPRS, Inc. were non-responsive. Enviroprobe Service, Inc was selected as the low bidder for the geophysical services at $2,050.

Drilling Services

Quotes were received from five potential drilling subcontractors: Atlantic Testing Laboratories (WBE), Cascade (ADT) Drilling, Summit Drilling, LLC, Core-Down Drilling, Inc., and MB Drilling, LLC. LaBella Associates and Eastern Environmental Solutions (SDVOB) were non-responsive. Cascade (ADT) Drilling was selected as the low bidder for the drilling services at $9,126.

Land Survey Services

Quotes were received from three land surveying subcontractors: Ravi Engineering and Land Surveying, PC (MBE), MJ Engineering, Architecture, Landscape Architecture, and Land Surveying, P.C., and Naik Consulting Group, PC. Popli Design Group (MBE) and C.T. Male Associates were non-responsive. MJ Engineering, Architecture, Landscape Architecture, and Land Surveying, P.C. was selected as the low bidder for the land survey services at $4,500.

IDW

Quotes were received from three IDW disposal subcontractors: Island Pump and Tank, LLC, Arcwood Environmental, Inc., and Miller Environmental Group, Inc. Clean Management Group, Inc. and Clean Harbors, Inc. were non-responsive, and Momentum Environmental Services, LLC and AARCO Environmental Services Inc. declined to bid. Island Pump and Tank, LLC was selected as the low bidder for the IDW disposal services at $2,241.

Anticipated Schedule

This WA will be performed according to the following anticipated time frames:

Activity	Days after NTP	Date
AECOM Notice to Proceed (NTP)	0	January 23, 2026
Submit Budget Package to NYSDEC	63	March 27, 2026
NYSDEC approval of 2.11 Package	84	April 17, 2026
Task 2: Field Work/Field Investigation Start	125	May 28, 2026
Task 2: Field Work/Field Investigation End	139	June 11, 2026
Task 3: Site Characterization Report Draft	229	September 23, 2026
Or 90 days after data deliverables received from laboratory.		
Task 3: Site Characterization Report Final	276	October 26, 2026
Or 2 weeks after comments received from NYSDECD		

TABLE 1
AECOM Work Assignment (WA) D009803-63
338 Broadway
Site Characterization
Site No. 356058
SAMPLE ANALYTICAL PROGRAM

Analytical Methods	Samples	Quality Control Samples						Total Number of Samples
		Field Duplicate	Matrix Spike	Matrix Spike Duplicate	Equipment/ Rinse Blank	Field Blank	Trip Blank	
Soil Samples								
VOCs via 8260D	12	1	1	1	1	0	1	17
Groundwater Samples								
VOCs via 8260D	4	1	1	1	0	0	1	8
Waste Characterization (IDW)								
Full TCLP	2	0	0	0	0	0	0	2
Ignitability	2	0	0	0	0	0	0	2
Corrosivity	2	0	0	0	0	0	0	2
Reactivity	2	0	0	0	0	0	0	2

Appendix B Field Activity Forms

AECOM

DAILY DRILLING RECORD

PROJECT TITLE: _____ DATE: _____

CLIENT: _____ CONTRACTOR: _____

FROM	TO	PRODUCTIVE HOURS	ACTIVITIES/COMMENTS
TOTAL PRODUCTIVE HOURS			LEVEL B / LEVEL C / LEVEL D (CIRCLE ONE SELCTION)

LABOR:		MATERIALS / SUPPLIES:	
UNITS		UNITS	

WEATHER:

_____ AECOM ONSITE COORDINATOR	_____ CONTRACTOR REPRESENTATIVE

AECOM

WELL DEVELOPMENT LOG

PROJECT TITLE: _____ WELL NO.: _____

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)	=	0.0	3"	0.38
4. VOLUME OF WATER/FOOT OF CASING (GAL.)	=	0.02	4"	0.66
5. VOLUME OF WATER IN CASING (GAL.)(#3 x #4)	=	0.0	5"	1.04
6. VOLUME OF WATER TO REMOVE (GAL.)(#5 x ___)	=	0	6"	1.50
7. VOLUME OF WATER ACTUALLY REMOVED (GAL.)	=		0.75"	0.02

OR

$V=0.0408 \times (\text{CASING DIAMETER})^2$

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
pH											
SPEC. COND. (umhos)											
APPEARANCE											
TEMPERATURE (°C)											

COMMENTS:

AECOM

WELL PURGING LOG

PROJECT TITLE: _____ WELL NO.: _____

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)	=	0.00	3"	0.38
4. VOLUME OF WATER/FOOT OF CASING (GAL.)	=	0.17	4"	0.66
5. VOLUME OF WATER IN CASING (GAL.)(#3 x #4)	=	0.00	5"	1.04
6. VOLUME OF WATER TO REMOVE (GAL.)(#5 x 3)	=	0.00	6"	1.50
7. VOLUME OF WATER ACTUALLY REMOVED (GAL.)	=		8"	2.60

OR

$V=0.0408 \times (\text{CASING DIAMETER})^2$

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)										
pH											
SPEC. COND. (umhos)											
APPEARANCE											
TEMPERATURE (°C)											

COMMENTS:

AECOM

LOW FLOW GROUNDWATER PURGING/SAMPLING LOG

PROJECT TITLE: _____ WELL ID: _____

CLIENT: _____ SAMPLING PERSONNEL: _____

DATE: _____

Purging/ Sampling Device: _____ Tubing Type: _____ Pump/Tubing Inlet Location: _____

Measuring Point: _____ Initial Depth to Water: _____ Depth to Well Bottom: _____ 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 (^{0}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	---	

Remarks:

AECOM

TEST BORING LOG

									BORING NO:
PROJECT:									SHEET: 1 of 1
CLIENT:									JOB NO.:
BORING CONTRACTOR:									BORING LOCATION:
GROUNDWATER:					CAS.	SAMPLER	CORE	TUBE	GROUND ELEVATION:
DATE	TIME	LEVEL	TYPE	TYPE		Macrocore			DATE STARTED:
				DIA.		2"			DATE FINISHED:
				WT.		--			DRILLER:
				FALL		--			GEOLOGIST:
				* POCKET PENETROMETER READING					REVIEWED BY:

DEPTH	SAMPLE					DESCRIPTION				REMARKS	
				BLOWS	REC%		CONSIST	MATERIAL			
FEET	STRATA	NO.	TYPE	PER 6"	ROD%	COLOR	HARD	DESCRIPTION	USCS	PID	Moist
5											
10											
15											
20											
25											
30											

COMMENTS:	PROJECT NO.
	BORING NO.

AECOM

TEST BORING LOG

									BORING NO:
PROJECT:									SHEET: 1 of 1
CLIENT:									JOB NO.:
BORING CONTRACTOR:									BORING LOCATION:
GROUNDWATER:					CAS.	SAMPLER	CORE	TUBE	GROUND ELEVATION:
DATE	TIME	LEVEL	TYPE	TYPE					DATE STARTED:
				DIA.					DATE FINISHED:
				WT.					DRILLER:
				FALL					GEOLOGIST:
				* POCKET PENETROMETER READING					REVIEWED BY:

DEPTH FEET	SAMPLE TIME	NO.	TYPE	BLOWS PER 6"		ROD%	DESCRIPTION COLOR	CONSISTENCY HARDNESS	MATERIAL DESCRIPTION	REMARKS
5										
10										
15										
20										
25										
30										

COMMENTS:	PROJECT NO.
	BORING NO.

AECOM

TEST BORING LOG

									BORING NO:
PROJECT:									SHEET: 2 of 2
CLIENT:									JOB NO.:
BORING CONTRACTOR:									BORING LOCATION:
GROUNDWATER:					CAS.	SAMPLER	CORE	TUBE	GROUND ELEVATION:
DATE	TIME	LEVEL	TYPE	TYPE					DATE STARTED:
				DIA.					DATE FINISHED:
				WT.					DRILLER:
				FALL					GEOLOGIST:
				* POCKET PENETROMETER READING					REVIEWED BY:

DEPTH FEET	SAMPLE TIME	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6"		ROD%	DESCRIPTION COLOR	DESCRIPTION CONSISTENCY HARDNESS	DESCRIPTION MATERIAL DESCRIPTION	REMARKS

COMMENTS:	PROJECT NO.
	BORING NO.

AECOM

MONITORING WELL CONSTRUCTION DETAILS

PROJECT: _____ WELL ID: _____

CLIENT: _____ DATE: _____

DRILLING SUMMARY

Geologist:

Drilling Company:

Driller:

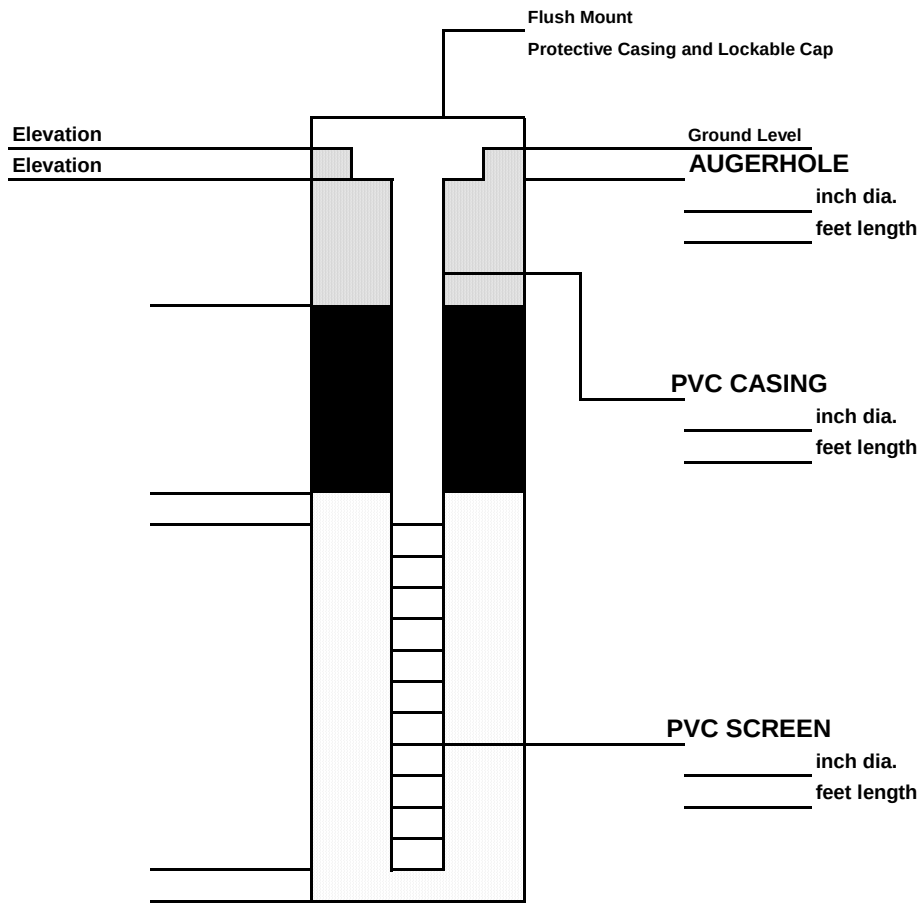
Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description

DEPTH



WELL DESIGN

CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface: Steel grade box	**Type:** 4" PVC	**Type:** #2 Sand **Setting:**
Monitor: 4" PVC	**Slot Size:** .020"	***SEAL MATERIAL***
		Type: Bentonite **Setting:**

COMMENTS:

LEGEND

- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

MONITORING WELL CONSTRUCTION DETAILS

AECOM

PROJECT: _____ WELL ID: _____

CLIENT: _____ DATE: _____

DRILLING SUMMARY

Geologist:

Contractor:

Operator:

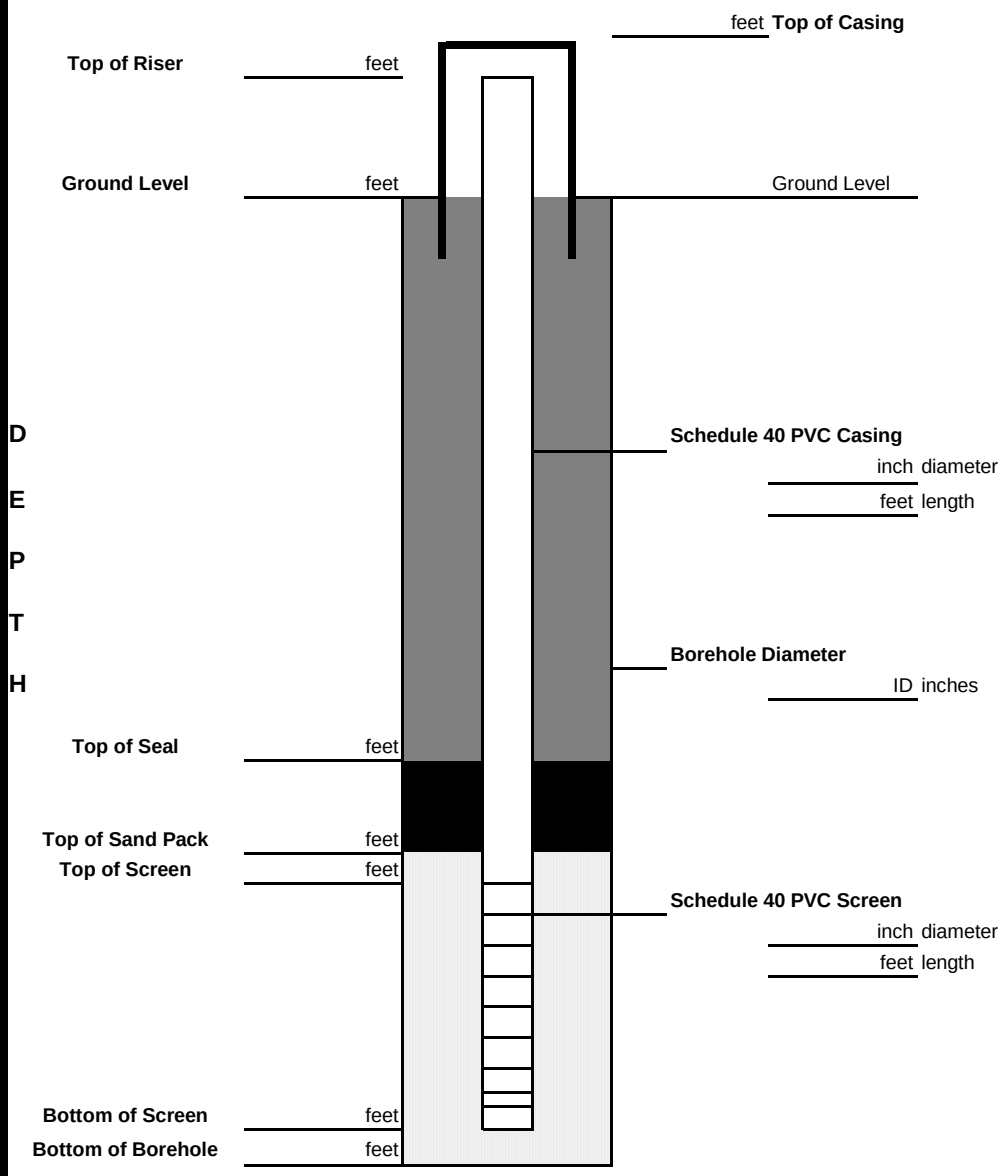
Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description

WELL DESIGN



CASING MATERIAL	SCREEN MATERIAL	FILTER MATERIAL
Surface: 12" Steel protective cover (Stick Up)	**Type:** 4" Schedule 40 PVC	**Type:** #2 well sand **Setting:**
Monitor: 4" Schedule 40 PVC	**Slot Size:** 0.020"	**SEAL MATERIAL** **Type 1:** Bentonite chips **Setting:** **Type 1:** **Setting:**

COMMENTS:

LEGEND

- Cement Grout
- Bentonite Seal
- Sand Pack

PIEZOMETER CONSTRUCTION DETAILS

PROJECT: _____ WELL ID: _____

CLIENT: _____ DATE: _____

DRILLING SUMMARY

Geologist:

Contractor:

Operator:

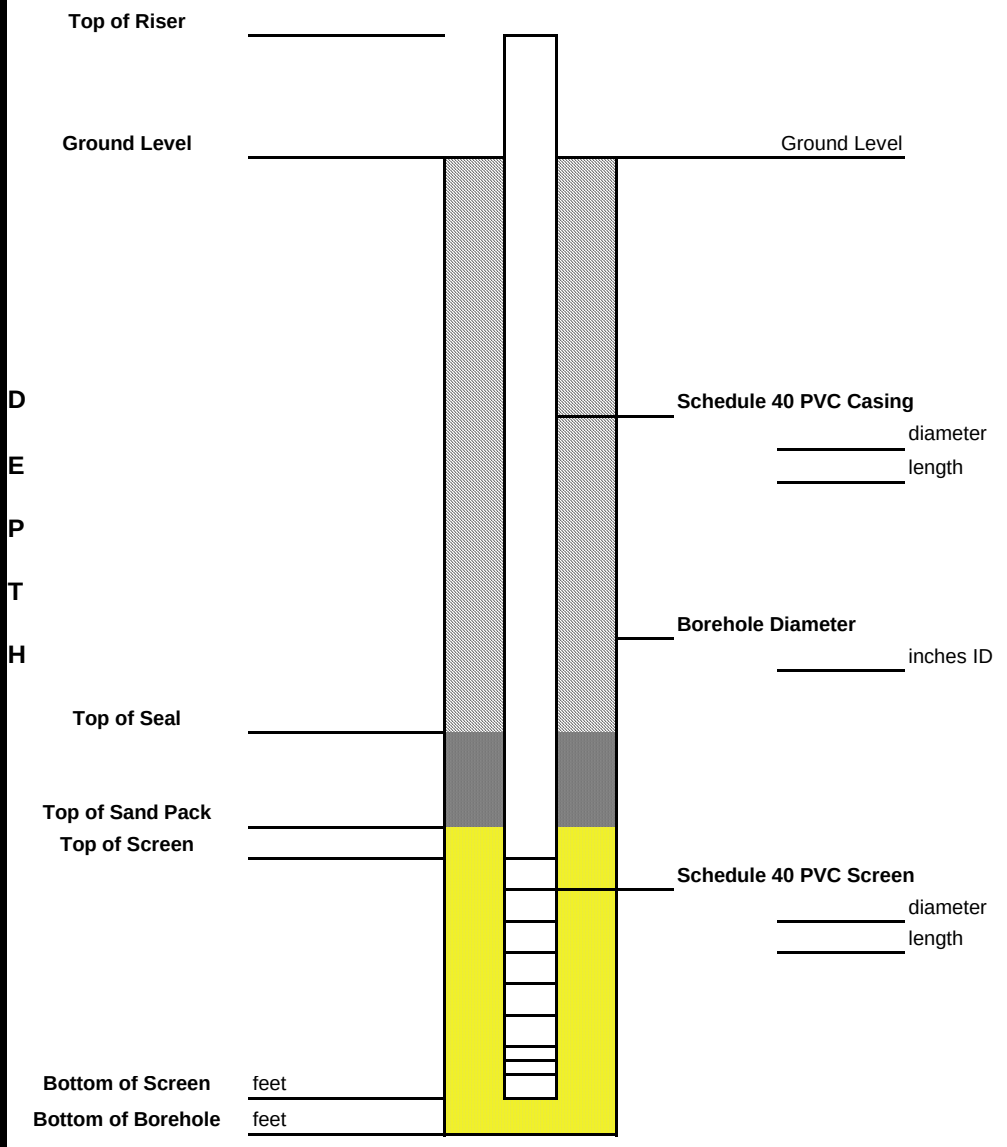
Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description

WELL DESIGN



CASING MATERIAL	SCREEN MATERIAL	FILTER MATERIAL
Surface:	**Type:** 1" Schedule 40 PVC	**Type:** **Setting:**
Monitor:	**Slot Size:**	**SEAL MATERIAL** **Type 1:** **Setting:** **Type 2:** **Setting:**

COMMENTS:

LEGEND

- Cement Grout
- Bentonite Seal
- Sand Pack

AECOM

BEDROCK MONITORING WELL CONSTRUCTION DETAILS

PROJECT: _____ WELL ID: _____

CLIENT: _____ DATE: _____

DRILLING SUMMARY

Geologist:

Drilling Company:

Driller:

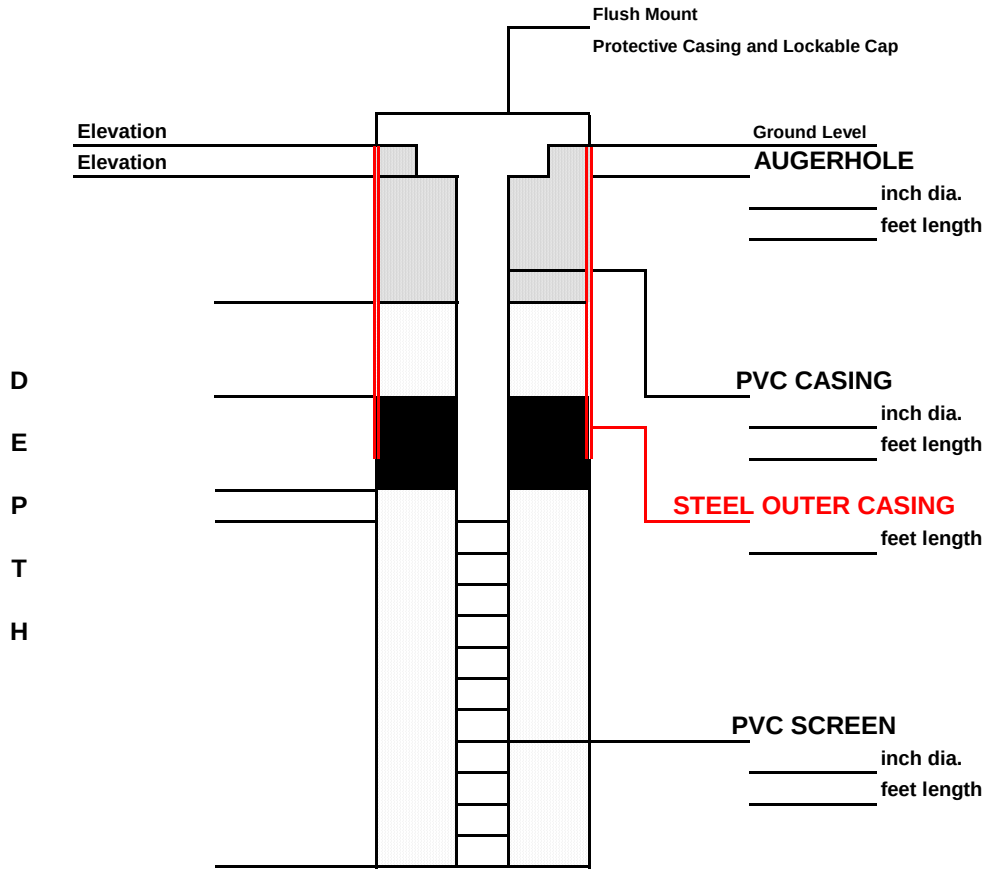
Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description
	See boring log for lithologic description.

WELL DESIGN



CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface:	**Type:**	**Type:** **Setting:**
Monitor:	**Slot Size:**	***SEAL MATERIAL***
		Type: Bentonite **Setting:**

COMMENTS:

LEGEND

- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

SOIL VAPOR IMPLANT CONSTRUCTION DETAILS

AECOM

PROJECT: _____ VAPOR IMPLANT ID: _____

CLIENT: _____ DATE: _____

DRILLING SUMMARY

Geologist:

Drilling Company:

Driller:

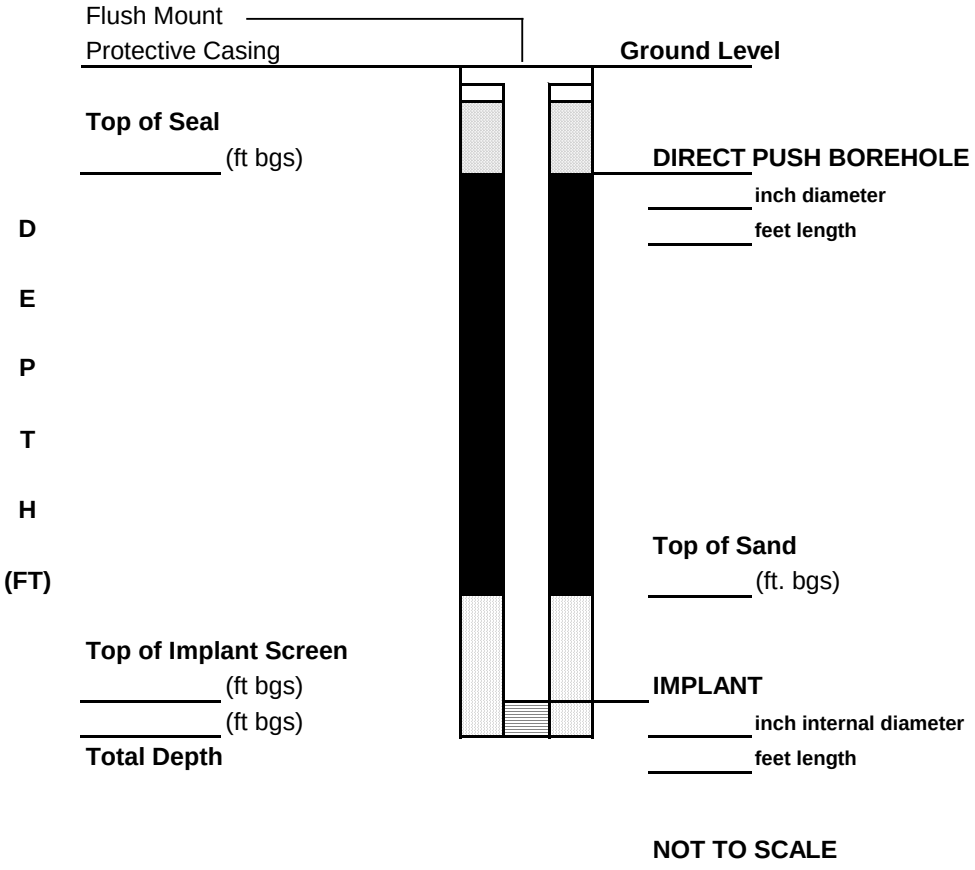
Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description

WELL DESIGN



CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface:	**Type:**	**Type**
		SEAL MATERIAL
Riser:	**Pore Diameter:**	**Type:**

COMMENTS:

LEGEND

- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

AECOM

SUMMA CANISTER SAMPLING FIELD SHEET

PROJECT: _____ DATE: _____

CLIENT: _____

Sample #					
Location					
Summa Canister ID					
Flow Controller ID					
Additional Tubing Added					
Purge Time (Start)					
Purge Time (Stop)					
Total Purge Time (min)					
Purge Volume (L)					
PID Test of Purge Air (ppm)					
Initial Tracer Gas Results (ppm)					
Pressure Gauge - before sampling					
Sample Time (Start)					
Sample Time (Stop)					
Total Sample Time (min)					
Pressure Gauge - after sampling					
Sample Volume (L)					
Canister Pressure Went To Ambient Pressure?					
Associated Ambient Air Sample Number					
General Comments:					

AECOM

TEST PIT LOG

PROJECT:			Sheet 1 of 1
CLIENT:	NYSDEC	**JOB NUMBER:**	
CONTRACTOR:		**LOCATION:**	
DATE STARTED:		**GROUND ELEVATION:**	
DATE COMPLETED:		**OPERATOR:**	
TRENCH NUMBER:		**GEOLOGIST:**	

DEPTH (FT)	DESCRIPTION
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

COMMENTS:

AECOM

DAILY CONSTRUCTION REPORT

PROJECT: _____

PROJECT NO: _____

PROJECT MANAGER: _____

CONTRACTOR: _____

DATE: _____

REPORT NO: _____

DAY	S	M	T	W	TH	F	S
WEATHER	Bright Sun		Clear	Overcast		Rain	Snow
TEMP	To 32		32-50	50-70		70-85	85 and up
WIND	Still		Moder	High		Report No.	
HUMIDITY	Dry		Moder	Humid			

AVERAGE FIELD FORCE

Name of Contractor	Non-manual	Manual	Remarks

VISITORS

Time	Representing	Representing	Remarks

EQUIPMENT AT THE SITE:

CONSTRUCTION ACTIVITIES:

See attached photos

☐ X - designates info on backside of page

By: _____ Title: _____

Reviewed by: _____ Title: _____

DAILY CONSTRUCTION REPORT (CONT'D)

AECOM

PROJECT: _____

PROJECT NO: _____

PROJECT MANAGER: _____

CONTRACTOR: _____

DATE: _____

REPORT NO: _____

CONSTRUCTION ACTIVITIES (cont'd):

By: Title:

Reviewed by: Title:

Appendix C– QAPP

Quality Assurance Project Plan

338 Broadway, Kingston, NY (Site No. 356058)

New York State Department of Environmental Conservation

Project number: 60781325

May 2026

Prepared for:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233

Prepared by:

AECOM
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Latham, NY 12110
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Table 1 Sample Bottle, Volume, Preservation, and Holding Time Summary
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Appendices

Appendix A Pace Analytical ELAP Certification

Acronyms and Abbreviations

ASP	Analytical Services Protocol
°C	degrees Celsius
CLP	Contract Laboratory Program
COC	chain of custody
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
FAP	Field Activities Plan
FD	field duplicate
HDPE	high density polyethylene
IDL	instrument detection limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MD	matrix duplicate
MDL	method detection limit
mg/L	milligrams per liter
mg/kg	milligrams per kilograms
MS	matrix spike
MSB	matrix spike blank
MSD	matrix spike duplicate
NEIC	National Enforcement Investigations Center
ng/L	nanograms per liter
NIST	National Institute of Standards and Technology
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
PCB	polychlorinated biphenyl
PFAS	Per- and polyfluoroalkyl substances (PFAS)
ppbv	parts per billion by volume
PQO	Project Quality Objective
PTFE	polytetrafluoroethylene
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	relative percent difference
RL	Reporting Limit
µg/kg	micrograms per kilograms
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
USEPA	United States Environmental Protection Agency

1. Introduction

AECOM USA, Inc. (AECOM) has prepared this Quality Assurance Project Plan (QAPP) for Site No. 356058 located at 338 Broadway, Kingston, Ulster County, New York (**Figure 1**). This work was performed for the New York State Department of Environmental Conservation (NYSDEC) under Contract D009803 Work Assignment (WA)-63.

1.1 Purpose and Objective

Project work will be conducted in general accordance with the NYSDEC Division of Environmental Remediation (DER)-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010a), DER's Spill Response Guidance Manual, as applicable, technical requirements in Contract D009803 between NYSDEC and AECOM (NYSDEC and AECOM, 2019), and United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988).

The QAPP is intended to be a companion document to the site-specific Work Plan prepared for each work assignment. A QAPP Addendum will be prepared as an Appendix included in the site-specific Work Plan for each Work Assignment, as needed to address site-specific conditions and project-specific requirements.

1.2 Project Management and Organization

1.2.1 Personnel

The general responsibilities of key project personnel are listed below.

Program Manager – Michael L. Spera, PE will have responsibility for overall program management and coordination of AECOM personnel and subcontractors to complete the work.

Project Manager – Abdiel López Torres, PG (AECOM) will have responsibility for overall project management and coordination with NYSDEC, and will coordinate the initiation and implementation of the work assignment activities. The AECOM Project Manager will serve as the initial and primary contact with NYSDEC throughout the project, and will be responsible for successful implementation of the project's QA/QC activities. The AECOM Project Manager may delegate a portion of the tasks required for successful implementation of the project to a qualified individual, the Site Manager, who will be on site during field activities (i.e., investigations, remedial action, operation and maintenance activities, etc.). The Site Manager will work under the direction of the AECOM Project Manager, and will be responsible for implementing applicable QC procedures in the field and verifying that all other AECOM field personnel adhere to these procedures and perform all activities as described in the project work plans.

Task Leaders/Field Team Leaders – Julie Healy (AECOM), will share the responsibility of implementing and coordinating the field and office project activities.

Program QA Officer – Robert Montione (AECOM) will serve as the Program Quality Assurance Officer (QAO) for work assignments issued under this contract. 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 AECOM database manager to assure that electronic deliverables provided by the laboratory are accurate and are formatted consistent with AECOM and NYSDEC requirements. The Program QAO may designate another qualified individual to serve as project QA officer to oversee the data-to-day quality assurance aspects of specific work assignments.

Project QA Officer – Robert Montione (AECOM), the AECOM Project QA Officer is responsible for verifying that the analytical laboratories adhere to the QA/QC requirements specified in this Site Specific QAPP and the requirements identified in the site-specific addendum to this Site Specific QAPP. The AECOM QA Officer will be the point of contact for the Laboratory's Project Manager and will personally communicate with the Laboratory's Project Manager to verify that all sample analyses are being performed such that the resulting data will be of sufficient quality for its intended purpose.

H & S Officer – Caroline Lee (AECOM) will be responsible for oversight of the preparation of the project health and safety plan, approving it, and tracking of its implementation.

Database Manager – Angela Toma-Eisele (AECOM), or an assigned qualified individual, 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.

Resumes for AECOM personnel have previously been submitted to the Bureau of Program Management. Resumes of individuals which have not been previously submitted to the NYSDEC and/or resumes of third-party data validator(s) (e.g., project specific) will be included in the site specific QAPP addendum.

1.2.2 Specific Tasks and Services

AECOM has obtained the following subcontractor specialist for services relating to laboratory/analytical services.

Laboratory Analysis – Pace Analytical Services, LLC (Pace) is the laboratory that has been assigned for the project, selected from a call-out list and subcontracted by NYSDEC. Pace is certified for aqueous and non-aqueous matrices.

All laboratories to be used for the work assignment shall hold applicable New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certifications for the analyses to be performed. Copies of the applicable ELAP certifications for each laboratory to be used during the work assignment are provided in Appendix B of this Site Specific QAPP. Each laboratory maintains its own QA/QC program and employs the required staff to implement this program. The QA Officer for each laboratory is responsible for verifying that all sample analyses are performed in accordance the analytical methods, laboratory QA/QC procedures, this Site Specific QAPP and the site-specific QAPP addendum.

AECOM will be performing the services relating to data validation as described below.

Data Validation – An AECOM data validator not associated with data collection or any other tasks will be assigned for data quality review and Data Usability Summary Report (DUSR) preparation. Data validation is performed to establish the data quality for all data which are to be considered when making project decisions.

Resumes for AECOM personnel have previously been submitted to the Bureau of Program Management. Resumes of individuals which have not been previously submitted to the NYSDEC and/or resumes of third-party data validator(s) (e.g., project specific) will be included in the site specific QAPP addendum.

1.3 Site Description and Location

Background data on the site, including the site description and location, site history, previous investigations of the surrounding area, and current conditions, are summarized in the site-specific

Work Plan (WP) and the site-specific Field Activities Plan (FAP). A site map showing proposed sampling locations is included in both.

2. Site Investigation

Site investigation procedures are provided below.

2.1 Field Sampling Procedures

Field activities are detailed in the FAP and are not repeated in the QAPP. Proposed sampling procedures to be utilized will be identified in the site-specific FAP.

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 FAP.

The procedures discussed here are general and will be superseded by project-specific requirements (as documented in the FAP). However, these procedures are provided for guidance in developing those plans.

Field equipment rinsate blanks (see Section 4.3.1) are generated and analyzed to monitor the effectiveness of field decontamination procedures.

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

2.2.1 Decontamination Procedures

As indicated in the FAP, a decontamination pad will be constructed on the site. The pad will be appropriately sized and 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 will be accomplished using the following procedures:

- Liquinox (or equivalent) and potable water wash;
- Potable water rinse; and
- Distilled/deionized water rinse.

Solvents will not be used in the field decontamination of such equipment. Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g., Liquinox) 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.

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.

Electric submersible pumps (such as a Grundfos Redi-Flow II) will be decontaminated using the above steps followed by running a large volume (several gallons) of potable water through the pump, followed by an analyte-free water rinse.

Tubing will not be re-used (new tubing will be used for each well). Submersible pumps and supporting lines and cables will be placed in a large clean plastic garbage can filled with potable

water and then run for several minutes (to decontaminate both exterior and interior parts); submersible pumps will also be given a final analyte-free water rinse of both interior and exterior parts.

If bladder pumps are used, the pump will be disassembled and cleaned after each use. A new bladder will be used for each sample. Small parts, such as screens and gaskets will be replaced after each use. Dedicated air line tubing and sample tubing will be used at each monitoring well. The pump will be cleaned using the following steps:

- Liquinox (or equivalent) and potable water wash;
- Potable water rinse;
- Distilled/deionized water rinse;
- Solvent (reagent or pesticide grade) rinse if samples are collected for organic analysis;
- Dilute (10%) nitric acid rinse if samples are collected for metals analysis; and
- Distilled/deionized rinse, air dry.

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 and disposal.

2.2.4 Personnel Decontamination

Wash buckets and potable water will be set up at the decontamination pad. This includes washing hands and a boot wash. Details of the personnel decontamination procedures will be provided in the HASP.

3. Sampling Handling

3.1 Sample Identification and Labelling

Samples will be assigned a unique identification using the sample location or other sample-specific identifier. Sample identification and labeling requirements are presented in FAP Section 8 and are not repeated here.

The procedures discussed here are general and will be superseded by project-specific requirements (as documented in the FAP). However, these procedures are provided for guidance in developing those plans. Sample identification may be limited to a specific number of alphanumeric characters to be consistent with the limitations of the laboratory tracking/reporting software. The general sample identification format follows (other designations may be used to accommodate the requirements of specific projects). It should be noted that the field sample IDs shown below are not those required for the EQuIS deliverable; AECOM will coordinate with the analytical laboratory so that the sample types and codes are entered properly for each field and QC sample, and that the codes are consistent with the most recent NYSDEC Valid Values.

MW = Monitoring Well

SB = Soil boring

SW = Surface Water

SD = Sediment

IA = Indoor Air

OA (or AA) = Outdoor (or ambient) air

SV = Soil Vapor

FB = Field (Equipment Rinsate) Blank

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 the same system as the original by adding 50 to the original well ID (e.g., MW-51S_052411 would be a field duplicate of MW-01S_052411). 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 name;
- Date and time;
- Sampler's name;
- Preservative;
- Type of sample (e.g., water, soil, sludge, sediment, air); and
- Requested analyses.

3.2 Sample Bottles, Preservation, and Holding Times

Table 1 identifies the sample preparation and analytical method, matrix, holding time, containers, and preservatives for the typical analyses to be performed under this contract. 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. Soil samples for VOC analysis will be collected in TerraCore® samplers and transferred to glass containers, and soil samples for Metals, cyanide, mercury, PCBs, pesticides and herbicides will be collected in glass jars.

3.2.2 Sample Preservation

Samples will be preserved as indicated below and summarized on Table 1.

Aqueous Samples:

- Volatile organics – cooled to 4º C; HCl added to pH ≤ 2.

Non-Aqueous (e.g., soil and sediment) Samples:

- VOC soil samples – collected in VOA vials with H2O, frozen to -10°C
- Mercury & Cyanide – cooled to ≤6 °C, no chemical preservation.

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

Holding times (see Table 1) are calculated from the time of sample collection; samples will be shipped via overnight delivery service from the field to arrive at the lab no later than 48 hours from the time of sample collection except for instances with shorter holding time parameters. Holding time requirements will be those specified in the analytical method.

Although trip blanks are prepared in the analytical laboratory and shipped to the site with VOC vials 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.

3.2.4 Sample Custody

Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody (COC) procedures. Chain-of-custody procedures are essential for presenting sample analytical results as evidence in litigation or at administrative hearings held by regulatory agencies. Chain-of-custody procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures used in this work assignment will follow the COC guidelines of National Enforcement Investigations Center (NEIC) Policies and Procedures, prepared by the NEIC of the USEPA Office of Enforcement.

Custody Definitions

Chain-of-Custody Officer - The employee responsible for oversight of all COC activities is the Project Manager (or his/her designee).

Under Custody - A sample is “Under Custody” if:

- It is in one's possession, or
- It is in one's view, after being in one's possession, or
- It was in one's possession, and one placed it under lock, or
- It is in a designated secure area.

Responsibilities

The Project Manager will be responsible for monitoring all COC activities and for collecting legally admissible COC documentation for the permanent project file, and will perform the following tasks:

- Review sample labels or tags, closure tapes, and COC records.
- Train all field sampling personnel in the methodologies for carrying out COC activities and the proper use of all COC and record documents.
- Monitor the implementation of COC procedures.
- Submit copies of the completed COC records to the Project Chemist.

A COC form will trace the path of sample containers from the project site to the laboratory. Chain-of-custody forms are typically provided by the analytical laboratory.

Sample bottle tracking sheets or the chain-of-custody 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 custody 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.

3.3 Laboratory Sample Receipt

Upon receipt at the laboratory, a laboratory representative inspects the samples for integrity and checks the shipment against the COC/analytical task order form. Discrepancies are addressed at this point and documented on the COC form and the cooler checklist (an example will be provided in each of the project-specific Field Sampling and Analysis Plans). Discrepancies are reported to the Laboratory Project Manager who contacts the AECOM Project Manager or QAO for resolution.

When the shipment and the COC are in agreement, the laboratory sample 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.

3.3.1 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)
- Transfers of samples in and out of storage are documented.

3.3.2 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. Data Quality Requirements

4.1 Analytical Methods

Soil and water sample analyses for this contract will typically utilize USEPA SW-846 methods as listed below.

Analytical and extraction/sample preparation methods typically used are shown on Table 1 and summarized below.

Site Characterization Analysis

- Volatile Organics - SW-846 Method 8260D

Waste Characterization Analysis

- Full Toxicity Characteristic Leaching Procedure (TCLP) – Method SW-846 8151
- Ignitability – SW 846 Method 1110
- Corrosivity – SW 846 Method 1030
- Reactivity – Total Cyanide SW-846 Method 9014; Total Sulfide SM4500S-F (aqueous), Method 9030 (soil)

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 for all samples listed under Site Characterization Analysis. Full Category A deliverables will be required for all samples listed under Waste Characterization Analysis.

NYSDEC has assigned Pace Laboratories to this project, and is certified by the NYSDOH Environmental Laboratory Approved Program (see Section 1.2). The laboratory is in good standing for the applicable parameter groups.

4.2 Quality Assurance Objectives

Data quality objectives (DQOs) 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.

Project quality objectives (PQOs), such as those described in the *Uniform Federal Policy for Quality Assurance Project Plans* (USEPA, 2005), define the type, quantity, and quality of data that are needed to answer specific environmental questions and support proper environmental decisions.

More specifically, the PQOs:

- Define the environmental problem;
- Identify target analytes/contaminants of concern and concentration levels;
- Establish the analytical techniques to be used (field-screening, on-site, and/or off-site);
- Establish the appropriate sampling techniques to be used;

- Establish project sampling/analytical measurement performance criteria (where applicable) for precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity; and
- Determine the number of samples needed for each analytical group/matrix/concentration level.

PQOs are provided in the site-specific QAPP addendum and FAP.

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 and USEPA document for the applicable method. Analytes detected analytes at concentrations below the RL but above the MDL will be flagged "J" (estimated) by the laboratory. Typical RLs are summarized on Table 2.

The RLs 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, 2010b), and groundwater and surface water criteria (compiled in TOGS 1.1.1).

Reporting limits for each analysis can be found in Table 2.

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 /matrix spike duplicate (MS/MSD) analyses will be performed once for every 20 samples for VOCs each parameter for soils and groundwaters. No MS/MSDs are performed for air samples.

Relative Percent Difference (RPD) criteria determined from laboratory performance data are used to evaluate precision between duplicates. 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 MS/MSDs and 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 RPD:

RPD = 100 x [(|X_1 – X_2|) / (X_1 + X_2)/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 RL. 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 matrix blank spike or laboratory control sample (LCS) 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:

% Recovery = 100 × (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 NYSDEC 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:

% Recovery = (R/S) x 100

Where:

S = surrogate spike concentration

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

Sampling Completeness (%) = (Sc/Sp) × 100

Where:

Sc = Samples collected (submitted) for analysis (documented from field records or COC)

Sp = Samples planned (as documented in the FAP 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 usable 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 typical QA/QC samples and RLs. QA/QC samples are discussed below.

4.3.1 Field Equipment (Rinsate) 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 rinsate is collected and analyzed to see if sampling could be biased by contamination from the equipment.

Rinsate blanks are not required when samples are collected directly into laboratory-provided sample containers (e.g., if specified as such in the FAP for matrices such as surface water or leachate seeps).

Field Equipment (Rinsate) blanks for bailers and pump tubing: For initial sampling, as well as at subsequent rounds of sampling when bailers or tubing are reused, a section of each type of tubing used per sampling batch or at least one of the bailers used per decontamination batch, will be used to generate equipment (rinsate) blanks during groundwater sampling. Disposable bailers and tubing will be obtained from a single vendor for this project. One rinsate 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.

Typically, one rinsate blank will be collected for every 20 field samples collected or one per week, whichever is more frequent, for each type of sampling equipment. The rinsate blanks will be collected from the soil and groundwater sampling equipment. One field equipment blank will be collected for every twenty samples.

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.

The default field duplicate precision (RPD) objective is ≤50% percent RPD for all matrices where the sample concentration is at least two times the RL. Where the analyte is detected in both samples, but the concentration is less than 2 times the RL, precision is assessed by the absolute difference, which should be less than the RL. 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 frequency of one per 20 environmental samples for both aqueous and non-aqueous samples being submitted for 8260, 8270, 6010, 9010, 7471, 8081, 8082, and 1633A analysis.

4.3.3 Split Samples

Split samples are used for performance audits or inter-laboratory comparability of data. Split samples may also be generated if a site owner or PRP requests them. A split sample will be defined as at least two separate sub-samples taken from a single original sample which has been thoroughly mixed or homogenized prior to the formation of the split samples. The exception to this is samples for volatile organics analysis which will not be homogenized. Collection of split samples may be conducted only when specifically requested by NYSDEC.

4.3.4 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 and non-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 (rinsate blanks).

4.3.5 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 Quality Assurance

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 upon delivery of the equipment.

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 10 NTU (the critical value for determining effectiveness of well development and evacuation). However, it is recognized that achieving consistently low-turbidity samples may be difficult due to the small diameter and temporary nature of the well points. 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 (except for 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. Field Data Documentation

Field reporting documentation, including field log books and field data reporting forms, is discussed in FAP Section 8; therefore, it is not repeated here.

6. 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 photoionization detector. See also Section 4.4 of this QAPP for additional discussion.

The organic vapor analyzer (MultiRAE, or equivalent organic vapor analyzer) 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 Analytical Support Areas

Prior to generating quality data, several analytical support areas must be considered:

Standard/Reagent Preparation - Primary reference standards and secondary standard solutions shall be obtained from sources traceable to National Institute of Standards and Technology, or other reliable commercial sources to ensure the highest purity possible. The preparation and maintenance of standards and reagents will be accomplished as per the methods referenced. All standards and standard solutions are to be formally documented (i.e., in a bound logbook) and should identify the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and any other pertinent information. All standard solutions shall be validated prior to use. Care shall be exercised in the proper storage and handling of standard solutions (e.g., separating volatile standards from nonvolatile standards). The laboratory shall continually monitor the quality of the standards and reagents through well-documented procedures.

Balances - The analytical balances shall be calibrated and maintained in accordance with manufacture specifications. Calibration is conducted with two American Society of Testing Materials Class 1 weights that bracket the expected balance use range. The laboratory shall check the accuracy of the balances daily and properly document results in permanently bound logbooks.

Refrigerators/Freezers - The temperature of the refrigerators and freezers within the laboratory shall be monitored and recorded daily.

This will verify that the quality of the standards and reagents is not compromised, and the integrity of the analytical samples is upheld. Appropriate acceptance ranges (e.g., 4°C ± 2°C for refrigerators) shall be clearly posted on each unit in service.

Water Supply System – Laboratories performing water/solid/waste sample analyses must maintain a sufficient supply of analyte-free water for all project needs. The grade of the water must be of the highest quality in order to eliminate false-positives from the analytical results. Ultraviolet cartridges or carbon absorption treatments are recommended for organic analyses, and ion-exchange treatment is recommended for inorganic tests. Appropriate documentation of the quality of the water supply system(s) will be performed on a regular basis by the laboratory.

Air Supply System – Laboratories performing air/soil vapor sample analyses must maintain a sufficient supply of analyte-free air for all project needs. The grade of air must be of the highest quality in order to eliminate false-positives from the analytical results. Appropriate documentation of the quality of the air supply system(s) will be performed on a regular basis by the laboratory.

6.2.2 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.

6.2.3 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.

6.2.4 Calibration Reference Standards

Two types of reference standards will be used by the standby laboratories 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.

6.2.5 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.

6.2.6 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. Data Reduction, Validation, and Reporting

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the Work Plan, 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 (milligrams per kilogram [mg/kg] or milligrams per liter [mg/L]), parts per billion (micrograms per kilogram [µg/kg] or micrograms per liter [µg/L]), or parts per trillion (ng/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 (Latham, NY). 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, laboratories subcontracted by AECOM for this work will be required to submit electronic deliverables in an EQuIS 4-file format consistent with AECOM standards. AECOM's database manager will be responsible 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). 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

As discussed in the Standby Contract (D009803), independent third-party validation is preferred when data validation is required. Data generated for work assignments under this contract will typically be validated by a third-party subcontractor (not affiliated with the laboratory or with AECOM).

However, for WA-63, AECOM will be performing in-house data validation. AECOM 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). Where necessary and appropriate, supplemental validation criteria may be derived from the EPA Functional Guidelines (USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-540-R-20-005, February 2020, and the National Functional Guidelines for Organic Superfund Methods Data Review, EPA-540-R-20-005, November 2020).

As discussed in the Standby Contract (D009803 – Attachment 1, Work Element V), a DUSR provides a thorough evaluation of analytical data . The primary objective of a DUSR is to determine whether the data, as presented, meet the site-specific criteria for data quality and data use. Appendix 2B of NYSDEC's DER-10 provides guidance on data deliverables and development of a DUSR.

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 RLs 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 and EPA Functional Guidelines as much as possible, 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

Subsequent to review of the items evaluated in the subcontractor data validator reports (DUSRs) and accompanying tables, AECOM's QA staff then prepares a brief data usability summary. The data usability summary, which will be provided as part of the project report, encompasses 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. 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 QA Officer will keep a tentative schedule on record that details the number and types of audits.

8.2 Field Audits

The need for field audits will be determined on a project-specific basis as required by the WA or in the approved work plans for the project. Not all the aspects listed below will be necessary or appropriate for projects for which field audits are specified.

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 Work Plan and FAP
- 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
- 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

As part of the laboratory subcontractor procurement process under the AECOM/NYSDEC Standby Engineering Contract, 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 and NYSDEC.

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 QA Officer 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. 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 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 Actions 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

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 are 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 the AECOM QAO and Project Manager.

10. 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
- 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 site-specific Work Plan
- Status of implementation of the site-specific Work Plan.

Monthly project status reporting to the NYSDEC 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 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. References

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

NYSDEC, 2010b. CP-51 / *Soil Cleanup Guidance*. October.

NYSDEC and AECOM USA Inc. (AECOM), 2019. Standby Contract No. D009803 between the State of New York Department of Environmental Conservation and AECOM for Engineering Services. October.

NYSDOH Wadsworth Laboratory Environmental Laboratory Approval Program Certification Manual. Accessed online at http://www.wadsworth.org/labcert/elapcert/index.html. Revisions through April, 2011; accessed May, 2011.

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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. accessed June 2025.

USEPA, 2020. *National Functional Guidelines for Superfund Inorganic Methods Data Review*, EPA 540/R-20-005. November.

USEPA, 2020. *National Functional Guidelines for Superfund Organic Methods Data Review*, EPA/540/R-20-005. November.

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
Quality Assurance Project Plan
6 Old River Road, Glenmont, NY (Site No. 401088)

Matrix / Analysis	Sample Prep Method[1,2]	Analytical Method	Sample Bottles[3]				Min Vol Rqd	Preservation	Holding Time[4,5]		Comment
			Mat'l	Size	Qty	Source			Extraction	Analysis	
Aqueous Samples											
Volatile Organics	SW 846 5030B	EPA Method 8260D	G	40 mL	2 or 3	Lab	40 mL	HCl to pH ≤ 2	NA	14 days	7 days if not preseved to pH < 2
Soil Samples											
Volatile Organics	SW 846 5035	EPA Method 8260D	TerraCore®	5 or 25 g	3 or 1	Vendor/lab	5 g	1 VOA Vial MeOH, 2 VOA Vial Water	14 days	14 days	Frozen -10°C
Semivolatile Organics	SW 846 3540C/3541/3545A/3546/3550C	EPA Method 8270E	G	8 oz	1	Lab	100 g	None	14 days	40 days	
1,4-Dioxane	SW 846 3540C/3541/3545A/3546/3550C	EPA Method 8270E/8270 SIM	G	8oz	1		100 g	None	14 days	40 days	
Metals	SW 846 3050B	EPA Method 6010C	G	8 oz	1		100 g	None	NA	6 months	
Cyanide	per Analytical Method	EPA Method 9010C/9012B	G	4 oz	1		100 g	≤6 °C	NA	28 days	
Mercury	per Analytical Method	EPA Method 7471B	G	2 oz	1		100 g	≤6 °C	NA	28 days	
PCBs	SW 846 3540C/3541/3545A/3546/3550C	EPA Method 8082A	G	8 oz	1		100 g	None	14 days	1 Year	
Pesticides		EPA Method 8081B	G	8 oz	1		100 g	None	14 days	40 days	
Waste Characterization (IDW)											
TCLP	NA	SW 846 8151	G	8 oz	1	Lab	100 g	None	7 days	14 days	
Corrosivity	NA	SW 846 1110	G	8 oz	1		100 g	None	7 days	14 days	
Ignitability	NA	SW 846 1030	G	8 oz	1		50 g	None	NA	28 days	
Total Sulfide	NA	SM4500S-F (aqueous) Method 9030 (soil)	P (a); G (s)	250 mL (a); 8 oz (s)	2 (a); 1 (s)		500 mL (a); 100g (s)	NaOH + Zinc Acetate (a); None (s)	7 days	28 days	(a) holding time is immediate if not preserved to pH 9
Total Cyanide	NA	SW 846 9014	G	8 oz	1		100 g	None	7 days	14 days	

Notes:
(1) Laboratory may propose alternate extraction/preparation methods, subject to NYSDOH ELAP certification and AECOM approval.
(2) More recent versions of analytical methods may be used subject to NYSDEC ELAP certification and AECOM approval.
(3) Bottles typical. EnCore or similar samplers for VOCs in soil will be provided by laboratory or AECOM on a case-by-case basis. 250 mL bottles may be used for extractable organics if NYSDOH ELAP certified.
(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 may be sufficient for SVOCs, pesticides, PCBs, and metals.
(7) Other collection methods consistent with SW 846 5035 may be used. Encore or similar samplers (e.g. Terra Core) are typically purchased from an outside supplier by AECOM but may also be requested (for a fee) from the analytical laboratory.
G = Glass
P = Plastic
SS = Stainless Steel
(a) = aqueous
(s) = soil
SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IV, March 2009.
SM = Standard Method

Table 2
Reporting Limits and QA/QC Sample Quantity Summary
Quality Assurance Project Plan
6 Old River Road, Glenmont, NY (Site No. 401088)

Matrix / Analysis		Analytical Method	Laboratory	Report Limit - Typical (units as specified)	Field Sample Quanitity	Matrix Spike (MS)	MS Duplicate or Matrix dupilicate	Field Duplicate	Equipment/ Rinse Blank[2]	Field Blank	Trip Blank	Total Billable Analyses
Aqueous Samples												
Volatile Organics		EPA Method 8260D	Pace	0.5 - 2.0 µg/L (typical)	4	1	1	1	1	0	1	18
Soil Samples												
Volatile Organics		EPA Method 8260D	Pace	0.0010 mg/Kg - 0.10 mg/Kg (typical)[1]	12	1	1	1	1	0	1	17
Semivolatile Organics		EPA Method 8270E		0.0010 mg/Kg - 0.10 mg/Kg (typical)[1]	12	1	1	1	1	0	0	16
1,4-Dioxane		EPA Method 8270E/8270 SIM		0.008 mg/kg	*	*	*	*	*	0	*	*
Metals		EPA Method 6010C		Analyte-Specific	12	1	1	1	1	0	0	16
Cyanide		EPA Method 9010C/9012B		1 mg/Kg	12	1	1	1	1	0	0	16
Mercury		EPA Method 7471B		0.08 mg/Kg	12	1	1	1	1	0	0	16
PCBs		EPA Method 8082A		0.05 mg/Kg	12	1	1	1	1	0	0	16
Pesticides		EPA Method 8081B		0.0040 mg/Kg - 0.10 mg/Kg (typical)[1]	12	1	1	1	1	0	0	16
				0.67 - 30 µg/kg	12	1	1	1	1	0	0	16
Waste Characterization (IDW)												
Full TCLP		SW 846 8151	Pace	Analyte-specific	2	0	0	0	0	0	0	2
Ignitability		SW 846 1110		N/A	2	0	0	0	0	0	0	2
Corrosivity		SW 846 1030		N/A	2	0	0	0	0	0	0	2
Reacitvity	Total Sulfide	SM4500S-F (aqueous) Method 9030 (soil)		N/A (aqueous) 2.0 mg/Kg (soil)	2	0	0	0	0	0	0	2
	Total Cyanide	SW 846 9014		0.20 mg/Kg		0	0	0	0	0	0	

Notes:
* = 1,4-Dioxane soil samples will be collected with SVOC samples, but the compound has a specified reporting limit.
(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) Field equipment rinsate blank quantity will vary depending on sample collection rate and types of sampling equipment used; quantity may be greater or less than that shown. See Work Plan or FAP.
(3) Matrix spikes and duplicates are not explicitly required by method TO-15 but are usually included as part the laboratory's analytical QA program.

Appendix A Pace Analytical ELAP Certification

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2026
Issued April 01, 2025

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MR. TOD KOPYSCINSKI *NY Lab Id No: 10899*
PACE ANALYTICAL SERVICES, LLC - EAST LONGMEADOW, MA
39 SPRUCE STREET
EAST LONGMEADOW, MA 01028

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Fuel Additives

Methyl tert-butyl ether	EPA 524.2
Naphthalene	EPA 524.2

Microextractables

1,2-Dibromo-3-chloropropane, Low Le	EPA 504.1
1,2-Dibromoethane, Low Level	EPA 504.1

Miscellaneous

Odor	SM 21-23 2150 B (-97)
Organic Carbon, Dissolved	SM 21-23 5310B (-00)
Organic Carbon, Total	SM 21-23 5310B (-00)
Turbidity	EPA 180.1 Rev. 2.0

Non-Metals

Alkalinity	SM 21-23 2320B (-97)
Chloride	SM 21-23 4500-Cl- B (-97)
	EPA 300.0 Rev. 2.1
Color	SM 21-23 2120B (-01)
Cyanide	SM 20, 21-23 4500-CN E
Fluoride, Total	EPA 300.0 Rev. 2.1
	SM 21-23 4500-F C (-97)
Nitrate (as N)	NECi Nitrate-Reductase
Nitrite (as N)	NECi Nitrate-Reductase
Orthophosphate (as P)	EPA 300.0 Rev. 2.1
Solids, Total Dissolved	SM 21-23 2540C (-97)
Sulfate (as SO4)	ASTM D516-07, 11, 16
	EPA 300.0 Rev. 2.1

Perfluorinated Alkyl Acids

11Cl-PF3OUdS	EPA 533

Serial No.: 70311

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

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Perfluorinated Alkyl Acids

11Cl-PF3OUdS	EPA 537.1, Version 2
4:2FTS	EPA 533
6:2FTS	EPA 533
8:2FTS	EPA 533
9Cl-PF3ONS	EPA 533
	EPA 537.1, Version 2
ADONA	EPA 533
	EPA 537.1, Version 2
HFPO-DA (GenX)	EPA 533
	EPA 537.1, Version 2
NEtFOSAA	EPA 537.1, Version 2
NFDHA	EPA 533
NMeFOSAA	EPA 537.1, Version 2
Perflourotridecanoic Acid (PFTrDA)	EPA 537.1, Version 2
Perfluordecanoic Acid (PFDA)	EPA 533
	EPA 537.1, Version 2
Perfluoro-3-Methoxypropanoic Acid (F	EPA 533
Perfluoro-4-Methoxybutanoic Acid (PF	EPA 533
Perfluorobutanesulfonic Acid (PFBS)	EPA 533
	EPA 537.1, Version 2
Perfluorobutanoic Acid (PFBA)	EPA 533
Perfluorododecanoic Acid (PFDoA)	EPA 533
	EPA 537.1, Version 2
Perfluoroheptanesulfonic Acid (PFHpS	EPA 533
Perfluoroheptanoic Acid (PFHpA)	EPA 533
	EPA 537.1, Version 2
Perfluorohexanesulfonic Acid (PFHxS	EPA 533

Serial No.: 70311

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Perfluorinated Alkyl Acids

Perfluorohexanesulfonic Acid (PFHxS	EPA 537.1, Version 2
Perfluorohexanoic Acid (PFHxA)	EPA 533
	EPA 537.1, Version 2
Perfluorononanoic Acid (PFNA)	EPA 533
	EPA 537.1, Version 2
Perfluorooctanesulfonic Acid (PFOS)	EPA 533
	EPA 537.1, Version 2
Perfluorooctanoic Acid (PFOA)	EPA 533
	EPA 537.1, Version 2
Perfluoropentanesulfonic Acid (PFPeS	EPA 533
Perfluoropentanoic Acid (PFPeA)	EPA 533
Perfluorotetradecanoic Acid (PFTeDA)	EPA 537.1, Version 2
Perfluoroundecanoic Acid (PFUnA)	EPA 533
	EPA 537.1, Version 2
PFEESA	EPA 533

Trihalomethanes

Bromodichloromethane	EPA 524.2
Bromoform	EPA 524.2
Chloroform	EPA 524.2
Dibromochloromethane	EPA 524.2
Total Trihalomethanes	EPA 524.2

Volatile Aromatics

1,2,3-Trichlorobenzene	EPA 524.2
1,2,4-Trichlorobenzene	EPA 524.2
1,2,4-Trimethylbenzene	EPA 524.2
1,2-Dichlorobenzene	EPA 524.2

Serial No.: 70311

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All approved analytes are listed below:

Volatile Aromatics

1,3,5-Trimethylbenzene	EPA 524.2
1,3-Dichlorobenzene	EPA 524.2
1,4-Dichlorobenzene	EPA 524.2
2-Chlorotoluene	EPA 524.2
4-Chlorotoluene	EPA 524.2
Benzene	EPA 524.2
Bromobenzene	EPA 524.2
Chlorobenzene	EPA 524.2
Ethyl benzene	EPA 524.2
Hexachlorobutadiene	EPA 524.2
Isopropylbenzene	EPA 524.2
n-Butylbenzene	EPA 524.2
n-Propylbenzene	EPA 524.2
p-Isopropyltoluene (P-Cymene)	EPA 524.2
sec-Butylbenzene	EPA 524.2
Styrene	EPA 524.2
tert-Butylbenzene	EPA 524.2
Toluene	EPA 524.2
Total Xylenes	EPA 524.2

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 524.2
1,1,1-Trichloroethane	EPA 524.2
1,1,2,2-Tetrachloroethane	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,1-Dichloroethane	EPA 524.2
1,1-Dichloroethene	EPA 524.2
1,1-Dichloropropene	EPA 524.2

Serial No.: 70311

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WADSWORTH CENTER

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MR. TOD KOPYSCINSKI *NY Lab Id No: 10899*
PACE ANALYTICAL SERVICES, LLC - EAST LONGMEADOW, MA
39 SPRUCE STREET
EAST LONGMEADOW, MA 01028

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All approved analytes are listed below:

Volatile Halocarbons

1,2,3-Trichloropropane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
1,2-Dichloropropane	EPA 524.2
1,3-Dichloropropane	EPA 524.2
2,2-Dichloropropane	EPA 524.2
Bromochloromethane	EPA 524.2
Bromomethane	EPA 524.2
Carbon tetrachloride	EPA 524.2
Chloroethane	EPA 524.2
Chloromethane	EPA 524.2
cis-1,2-Dichloroethene	EPA 524.2
cis-1,3-Dichloropropene	EPA 524.2
Dibromomethane	EPA 524.2
Dichlorodifluoromethane	EPA 524.2
Methylene chloride	EPA 524.2
Tetrachloroethene	EPA 524.2
trans-1,2-Dichloroethene	EPA 524.2
trans-1,3-Dichloropropene	EPA 524.2
Trichloroethene	EPA 524.2
Trichlorofluoromethane	EPA 524.2
Vinyl chloride	EPA 524.2

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All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 624.1
Acrylonitrile	EPA 8260D
	EPA 624.1
Amines	
1,2-Diphenylhydrazine	EPA 625.1
	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 625.1
	EPA 8270E
Pyridine	EPA 625.1
	EPA 8270E
Benzidines	
3,3'-Dichlorobenzidine	EPA 625.1
	EPA 8270E
Benzidine	EPA 625.1
	EPA 8270E
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
	EPA 608.3
4,4'-DDE	EPA 8081B
	EPA 608.3
4,4'-DDT	EPA 8081B
	EPA 608.3

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All approved analytes are listed below:

Chlorinated Hydrocarbon Pesticides

Aldrin	EPA 8081B
	EPA 608.3
alpha-BHC	EPA 8081B
	EPA 608.3
beta-BHC	EPA 8081B
	EPA 608.3
Chlordane Total	EPA 8081B
	EPA 608.3
delta-BHC	EPA 8081B
	EPA 608.3
Dieldrin	EPA 8081B
	EPA 608.3
Endosulfan I	EPA 8081B
	EPA 608.3
Endosulfan II	EPA 8081B
	EPA 608.3
Endosulfan sulfate	EPA 8081B
	EPA 608.3
Endrin	EPA 8081B
	EPA 608.3
Endrin aldehyde	EPA 8081B
	EPA 608.3
Heptachlor	EPA 8081B
	EPA 608.3
Heptachlor epoxide	EPA 8081B
	EPA 608.3
Lindane	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

Lindane	EPA 608.3
Methoxychlor	EPA 8081B
	EPA 608.3
Toxaphene	EPA 8081B
	EPA 608.3

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
1,2,4,5-Tetrachlorobenzene	EPA 8270E
1,2,4-Trichlorobenzene	EPA 625.1
	EPA 8270E
2-Chloronaphthalene	EPA 625.1
	EPA 8270E
Hexachlorobenzene	EPA 625.1
	EPA 8270E
Hexachlorobutadiene	EPA 625.1
	EPA 8270E
Hexachlorocyclopentadiene	EPA 625.1
	EPA 8270E
Hexachloroethane	EPA 625.1
	EPA 8270E

Demand

Biochemical Oxygen Demand	SM 5210B-2016
Carbonaceous BOD	SM 5210B-2016
Chemical Oxygen Demand	EPA 410.4, Rev. 2.0 (1993)

Dissolved Gases

Ethane	RSK-175

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Dissolved Gases

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

Fuel Oxygenates

Di-isopropyl ether	EPA 8260D
Ethanol	EPA 624.1
Methyl tert-butyl ether	EPA 8260D
	EPA 624.1
tert-amyl alcohol	EPA 8260D
tert-amyl methyl ether (TAME)	EPA 8260D
tert-butyl alcohol	EPA 8260D
	EPA 624.1
tert-butyl ethyl ether (ETBE)	EPA 8260D

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 625.1
	EPA 8270E
4-Bromophenylphenyl ether	EPA 625.1
	EPA 8270E
4-Chlorophenylphenyl ether	EPA 625.1
	EPA 8270E
Bis(2-chloroethoxy)methane	EPA 625.1
	EPA 8270E
Bis(2-chloroethyl)ether	EPA 625.1
	EPA 8270E

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Low Level Polynuclear Aromatics

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

Metals II

Chromium VI	EPA 7196A
	SM 3500-Cr B-2011

Mineral

Alkalinity	SM 2320B-2011
Chloride	SM 4500-Cl- B-2011
	EPA 300.0, Rev. 2.1 (1993)
Fluoride, Total	EPA 300.0, Rev. 2.1 (1993)
Sulfate (as SO4)	ASTM D516-16
	EPA 300.0, Rev. 2.1 (1993)

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Miscellaneous

Bromide	EPA 300.0, Rev. 2.1 (1993)
Color	SM 2120B-2011
Cyanide, Total	EPA 9014
	SM 4500-CN E-2016
Oil and Grease Total Recoverable	EPA 1664B
Organic Carbon, Total	SM 5310B-2014
Phenols	EPA 420.1 (Rev. 1978)
Specific Conductance	SM 2510B-2011
Sulfide (as S)	SM 4500-S2- F-2011
Turbidity	EPA 180.1, Rev. 2.0 (1993)

Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 625.1
	EPA 8270E
2,6-Dinitrotoluene	EPA 625.1
	EPA 8270E
Isophorone	EPA 625.1
	EPA 8270E
Nitrobenzene	EPA 625.1
	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 625.1
	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 625.1
	EPA 8270E
N-Nitrosodiphenylamine	EPA 625.1
	EPA 8270E

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Nutrient

Ammonia (as N)	SM 4500-NH3 C-2011
	EPA 350.1, Rev. 2.0 (1993)
Kjeldahl Nitrogen, Total	SM 4500-NH3 C-2011
Nitrate (as N)	EPA 300.0, Rev. 2.1 (1993)
	NECi N07-0003
Nitrate-Nitrite (as N)	NECi N07-0003
Nitrite (as N)	EPA 300.0, Rev. 2.1 (1993)
	NECi N07-0003
Orthophosphate (as P)	EPA 300.0, Rev. 2.1 (1993)
	SM 4500-P E-2011
Phosphorus, Total	SM 4500-P E-2011

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
	EPA 8015C
Gasoline Range Organics	EPA 8015D
	EPA 8015C

Phthalate Esters

Benzyl butyl phthalate	EPA 625.1
	EPA 8270E
Bis(2-ethylhexyl) phthalate	EPA 625.1
	EPA 8270E
Diethyl phthalate	EPA 625.1
	EPA 8270E
Dimethyl phthalate	EPA 625.1
	EPA 8270E
Di-n-butyl phthalate	EPA 625.1

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Phthalate Esters	
Di-n-butyl phthalate	EPA 8270E
Di-n-octyl phthalate	EPA 625.1
	EPA 8270E
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A
	EPA 608.3
Aroclor 1221 (PCB-1221)	EPA 8082A
	EPA 608.3
Aroclor 1232 (PCB-1232)	EPA 8082A
	EPA 608.3
Aroclor 1242 (PCB-1242)	EPA 8082A
	EPA 608.3
Aroclor 1248 (PCB-1248)	EPA 8082A
	EPA 608.3
Aroclor 1254 (PCB-1254)	EPA 8082A
	EPA 608.3
Aroclor 1260 (PCB-1260)	EPA 8082A
	EPA 608.3
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Polynuclear Aromatics	
Acenaphthene	EPA 625.1
	EPA 8270E
Acenaphthylene	EPA 625.1
	EPA 8270E
Anthracene	EPA 625.1

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Polynuclear Aromatics

Anthracene	EPA 8270E
Benzo(a)anthracene	EPA 625.1
	EPA 8270E
Benzo(a)pyrene	EPA 625.1
	EPA 8270E
Benzo(b)fluoranthene	EPA 625.1
	EPA 8270E
Benzo(g,h,i)perylene	EPA 625.1
	EPA 8270E
Benzo(k)fluoranthene	EPA 625.1
	EPA 8270E
Chrysene	EPA 625.1
	EPA 8270E
Dibenzo(a,h)anthracene	EPA 625.1
	EPA 8270E
Fluoranthene	EPA 625.1
	EPA 8270E
Fluorene	EPA 625.1
	EPA 8270E
Indeno(1,2,3-cd)pyrene	EPA 625.1
	EPA 8270E
Naphthalene	EPA 625.1
	EPA 8270E
Phenanthrene	EPA 625.1
	EPA 8270E
Pyrene	EPA 625.1
	EPA 8270E

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Priority Pollutant Phenols

2,4,5-Trichlorophenol	EPA 625.1
	EPA 8270E
2,4,6-Trichlorophenol	EPA 625.1
	EPA 8270E
2,4-Dichlorophenol	EPA 625.1
	EPA 8270E
2,4-Dimethylphenol	EPA 625.1
	EPA 8270E
2,4-Dinitrophenol	EPA 625.1
	EPA 8270E
2-Chlorophenol	EPA 625.1
	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 625.1
	EPA 8270E
2-Methylphenol	EPA 625.1
	EPA 8270E
2-Nitrophenol	EPA 625.1
	EPA 8270E
4-Chloro-3-methylphenol	EPA 625.1
	EPA 8270E
4-Nitrophenol	EPA 625.1
	EPA 8270E
Cresols, Total	EPA 625.1
	EPA 8270E
Pentachlorophenol	EPA 625.1
	EPA 8270E
Phenol	EPA 625.1

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Priority Pollutant Phenols	
Phenol	EPA 8270E
Residue	
Settleable Solids	SM 2540 F-2015
Solids, Total	SM 2540 B-2015
Solids, Total Dissolved	SM 2540 C-2015
Solids, Total Suspended	SM 2540 D-2015
Semi-Volatile Organics	
1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 625.1
	EPA 8270E
Acetophenone	EPA 625.1
	EPA 8270E
Benzoic Acid	EPA 8270E
Dibenzofuran	EPA 8270E
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D
	EPA 624.1
	EPA 524.2
1,3,5-Trimethylbenzene	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D
	EPA 624.1
1,4-Dichlorobenzene	EPA 8260D

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2026
Issued April 01, 2025

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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

MR. TOD KOPYSCINSKI *NY Lab Id No: 10899*
PACE ANALYTICAL SERVICES, LLC - EAST LONGMEADOW, MA
39 SPRUCE STREET
EAST LONGMEADOW, MA 01028

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Volatile Aromatics

1,4-Dichlorobenzene	EPA 624.1
2-Chlorotoluene	EPA 8260D
4-Chlorotoluene	EPA 8260D
Benzene	EPA 8260D
	EPA 624.1
	EPA 524.2
Bromobenzene	EPA 8260D
Chlorobenzene	EPA 8260D
	EPA 624.1
	EPA 524.2
Ethyl benzene	EPA 8260D
	EPA 624.1
Isopropylbenzene	EPA 8260D
m/p-Xylenes	EPA 8260D
	EPA 624.1
Naphthalene, Volatile	EPA 8260D
	EPA 624.1
n-Butylbenzene	EPA 8260D
n-Propylbenzene	EPA 8260D
o-Xylene	EPA 8260D
	EPA 624.1
p-Isopropyltoluene (P-Cymene)	EPA 8260D
sec-Butylbenzene	EPA 8260D
Styrene	EPA 8260D
	EPA 624.1
tert-Butylbenzene	EPA 8260D
Toluene	EPA 8260D

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All approved analytes are listed below:

Volatile Aromatics

Toluene	EPA 624.1
	EPA 524.2
Total Xylenes	EPA 8260D
	EPA 624.1

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D
	EPA 624.1
1,1,2,2-Tetrachloroethane	EPA 8260D
	EPA 624.1
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
	EPA 624.1
1,1,2-Trichloroethane	EPA 8260D
	EPA 624.1
1,1-Dichloroethane	EPA 8260D
	EPA 624.1
1,1-Dichloroethene	EPA 8260D
	EPA 624.1
1,1-Dichloropropene	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D
1,2-Dibromoethane	EPA 8260D
1,2-Dichloroethane	EPA 8260D
	EPA 624.1
	EPA 524.2
1,2-Dichloropropane	EPA 8260D
	EPA 624.1

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Volatile Halocarbons

1,3-Dichloropropane	EPA 8260D
2,2-Dichloropropane	EPA 8260D
2-Chloroethylvinyl ether	EPA 624.1
Bromochloromethane	EPA 8260D
Bromodichloromethane	EPA 8260D
	EPA 624.1
Bromoform	EPA 8260D
	EPA 624.1
Bromomethane	EPA 8260D
	EPA 624.1
Carbon tetrachloride	EPA 8260D
	EPA 624.1
Chloroethane	EPA 8260D
	EPA 624.1
Chloroform	EPA 8260D
	EPA 624.1
	EPA 524.2
Chloromethane	EPA 8260D
	EPA 624.1
cis-1,2-Dichloroethene	EPA 8260D
	EPA 624.1
cis-1,3-Dichloropropene	EPA 8260D
	EPA 624.1
Dibromochloromethane	EPA 8260D
	EPA 624.1
Dibromomethane	EPA 8260D
Dichlorodifluoromethane	EPA 8260D

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Volatile Halocarbons

Dichlorodifluoromethane	EPA 624.1
Hexachlorobutadiene, Volatile	EPA 8260D
Methylene chloride	EPA 8260D
	EPA 624.1
	EPA 524.2
Tetrachloroethene	EPA 8260D
	EPA 624.1
trans-1,2-Dichloroethene	EPA 8260D
	EPA 624.1
trans-1,3-Dichloropropene	EPA 8260D
	EPA 624.1
trans-1,4-Dichloro-2-butene	EPA 8260D
Trichloroethene	EPA 8260D
	EPA 624.1
Trichlorofluoromethane	EPA 8260D
	EPA 624.1
Vinyl chloride	EPA 8260D
	EPA 624.1

Volatiles Organics

2-Butanone (Methylethyl ketone)	EPA 8260D
2-Hexanone	EPA 8260D
4-Methyl-2-Pentanone	EPA 8260D
	EPA 624.1
	EPA 524.2
Acetone	EPA 8260D
	EPA 624.1
	EPA 524.2

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Volatiles Organics

Carbon Disulfide	EPA 8260D
Cyclohexane	EPA 8260D
Di-ethyl ether	EPA 8260D
Methyl acetate	EPA 8260D
Methyl cyclohexane	EPA 8260D
Tetrahydrofuran	EPA 624.1
	EPA 524.2

Sample Preparation Methods

SM 4500-P B(5)-2011
EPA 5030C
SM 4500-CN B-2016 and C-2016
EPA 3511
EPA 3510C
SM 4500-NH3 B-2011
SM 4500-N Org B-2011 or C-2011
EPA 9010C

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ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved subcategories and/or analytes are listed below:

Amines

Carbazole	EPA 625.1

Chlorinated Hydrocarbon Pesticides

Mirex	EPA 8081B
	EPA 608.3

Perfluorinated Alkyl Acids

11Cl-PF3OUdS	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
4:2FTS	ENV-SOP-ELON-0004
6:2FTS	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
8:2FTS	EPA 1633 (Draft)
9Cl-PF3ONS	EPA 1633 (Draft)
ADONA	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
HFPO-DA (GenX)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
NEtFOSAA	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
NMeFOSAA	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perflourotridecanoic Acid (PFTrDA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluordecanoic Acid (PFDA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluoro-3-Methoxypropanoic Acid (P	EPA 1633 (Draft)
	ENV-SOP-ELON-0004

Serial No.: 70957

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ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved subcategories and/or analytes are listed below:

Perfluorinated Alkyl Acids

Perfluoro-4-Methoxybutanoic Acid (PF	ENV-SOP-ELON-0004
Perfluorobutanesulfonic Acid (PFBS)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluorobutanoic Acid (PFBA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluorododecanoic Acid (PFDoA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluoroheptanesulfonic Acid (PFHpS	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluoroheptanoic Acid (PFHpA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluorohexanesulfonic Acid (PFHxS	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluorohexanoic Acid (PFHxA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluorononanoic Acid (PFNA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluorooctanesulfonic Acid (PFOS)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluorooctanoic Acid (PFOA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluoropentanesulfonic Acid (PFPeS	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluoropentanoic Acid (PFPeA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Perfluorotetradecanoic Acid (PFTeDA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004

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Perfluorinated Alkyl Acids	
Perfluoroundecanoic Acid (PFUnA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
PFEESA	EPA 1633 (Draft)
	ENV-SOP-ELON-0004
Priority Pollutant Phenols	
3-Methylphenol	EPA 625.1
Volatiles Organics	
1,4-Dioxane	EPA 8260D
	EPA 8270E
	EPA 8270E SIM
Vinyl acetate	EPA 8260D
	EPA 624.1
Sample Preparation Methods	
	EPA 5030C

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All approved analytes are listed below:

Acrylates	
Acrylonitrile	EPA 8260D
Amines	
1,2-Diphenylhydrazine	EPA 8270E
2-Nitroaniline	EPA 8270E
3-Nitroaniline	EPA 8270E
4-Chloroaniline	EPA 8270E
4-Nitroaniline	EPA 8270E
Aniline	EPA 8270E
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270E
Benzidine	EPA 8270E
Characteristic Testing	
Free Liquids	EPA 9095B
Ignitability	EPA 1030
	EPA 1010B
	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B

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Chlorinated Hydrocarbon Pesticides

delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Pentachloronitrobenzene	EPA 8270E
Toxaphene	EPA 8081B

Chlorinated Hydrocarbons

1,2,3-Trichlorobenzene	EPA 8260D
1,2,4,5-Tetrachlorobenzene	EPA 8270E
1,2,4-Trichlorobenzene	EPA 8270E
2-Chloronaphthalene	EPA 8270E
Hexachlorobenzene	EPA 8270E
Hexachlorobutadiene	EPA 8270E
Hexachlorocyclopentadiene	EPA 8270E
Hexachloroethane	EPA 8270E

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270E
4-Bromophenylphenyl ether	EPA 8270E
4-Chlorophenylphenyl ether	EPA 8270E

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Haloethers

Bis(2-chloroethoxy)methane	EPA 8270E
Bis(2-chloroethyl)ether	EPA 8270E

Low Level Polynuclear Aromatic Hydrocarbons

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

Metals II

Chromium VI	EPA 7196A

Miscellaneous

Cyanide, Total	EPA 9014
Organic Carbon, Total	Lloyd Kahn Method
	EPA 9060A

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Nitroaromatics and Isophorone

2,4-Dinitrotoluene	EPA 8270E
2,6-Dinitrotoluene	EPA 8270E
Isophorone	EPA 8270E
Nitrobenzene	EPA 8270E
Pyridine	EPA 8270E

Nitrosoamines

N-Nitrosodimethylamine	EPA 8270E
N-Nitrosodi-n-propylamine	EPA 8270E
N-Nitrosodiphenylamine	EPA 8270E

Petroleum Hydrocarbons

Diesel Range Organics	EPA 8015D
	EPA 8015C
Gasoline Range Organics	EPA 8015D
	EPA 8015C

Phthalate Esters

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

Polychlorinated Biphenyls

Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A

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All approved analytes are listed below:

Polychlorinated Biphenyls

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

Polynuclear Aromatic Hydrocarbons

Acenaphthene	EPA 8270E
Acenaphthylene	EPA 8270E
Anthracene	EPA 8270E
Benzo(a)anthracene	EPA 8270E
Benzo(a)pyrene	EPA 8270E
Benzo(b)fluoranthene	EPA 8270E
Benzo(g,h,i)perylene	EPA 8270E
Benzo(k)fluoranthene	EPA 8270E
Chrysene	EPA 8270E
Dibenzo(a,h)anthracene	EPA 8270E
Fluoranthene	EPA 8270E
Fluorene	EPA 8270E

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All approved analytes are listed below:

Polynuclear Aromatic Hydrocarbons

Indeno(1,2,3-cd)pyrene	EPA 8270E
Naphthalene	EPA 8270E
Phenanthrene	EPA 8270E
Pyrene	EPA 8270E

Priority Pollutant Phenols

2,4,5-Trichlorophenol	EPA 8270E
2,4,6-Trichlorophenol	EPA 8270E
2,4-Dichlorophenol	EPA 8270E
2,4-Dimethylphenol	EPA 8270E
2,4-Dinitrophenol	EPA 8270E
2-Chlorophenol	EPA 8270E
2-Methyl-4,6-dinitrophenol	EPA 8270E
2-Methylphenol	EPA 8270E
2-Nitrophenol	EPA 8270E
3-Methylphenol	EPA 8270E
4-Chloro-3-methylphenol	EPA 8270E
4-Methylphenol	EPA 8270E
4-Nitrophenol	EPA 8270E
Pentachlorophenol	EPA 8270E
Phenol	EPA 8270E

Semi-Volatile Organics

1,2-Dichlorobenzene, Semi-volatile	EPA 8270E
1,3-Dichlorobenzene, Semi-volatile	EPA 8270E
1,4-Dichlorobenzene, Semi-volatile	EPA 8270E
2-Methylnaphthalene	EPA 8270E
Acetophenone	EPA 8270E

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Semi-Volatile Organics

Benzoic Acid	EPA 8270E
Dibenzofuran	EPA 8270E

Volatile Aromatics

1,2,4-Trichlorobenzene, Volatile	EPA 8260D
1,2,4-Trimethylbenzene	EPA 8260D
1,2-Dichlorobenzene	EPA 8260D
1,3,5-Trimethylbenzene	EPA 8260D
1,3-Dichlorobenzene	EPA 8260D
1,4-Dichlorobenzene	EPA 8260D
2-Chlorotoluene	EPA 8260D
4-Chlorotoluene	EPA 8260D
Benzene	EPA 8260D
Bromobenzene	EPA 8260D
Chlorobenzene	EPA 8260D
Ethyl benzene	EPA 8260D
Isopropylbenzene	EPA 8260D
m/p-Xylenes	EPA 8260D
Naphthalene, Volatile	EPA 8260D
n-Butylbenzene	EPA 8260D
n-Propylbenzene	EPA 8260D
o-Xylene	EPA 8260D
p-Isopropyltoluene (P-Cymene)	EPA 8260D
sec-Butylbenzene	EPA 8260D
Styrene	EPA 8260D
tert-Butylbenzene	EPA 8260D
Toluene	EPA 8260D
Total Xylenes	EPA 8260D

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All approved analytes are listed below:

Volatile Halocarbons

1,1,1,2-Tetrachloroethane	EPA 8260D
1,1,1-Trichloroethane	EPA 8260D
1,1,2,2-Tetrachloroethane	EPA 8260D
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260D
1,1,2-Trichloroethane	EPA 8260D
1,1-Dichloroethane	EPA 8260D
1,1-Dichloroethene	EPA 8260D
1,1-Dichloropropene	EPA 8260D
1,2,3-Trichloropropane	EPA 8260D
1,2-Dibromo-3-chloropropane	EPA 8260D
1,2-Dibromoethane	EPA 8260D
1,2-Dichloroethane	EPA 8260D
1,2-Dichloropropane	EPA 8260D
1,3-Dichloropropane	EPA 8260D
2,2-Dichloropropane	EPA 8260D
Bromochloromethane	EPA 8260D
Bromodichloromethane	EPA 8260D
Bromoform	EPA 8260D
Bromomethane	EPA 8260D
Carbon tetrachloride	EPA 8260D
Chloroethane	EPA 8260D
Chloroform	EPA 8260D
Chloromethane	EPA 8260D
cis-1,2-Dichloroethene	EPA 8260D
cis-1,3-Dichloropropene	EPA 8260D
Dibromochloromethane	EPA 8260D
Dibromomethane	EPA 8260D

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Volatile Halocarbons

Dichlorodifluoromethane	EPA 8260D
Hexachlorobutadiene, Volatile	EPA 8260D
Methylene chloride	EPA 8260D
Tetrachloroethene	EPA 8260D
trans-1,2-Dichloroethene	EPA 8260D
trans-1,3-Dichloropropene	EPA 8260D
trans-1,4-Dichloro-2-butene	EPA 8260D
Trichloroethene	EPA 8260D
Trichlorofluoromethane	EPA 8260D
Vinyl chloride	EPA 8260D

Volatile Organics

2-Butanone (Methylethyl ketone)	EPA 8260D
2-Hexanone	EPA 8260D
4-Methyl-2-Pentanone	EPA 8260D
Acetone	EPA 8260D
Carbon Disulfide	EPA 8260D
Cyclohexane	EPA 8260D
Di-ethyl ether	EPA 8260D
Methyl acetate	EPA 8260D
Methyl cyclohexane	EPA 8260D
Methyl tert-butyl ether	EPA 8260D
tert-butyl alcohol	EPA 8260D
Tetrahydrofuran	EPA 8260D
Vinyl acetate	EPA 8260D

Sample Preparation Methods

EPA 5035A-L

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Sample Preparation Methods

EPA 5035A-H
EPA 3580A
EPA 3540C
EPA 3546
EPA 3060A
EPA 9010C

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

Chlorinated Hydrocarbon Pesticides

Mirex	EPA 8081B

Perfluorinated Alkyl Acids

8:2FTS	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
NEtFOSAA	ENV-SOP-ELON-0033
NMeFOSAA	EPA 1633 (Draft)
Perflourotridecanoic Acid (PFTrDA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluordecanoic Acid (PFDA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluorobutanoic Acid (PFBA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluorododecanoic Acid (PFDoA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluoroheptanoic Acid (PFHpA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluorohexanoic Acid (PFHxA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluorononanoic Acid (PFNA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluorooctanesulfonic Acid (PFOS)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluorooctanoic Acid (PFOA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluoropentanoic Acid (PFPeA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033
Perfluorotetradecanoic Acid (PFTeDA)	ENV-SOP-ELON-0033

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Perfluorinated Alkyl Acids

Perfluoroundecanoic Acid (PFUnA)	EPA 1633 (Draft)
	ENV-SOP-ELON-0033

Volatile Organics

1,4-Dioxane	EPA 8260D
	EPA 8270E
	EPA 8270E SIM

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All approved analytes are listed below:

Chlorinated Hydrocarbon Pesticides

4,4'-DDD	EPA TO-4A
4,4'-DDE	EPA TO-4A
4,4'-DDT	EPA TO-4A
Alachlor	EPA TO-4A
Aldrin	EPA TO-4A
alpha-BHC	EPA TO-4A
beta-BHC	EPA TO-4A
Chlordane Total	EPA TO-4A
Dieldrin	EPA TO-4A
Heptachlor	EPA TO-4A
Heptachlor epoxide	EPA TO-4A
Lindane	EPA TO-4A

Polychlorinated Biphenyls

PCBs and Aroclors	EPA TO-10A
	EPA TO-4A

Polynuclear Aromatics

Acenaphthene	EPA TO-13A
Acenaphthylene	EPA TO-13A
Anthracene	EPA TO-13A
Benzo(a)anthracene	EPA TO-13A
Benzo(a)pyrene	EPA TO-13A
Benzo(b)fluoranthene	EPA TO-13A
Benzo(g,h,i)perylene	EPA TO-13A
Benzo(k)fluoranthene	EPA TO-13A
Chrysene	EPA TO-13A
Dibenzo(a,h)anthracene	EPA TO-13A

Serial No.: 70316

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All approved analytes are listed below:

Polynuclear Aromatics

Fluoranthene	EPA TO-13A
Fluorene	EPA TO-13A
Indeno(1,2,3-cd)pyrene	EPA TO-13A
Naphthalene	EPA TO-13A
Phenanthrene	EPA TO-13A
Pyrene	EPA TO-13A

NEW YORK STATE Department of Health

Serial No.: 70316

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Appendix D– Green Remediation Best Management Practices: Site Investigation

United States Environmental Protection Agency

Office of Land and Emergency Management (5203P)
EPA 542-F-16-002 September 2016 Update

Green Remediation Best Management Practices: Site Investigation and Environmental Monitoring

A fact sheet about the concepts and tools for using best management practices to reduce the environmental footprint of activities associated with assessing or remediating contaminated sites

www.cluin.org/greenremediation

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Materials and Waste Management	Page 3
Laboratory Support	Page 4

The U.S. Environmental Protection Agency (EPA) *Principles for Greener Cleanups* outline the Agency's policy for evaluating and minimizing the environmental footprint of activities involved in cleaning up contaminated sites.[1] Best management practices (BMPs) of green remediation involve specific activities to address the core elements of greener cleanups:

- Reduce total energy use and increase the percentage of energy from renewable resources.
- Reduce air pollutants and greenhouse gas emissions.
- Reduce water use and preserve water quality.
- Conserve material resources and reduce waste.
- Protect land and ecosystem services.

Overview

The need for site investigation is common to cleanups under any regulatory program. Investigative activities can occur at all points in the cleanup process, from initial site assessment through waste site closeout. A site investigation generally is undertaken to:

- Confirm the presence or absence of specific contaminants.
- Delineate the nature and extent of environmental contamination.
- Identify contaminant sources.
- Provide data for assessing potential risk to human health or the environment.
- Gather data for determining if a remedial or removal action should be taken.
- Identify site characteristics affecting remedial design, construction or operation.

Site investigation as well as long-term environmental monitoring typically involve a range of technologies and techniques to gather field measurements and collect analytical samples of soil and groundwater and often surface water, sediment, soil gas or indoor air. Investigation also may involve searching for underground storage tanks, drums or other buried objects, or evaluating demolition material containing asbestos, lead-based paint or other toxic products. Many of the same techniques and technologies may be used in later stages of a cleanup to evaluate ongoing performance of a remedy; determine the need for any modification to a remedial system; or track factors influencing anticipated closeout of a cleanup project. At certain points, site investigation and environmental monitoring both rely on data analysis or verification conducted by offsite laboratories.

Water monitoring at the New Idria Mercury Mine Superfund site in California involves use of time-interval sampling devices powered by solar energy. Collected sampling data are transmitted via satellite to a website accessible by project staff. This approach supplies a renewable source of onsite energy and reduces the frequency of staff visits to this remote site. Ongoing investigation of this site led to removal actions in 2011 and 2015.

Project Planning

Integration of green remediation BMPs early during the project design phase will help reduce cumulative environmental footprints of a cleanup. The BMP integration process involves selecting BMPs most suitable for the site's unique contamination scenario, potential remedies and anticipated site reuse. BMPs to be considered when planning a site investigation include:

- Schedule activities for suitable seasons to reduce the amount of fuel needed for heating or cooling equipment and supplies.
- Select service providers, product suppliers and analytical laboratories from the local area and consolidate the service and delivery schedules.

The ASTM *Standard Guide for Greener Cleanups* outlines a process for identifying, screening and selecting BMPs to minimize the environmental footprint of site-specific cleanup activities.[2]

- Identify local sources of trucks and machinery equipped with advanced emission controls and of cleaner alternative fuels.[3]
- Identify the nearest facility to be used for disposing of hazardous waste.
- Establish electronic networks for data transfers, team decisions and document preparation, and select electronic products through tools such as the Electronic Product Environmental Assessment Tool (EPEAT).[4]
- Reduce travel through increased teleconferencing and compressed work hours.
- Select facilities with green policies for worker accommodations and meetings.
- Integrate sources of onsite renewable energy to power hand-held devices, portable equipment, and stationery monitoring systems.

Product and service acquisitions provide opportunities to integrate BMPs when planning a site investigation. New contracts awarded by EPA for remediation environmental services at Superfund sites, for example, now require contractors to explore and implement strategies to reduce energy and water usage, promote carbon neutrality, promote industrial materials reuse and recycling, and protect and preserve land resources.[5]

Development of a well-conceived dynamic sampling plan can help assure that data truly representing a site are collected at the project onset, consequently minimizing remobilization of field crews and equipment. Systematic planning, which is a critical component of optimized strategies for investigating hazardous waste sites, involves identifying key decisions to be made, developing a conceptual site model (CSM) to support decision making, and evaluating decision uncertainty along with approaches for actively managing that uncertainty. The CSM combines analytical data with historical information to identify data gaps and allows for refinement as additional data become available.

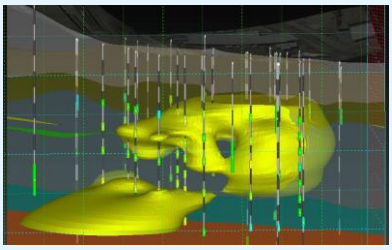
Field Activities

Fewer field mobilizations typically lead to reduced fuel consumption and associated air emissions and often less disturbance to the land and local ecosystems. BMPs that can help minimize mobilization during site investigation and environmental monitoring include:

- Use in situ data loggers to monitor water quality parameters and water levels, as an alternative to frequent sample collection or physical measurement.
- Install solar-powered telemetry systems to remotely transmit logging data.
- Use dynamic work plans involving real-time field measurements, which can immediately provide data to help determine the next activity during a given sampling event.

Technologies for collecting real-time data are typically non-invasive or minimally invasive; examples include:

- Direct sensing equipment such as the membrane interface probe, laser-induced or X-ray fluorescence sensors and cone penetration tests.
- Immunoassay, colorimetric and other field test kits to screen soil and groundwater contaminants.
- Portable vapor/gas detection systems using photoionization or flame ionization for screening purposes.
- Soil gas surveys involving instruments such as SUMMA canisters to determine the presence, composition and distribution of volatile organic compounds (VOCs) in the vadose zone and water table.
- Portable gas chromatography/mass spectrometry for analyzing fuel-related compounds and VOCs in soil and groundwater.
- Ground penetrating radar, magnetometers, and other geophysical survey instrumentation to locate metal objects and delineate disposal areas.



At Well 12A within the Commencement Bay-South Tacoma Channel Superfund site in Washington, high-resolution characterization data and 3D visualization were used to develop a robust CSM. The CSM helped quantify contaminant mass in soil and groundwater, delineate discrete treatment zones and prioritize remediation design approaches. This refined, minimally invasive strategy for site characterization significantly accelerated site cleanup, saving an estimated $1 million in treatment costs. Additionally, use of passive sampling devices for long-term monitoring avoided generation of purge water while saving more than $100,000 in the first five years of monitoring alone.

Other BMPs typically applying to site investigation and environmental monitoring focus on conserving and protecting water and using environmentally friendly products, such as:

- Deploy passive sampling devices, which involve no well purging.
- Use supplemental techniques to map the source and extent of a contaminated groundwater plume, such as analyzing core samples taken from rapid-growing trees.
- Employ a closed-loop graywater washing system to decontaminate trucks or machinery.
- Steam-clean or use phosphate-free detergents instead of organic solvents or acids to decontaminate sampling equipment.
- Use plastic sheeting or portable wash pads to contain and collect decontamination fluids and prevent their entrance into storm drains or groundwater.

- Treat potentially contaminated purge water through use of technologies such as activated carbon filtration prior to discharge to storm drains or waterways.
- Quickly restore disturbed areas of vegetation serving as stormwater controls.
- Use biodegradable lubricants and hydraulic fluids.
- Choose groundwater monitoring equipment made of noncorrosive material.

Yet other BMPs concern design and installation of groundwater wells to be used for sampling and monitoring. Relevant BMPs include:

- Design investigative wells in ways that allow for maximum reuse during remediation or to meet water demands of ongoing or future site activities.
- Integrate a horizontal well network where feasible as an alternative to a greater number of vertical wells.
- Choose a multi-port sampling system in wells intended for monitoring, to minimize the total number of wells needing to be installed.
- Use minimally invasive drilling techniques such as direct-push or sonic technology whenever feasible to reduce drilling duration, avoid or minimize use of water, and prevent or reduce generation of cuttings and associated disposal of investigation-derived waste (IDW).
- Use dual tube technology during drilling, which allows collection of continuous soil cores and later reuse of the same boreholes for site investigation, remediation or monitoring.
- Use an electric top drive system to minimize use of hydraulic fluids when rotary drills are used.
- Segregate and screen drill cuttings for potential use such as onsite backfill if allowed under applicable state or federal cleanup programs; use of an organic vapor analyzer may significantly improve or accelerate the screening process.
- Use environmentally friendly pipe dope for drill pipes and casings.
- Emplace mats to limit ground surface disturbance at drilling locations.

Use of passive diffusion bag (PDB) sampling techniques in 56 wells at the Joint Base Lewis McChord Superfund site in Washington significantly reduced the environmental footprint of sampling activities. When compared to using low-flow sampling techniques in other wells, PDB use achieved a:

- 54% reduction in energy used.
- 55% reduction in greenhouse gas emissions.
- 63% reduction in criteria pollutants.

The footprint reductions were driven by demonstrated reductions in the amount of field time, which leads to fewer vehicle miles traveled and associated fuel consumption. A two-person team was able to sample 12 of the wells per day when using PDBs but only five wells per day if using low-flow methods.[6]

Materials and Waste Management

Site investigation and environmental monitoring activities typically involve using an assortment of manufactured products such as personal protective equipment (PPE), sample containers and routine business materials. BMPs concerning green purchasing of such products include:

- Choose products with recycled and biobased contents such as agricultural or forestry waste instead of petroleum-based ingredients.
- Choose products, packing material and equipment that have reuse or recycling potential.
- Choose products manufactured through processes involving nontoxic chemical alternatives.

A comprehensive list of tools and resources for materials management decision-making is available in EPA's *Sustainable Materials Management in Site Cleanup* engineering issue paper.[7]

IDW generation and management frequently account for a significant portion of the environmental footprint of site investigation. IDW includes drill cuttings, well purge water, spent carbon from filtration equipment, reagents used with environmental field test kits, non-reusable or contaminated PPE and solutions for decontaminating non-disposable PPE and equipment. Reducing the volume of generated IDW will decrease the need for waste containers such as 55-gallon storage drums and for treating IDW onsite or disposing of it at a waste facility. Recommended BMPs to reduce the volume of routine waste or IDW, while often decreasing materials consumption, include:

- Compress the number of days needed for a given round of sampling.
- Minimize the need for disposable single-use items such as plastic bags.
- Designate collection points for items that are locally recyclable, such as metal, plastic or glass containers and paper or cardboard.
- Select test kits that generate less waste, such as soil samplers with reusable handles for coring syringes.
- Collect hydraulic fluids and lubricants for recycling at suitable local facilities.
- Maximize use of environmentally friendly additives such as ascorbic acid to preserve or stabilize collected samples, if compatible with target analytes and anticipated analytical methods.[10]

Use of EPA's *Spreadsheets for Environmental Analysis*[8] to estimate the footprint of cleanup activities at the Grants Chlorinated Solvents Plume Site indicated that laboratory analysis (including sample collection and preparation and offsite transport) accounted for approximately 10% of the energy- and carbon dioxide (equivalent)-related footprint of operating, maintaining and monitoring the remedy.[9] As a result, optimization of the sampling program is underway to reduce the frequency of sample collection and analysis.

Laboratory Support

Use of fixed-base laboratories for analytical services may significantly contribute to the environmental footprint of site investigation and environmental monitoring when considering offsite as well as onsite contributions. Green remediation BMPs concerning analytical support include:

- Use a mobile laboratory or portable analytical equipment, particularly for screening purposes and when rapid analytical results are needed.
- Specify EPA analytical methods involving procedures that need relatively low volumes of samples or solvents and generate less waste, such as solid phase micro extraction (SPME), pressurized fluid extraction, microwave extraction, and supercritical fluid extraction when possible. For example, SPME is a single-step process using little or no solvents and taking up to 70% less time.
- Choose fixed laboratories demonstrating a strong commitment to environmental performance, such as routine use of management practices identified by the International Institute for Sustainable Laboratories.[11]

Attributes of high-performing laboratories include:

- Optimized ventilation rates in light of the mixing factor of particular pollutants being removed from the laboratory; simply maximizing ventilation results in unnecessary energy expenditure (and may diminish safety conditions).
- Use of energy recovery devices and systems to reduce energy consumption for interior heating and cooling.
- Use of energy-efficient equipment for ventilation, refrigeration and lighting.
- Use of energy consumption controls such as programmable thermostats, window glass tinting and ample insulation.
- Cooling tower operation with a high concentration ratio, which increases the number of times water circulates before it is bled off and discharged; cooling accounts for an estimated 30-60% of water used in multipurpose laboratories.[12]
- Integration of solenoid valves, timers or other controls on equipment used in processes requiring flowing water.
- Use of less hazardous materials; for example, toluene may substitute for benzene as a solvent.
- Implementation of purchasing strategies and inventory controls that minimize disposal of excess materials.
- Recycling of liquid waste; for example, non-halogenated solvents may be used offsite as fuel blending feedstock.
- Recycling of materials such as clean glass or plastic containers, drums, electronics, and steel or aluminum instrumentation.

Acquisition of laboratory services supporting remedial investigation at the Diaz Chemical Corporation Superfund site in Holley, New York, included specifications meeting EPA greener cleanup policy. The selected laboratory employs practices such as:

- Recycling all paper products and shipping materials.
- Using energy-efficient lighting.
- Maintaining a paperless reporting and invoicing program.
- Minimizing waste through use of EPA-approved microscale methods.

Similar procurement requirements for subcontractor drilling activities reduced the investigative footprint by:

- Using direct-push technology.
- Deploying trucks equipped with advanced emission controls.
- Minimizing waste through waste oil and scrap recycling.

This fact sheet provides an update on information compiled in the December 2009 "Site Investigation" fact sheet (EPA 542-F-09-004), in collaboration with the Greener Cleanups Subcommittee of the EPA Technical Support Project's Engineering Forum.

To view BMP fact sheets on other topics, visit CLU-IN Green Remediation Focus: www.clu-in.org/greenremediation.

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For more information, contact: Carlos Pachon, OLEM/OSRTI (pachon.carlos@epa.gov), U.S. Environmental Protection Agency

Appendix E – Community Air Monitoring Plan (CAMP)

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– Aztech Environmental Technologies (LaBella) Draft Site Characterization Report, 2023

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Aztech Environmental
TECHNOLOGIES
A LaBella Company

November 21, 2023

Mr. Parag Amin
NYSDEC – Central Office
625 Broadway
Albany, NY 12233

RE: Site Characterization Report
338 Broadway
City of Kingston, Ulster County, New York
NYSDEC Site No. 356058

Dear Mr. Amin:

LaBella Associates (Labella), Formerly Aztech Environmental Technologies (Aztech), has prepared this correspondence to summarize initial site characterization activities conducted at the above referenced site.

The activities included: a ground penetrating radar (GPR) study of the site; advancement of six (6) soil borings completed as groundwater monitoring wells; gauging and low-flow groundwater sampling of newly installed monitoring wells, surface soil sampling and installation and sampling of 20 soil gas vapor probes in two (2) events. In addition, a soil vapor intrusion investigation was performed at eight (8) site related properties. The above noted site investigation activities were conducted between September 23, 2020 and September 17, 2021.

A supplemental subsurface investigation was conducted between May 16 and May 23, 2023. The investigation included, GPR and utility tracing within the interior and exterior of the building located at 334 Broadway and advancement of eight (8) soil borings and collection of a grab groundwater sample from a temporary monitoring well set at each location. A total four (4) borings were located within the building and four (4) borings were located on the exterior of the building.

If you have any questions regarding the information contained herein, please contact Labella at (518) 885-5383.

Sincerely,

Thomas Giamichael, P.G.
Project Manager/Senior Environmental Geologist
Enclosure
Cc: File

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Site Characterization Report

PREPARED FOR:
New York State Department of Environmental Conservation
Central Office
625 Broadway
Albany, New York 12233
Attn: Parag Amin

SUBJECT SITE:
338 Broadway
Kingston, Ulster County, New York

NYSDEC Site No. 356058

November 21, 2023

Aztech Environmental
TECHNOLOGIES
A LaBella Company
5 McCrea Hill Road | Ballston Spa, NY 12020 | p (518) 885-5383

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Site Characterization Report

Site No. C356058

338 Broadway
City of Kingston, Ulster County, New York

CERTIFICATION

Dated: November 21, 2023

I, Thomas Giamichael, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Site Characterization Report 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).

Thomas Giamichael, P.G. #0621
Project Manager/Senior Environmental Geologist

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1.0 INTRODUCTION

LaBella Associates (Labella), Formerly Aztech Environmental Technologies (Aztech), has prepared this correspondence to document investigation activities for an initial Site Characterization (SC) related to the property located at 338 Broadway, Ulster County, Kingston, New York, hereinafter referred to as "the Site". A Site Location Map is included as **Figure 1**.

The Site has been assigned Site No. 356058 and classified as a "P-Site" (sites that have the potential to be listed on the Registry of Inactive Hazardous Waste Disposal Sites) within the NYSDEC State Superfund Program. The primary goal of the SC is to characterize Site related contamination as it applies to groundwater, soil and soil vapor. The results of the SC will be used to determine an appropriate classification of the site and determine whether an Interim Remedial Measure (IRM) is required.

1.1 SITE LOCATION AND DESCRIPTION

The subject property located at 338 Broadway consists of approximately 0.23 acres and is located in the City of Kingston within Ulster County. The Site surface is generally level with a slight downward grade towards the north-northeast.

The Site is bounded by Broadway and Jensen Avenue toward the south and north, respectively. Immediately east of the Site is an automobile repair shop, (Bob's Automotive), located at 336 Broadway and a fast food restaurant, (Burger King), located at 332 Broadway. Northeast of the site is a residential two story home, located at 25 Jansen. The building immediately to the west is occupied by a fast food restaurant (Kulture) at 342 Broadway and a Grocery Store (El Mercadito) at 344 Broadway. The properties located south of the Site, across Broadway, consist of a Valero gasoline station and residential properties.

The Site is comprised of one (1) parcel, Tax Map No. 56.26-11-46. According to the Image Mate Online database for Ulster County, the Site is currently zoned Commercial. The parcel is occupied by a single large building with split units and a portion consisting of three (3) stories. The building currently operates as a clothing boutique. The remainder of the parcel consists of broken pavement.

Initial investigation activities for the SC also included work on additional parcels, under the same ownership as the Site, located adjacent to 338 Broadway. The additional parcels consisted of Tax Map number 56.26-11-45 located at 17 Jansen Avenue; Parcel number 56.26-11-44 located at 15 Jansen Avenue, and Parcel number 56.26-11-12 located at 336 Broadway (Bob's Automotive).

A Site map with approximate property boundaries map is provided as **Figure 2.**

1.2 GEOLOGY AND HYDROGEOLOGY

The Site is situated in the Hudson/Mohawk Lowlands of New York State. Erosion of weak rocks along outcrop belts have shaped the regional topography. Localized outcrops of Devonian

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limestone occur near the Site, as the overburden sequence thins along valley walls and at hilltops exposing the underlying bedrock. The Catskill Mountains to the west and metamorphosed shale hills of the Taconic range to the east create regionally high relief, but with the lowlands near the Hudson River, where the Site is located, the topography is generally flat.

The surficial geology of the Site consists primarily of a stratified glacial outwash sequence overlying lacustrine varved silt and clay deposits. According to the Natural Resources Conservation Service (NRCS) in Ulster County, the Site bedrock is overlain by the Plainfield loamy sand, 0 to 8 percent slopes. The Plainfield series consists of deep, excessively drained soils formed in sandy drift on outwash plains, valley trains, glacial lake basins, stream terraces, and moraines and other upland areas. Permeability is rapid or very rapid. These soils occupy gently sloping areas of glacial till in the uplands.

Review of the geologic bedrock map of New York, Lower Hudson Sheet published by the University of the State of New York, the State Education Department, dated 1970, indicates that the Site is underlain by the Onondaga limestone. The Onondaga formation is within the Onondaga and Ulster Group, which is lower to middle Devonian in age, and is comprised of carbonate sedimentary rock that are characterized by calcarenitic to cherty to argillaceous limestone and minor shales deposited in a shallow epicontinental sea. The Esopus unit, relative to the Site, is moderately hard, dark gray or buff to light olive sandy shale. Unit thickness ranges from 200 to 300 feet in Ulster County.

Knowledge from recent subsurface investigations in the local area suggest that groundwater is typically encountered between eight (8) and 14 feet below ground surface (fbgs). A layer of less permeable glacial deposits (silt-rich clay) is typically encountered between shallow groundwater and the bedrock sequence.

The Hudson River is the main regional hydrologic feature, flowing from north to south along the Hudson Valley floor approximately 1½ miles east of the Site. The Roundout Creek, an eastward flowing tributary to the Hudson River, is located approximately ¾ mile south of the Site. The Hudson River and its tributaries are areas of groundwater discharge. As such, groundwater in topographically flat areas near the site will tend to flow towards the river and nearby creeks and streams that flow into the Hudson River.

1.3 SITE BACKGROUND

A review of available records show the earliest history of the subject Site being identified on the 1887 Sanborn Fire Insurance map. The map identifies a structure partially resembling the current building form. However, the rear of the structure at the time of 1887 appears to be connected to another structure residing on the adjoining parcel to the east. According to the 1887 Sanborn record, the use of the structure is identified as a saloon. The earliest recorded change to the

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physical structure of the Site building and its use is identified on the 1950 Sanborn map. As presented in the 1950 record, the building has been separated from the formerly adjoining building to the east and the structure has been expanded to the north resembling its current structure form. Use of the Site in 1950 is identified as a dry cleaner. It is unclear when dry cleaning operations at the site ceased. A copy of the 1887 and 1950 Sanborn maps are presented in **Figure 3** and **Figure 4**, respectively.

1.4 HISTORICAL INVESTIGATIONS AND REPORTING

No record of previous investigation work specific to the onsite property was available for review prior to implementation of the SC.

A previous offsite subsurface investigation, east of the Site, related to the New York State Brownfield Cleanup Program (BCP Site Number C356032) was performed by AECOM in 2016. The offsite investigation documented the presence of chlorinated volatile organic compounds (CVOCs) including Tetrachloroethene (PCE), Trichloroethene (TCE), cis-1,2, dichloroethene (DCE) and trans-1,2,DCE in groundwater samples collected from offsite monitoring well MW-6 located at 322 Broadway (Burger King). The MW-6 location is immediately adjacent and to the east of the Site at 338 Broadway (Figure 2).

The 2016 offsite investigation by AECOM ultimately led to the pursuit for investigation of 338 Broadway as a potential CVOC source.

2.0 SITE CHARACTERIZATION

The scope of work for initial characterization of the Site was defined by the NYSDEC in callout 137372. A summary of investigation activities performed during the SC include the following:

- Geophysical survey;
- Installation of six (6) soil borings completed as groundwater monitoring wells;
- Collection of four (4) surface soil samples;
- Initial installation of ten (10) soil gas probes and additional installation of ten (10) supplemental soil gas probes;
- Installation of sub-slab vapor points for evaluation of Soil Vapor Intrusion (SVI) at eight (8) locations;
- Professional land survey;
- Collection and analysis of soil, soil vapor and groundwater samples for parameters of concern including emerging contaminants; and
- Report of findings.

The field activities associated with the SC investigation were conducted in several phases, which began on September 23, 2020 and were complete on September 17, 2022.

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Details of the investigation activities are presented in the following sections.

2.1 GEOPHYSICAL SURVEY

On September 23, 2020 Clean Globe Environmental (Clean Globe) of Brentwood, New York, a subcontractor of Labella, performed a geophysical subsurface survey in accessible areas of the Site. A Labella Geologist was onsite to oversee activities.

Clean Globe used an electromagnetic metal detector, ground penetration radar (GPR) and various utility locating instruments to scan detectable subsurface utilities and/or structures. The objective of the geophysical survey was to:

- Locate potential below-grade remnants of building structures, drums or underground storage tanks (USTs).
- Assess and mark-out locations for possible underground utilities.
- Evaluate the depth to the bedrock surface (if the bedrock surface is less than approximately 15 feet below grade).
- Aid in determining the locations of soil borings and monitoring wells to be installed during the SC.

During the investigation, multiple underground utilities were identified and marked in the field with spray paint and flags to assist in the soil boring program. However, no anomalies such as potential USTs were identified. Bedrock was also not encountered during the investigation.

A photographic record of general Investigation activities is presented in **Attachment A**.

2.2 SOIL BORING ADVANCMENT

Between September 30 and October 6, 2020 Parratt Wolff of Syracuse, New York, a subcontractor of Labella, on behalf of NYSDEC installed six (6) soil borings SB-1 to SB-6 at the Site. The soil borings were completed as groundwater monitoring wells MW-1 through MW-6, respectively. The boring locations were selected by NYSDEC and slightly modified in the field based on GPR results to allow for an accurate characterization of the Site with consideration for anticipated direction of groundwater flow and potential contaminant migration. The soil boring locations are presented on **Figure 5**.

A track mounted 7822 Geoprobe® drill rig, equipped with direct push technology was utilized during the soil boring advancement and monitoring well installation. Each soil boring was advanced from the surface to between five (5) and seven (7) feet into the observed groundwater table. Terminal depths of each boring varied between 15 and 20 feet below grounds surface (fbgs). During these activities, depth discrete soil samples were collected utilizing 5-foot macro-core acetate sleeves, two (2) inches in diameter. A Labella geologist characterized recovered soil

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samples in the field for color, grain size, moisture content, and presence of petroleum or solvent impacts.

After the soil samples were characterized, they were placed in re-sealable, airtight plastic bags and allowed to volatilize. The headspaces of samples were then screened for volatile organic compounds (VOCs) using a MiniRae 3000 photoionization detector (PID) equipped with a 10.6 eV bulb and calibrated to a benzene standard using 100 parts per million (ppm) isobutylene gas. No soil samples recovered from borings SB-1 to SB-6 during the investigation exhibited elevated headspace readings. The highest headspace response observed was 1.2 ppm from the 10 to 15 fbgs interval in SB-3.

Details for each soil boring are presented in the soil boring and well completion logs (**Attachment B**).

2.2 GEOLOGY OF SOIL SAMPLES

Soil encountered during the boring program typically consisted of loose brown fine to medium sand with varying amounts of silt from just beneath the surface and ranging to approximately 10 to 14 fgbs. The predominant sand and silt soils were found to overlay a confining layer of gray silt and clay. The silt and clay confining interval was generally firm, and encountered below the observed water table. The silt and clay layer extended to the maximum investigation terminal depth 20 fbgs. Groundwater was observed in all soil samples at an average depth of 8.2 fbgs. Boring advancement did not exceed the confining layer of silt and clay. The average terminal depth of boring was 16.6 fbgs. Boring refusal and bedrock were not encountered during the investigation.

2.3 SOIL BORING SAMPLING AND LABORATORY ANALYSIS

Three (3) subsurface samples for laboratory analysis were collected from each of the six (6) soil borings installed between September 30 and October 6, 2020. In general, one (1) sample designated as (A) was collected from the vadose zone; one (1) sample designated as (B) was collected from the observed water table interface and one (1) sample designated as (C) was retained from within the saturated zone.

Each sample selected for laboratory analysis was placed in the appropriate containers provided by the laboratory. Sample containers for VOC analyses were filled first. The remaining soil from select locations was then homogenized for composite sampling of additional laboratory analysis. Composite samples we prepared by mixing the soil in a decontaminated stainless steel bowl with a decontaminated stainless steel trowel. The samples were collected in appropriate bottleware supplied by the analytical laboratory, placed on ice in a cooler, and transported under proper chain of custody to, Eurofins Test America Laboratories (Test America) of Amherst, New York.

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Test America holds certification #10026 under the Environmental Laboratory Accreditation Program (ELAP).

All submitted soil samples were analyzed for the NYSDEC full list VOCs by United States Environmental Protection Agency (USEPA) Method 8260C. Two (2) randomly selected samples (SB-2B and SB-5C) were further analyzed for Semi-VOCs (SVOCs), polychlorinated biphenyls (PCBs), metals, pesticides, herbicides and Per-and Polyfluoroalkyl Substances (PFAS) by USEPA methods 8270D, 8082A, 6010C/7471B, 8081B, 8151A and modified 537, respectively.

The soil analytical results compared to the soil cleanup objectives published in the Title 6 New York Codes, Rules and Regulations (6 NYCRR) NYSDEC Unrestricted Use Soil Clean-up Objectives (SCOs) Subpart 375-6.8(a) and Commissioner's Policy-51 SCO (CP-51) are presented in **Table 1 to Table 6** and summarized below. The laboratory report is presented in **Attachment C**.

- Laboratory analytical results indicate that concentrations for all constituents analyzed were below their respective laboratory reporting limit in the soil sample submitted from SB-3A, SB-4A and SB-5A.
- Reported VOC concentrations above their respective laboratory reporting limits were detected in all soil samples except for SB-3A, SB-4A and SB-5A. However, all detected VOC concentrations were below the NYSDEC Unrestricted Use SCOs as per Subpart 375-6.8(a) or CP-51.
- Total VOCs ranged from 1.3 micrograms per kilogram (µg/kg) in SB-1A and SB-1B to 103.9 µg/kg in SB-5C.
- Tetrachloroethene (PCE) was detected above the laboratory reporting limit in SB-1A, SB-2A, SB-3C, SB-4C, SB-5B, SB-5C, and SB-6A. However, all detections were below the NYSDEC Unrestricted Use SCO of 1,300 µg/kg.
- Trichloroethene (TCE) was detected only in SB-5C at a concentration of 1.9 µg/kg. This is well below the NYSDEC Unrestricted Use SCO of 470 µg/kg.
- Methylene Chloride was detected in SB-2A, SB-2B, SB-3B, and SB-3C at concentrations of 2.7 µg/kg, 3.0 µg/kg, 3.4 µg/kg, and 4.3 µg/kg, respectively. These detections were below the NYSDEC Unrestricted Use SCO of 50 µg/kg.
- Chloroform was detected in SB-1B and SB-4B at concentration of 1.3 µg/kg and 0.55 µg/kg, respectively. These detections are both below the NYSDEC Unrestricted Use SCO of 370 µg/kg.
- The analyte Acetone was detected at various concentrations below the respective NYSDEC Unrestricted Use SCO of 50 µg/kg in SB-1C, SB-2C, SB-3C, SB-4B, SB-4C, SB-5Cm SB-6B, and SB-6C

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- SVOCs were analyzed only in samples SB-2B and SB-5C; no detections above the laboratory reporting limit were reported. As such, the samples are considered non-detect (ND).
- The Pesticide analyte Beta-BHC was reported in the sample from SB-5C at a concentration of 0.55 µg/kg. This is below the respective NYSDEC Unrestricted Use SCO of 36 µg/kg.
- Herbicides and PCBs were reported as ND from the samples collected from SB-2B and SB-5C.
- Total metals were reported at a concentration of 28,624 milligrams per Kilogram (mg/Kg) and 60,796 mg/Kg in samples SB-2B and SB-5C, respectively. All detections were below their respective NYSDEC Unrestricted Use SCO with the exception of Nickel. The sample from SB-5 reported Nickel at a concentration of 36.8 mg/Kg. The NYSDEC Unrestricted Use SCO for Nickel is 30 mg/Kg.
- Emerging contaminants 1,4-Dioxane and PFAs were analyzed only in the samples from SB-2B and SB-5C. Both samples reported 1,4-Dioxane as ND. The total reported concentration for PFAs was 0.786 µg/kg and 0.018 µg/kg, respectively. The detections for PFAs were below their respective NYSDEC Unrestricted Use SCOs in both samples.

2.4 SURFACE SOIL SAMPLING AND LABORATORY ANALYSIS

On October 6, 2020 a total of four (4) surface soil samples were collected from exposed surficial soils observed onsite. The surface soil sampling was conducted independent of the soil boring program discussed in the previous section.

In general, samples were collected no deeper than six (6) inches below the existing grade using a stainless steel trowel. Samples for inorganics and semi-volatile compounds were collected from between the surface and two (2) inches. Samples for VOCs were collected between two (2) and six (6) inches below grade. Each surface soil sample was placed in a re-sealable, airtight plastic bag and allowed to volatilize. The headspaces of samples were then screened for VOCs using a MiniRae 3000 PID equipped with a 10.6 eV bulb and calibrated to a benzene standard using 100 ppm isobutylene gas. In general, no positive PID response (i.e. >5.0 ppm) was observed in the headspaces of field screened samples.

Each sample was then containerized in appropriate bottleware supplied by the analytical laboratory, placed on ice in a cooler, and transported under proper chain of custody to Test America. All submitted soil samples were analyzed for the NYSDEC full list VOCs by USEPA Method 8260C. One (1) randomly selected sample (SURF-3) was further analyzed for SVOCs, PCBs, metals, pesticides, herbicides and PFAS by USEPA Methods 8270D, 8082A, 6010C/7471B, 8081B, 8151A and modified 537, respectively.

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The soil analytical results compared to the soil cleanup objectives published in the Title 6 NYCRR NYSDEC Unrestricted Use SCOs Subpart 375-6.8(a) and CP-51 are presented in **Table 1 to Table 6** and summarized below. The location of each soil sample is presented on **Figure 6**. The laboratory report is presented in **Attachment C**.

- Laboratory analytical results indicate that concentrations for all constituents analyzed were below their respective laboratory reporting limit in the soil sample submitted from SURF-1 and SURF-2.
- Reported VOC concentrations above their respective laboratory reporting limits were detected in soil samples SURF-3 AND SURF-4. However, all detected VOC concentrations were below the NYSDEC Unrestricted Use SCOs as per Subpart 375-6.8(a) or CP-51.
- Total VOCs ranged from 2.6 µg/kg in SURF-3 to 0.7 µg/kg in SURF-4.
- PCE was detected in sample SURF-3 at a concentration of 2.6 µg/kg. This detection is below the NYSDEC Unrestricted Use SCO of 1,300 µg/kg.
- SVOCs were analyzed only in the SURF-3 sample. Total SVOCs were reported at a concentration of 6,200 µg/kg. However, all detected SVOC analytes in SURF-3 were below the NYSDEC Unrestricted Use SCOs as per Subpart 375-6.8(a) or CP-51.
- Several pesticide constituents were detected above the laboratory reporting limit in sample SURF-3. A total of four (4) constituents exceeded their respective NYSDEC Unrestricted Use SCO. Specifically;
    - Analytes 4-4'-DDD, 4,4'-DDE, and 4,4'-DDT were reported at concentrations of 2,300 µg/kg, 410 µg/kg, and 1,400 µg/kg, respectively. These detections are above the respective NYSDEC Unrestricted Use SCO of 3.3 µg/kg.
    - The compound Dieldrin was reported at a concentration of 110 µg/kg. This detection exceeds the NYSDEC Unrestricted Use SCO of 5 µg/kg.
- Herbicides and PCBs were reported as ND in the samples collected from SURF-3.
- Total metals were reported at a concentration of 78,476 mg/Kg in the sample from SURF-3. A total of four (4) constituents exceeded their respective NYSDEC Unrestricted Use SCO. Specifically;
    - Copper was reported at a concentration of 51.9 mg/Kg. This detection is slightly above the NYSDEC Unrestricted Use SCO of 50 mg/kg;
    - Lead was reported a concentration of 365 mg/Kg. This detection exceeds the NYSDEC Unrestricted Use SCO of 63 mg/kg;

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- Zinc was reported above the NYSDEC Unrestricted Use SCO of 109 mg/kg at a concentration of 508 mg/Kg; and
- Mercury was reported at a concentration of 0.27 mg/Kg. This detection exceeds the NYSDEC Unrestricted Use SCO of 0.18 mg/kg.

- Emerging contaminants 1,4-Dioxane and PFAs were analyzed in the sample from SURF-3. The constituent 1,4-Dioxane was reported as ND. However, the total reported concentration for PFAs was 10.563 µg/kg. The analyte Perfluorooctane Sulfonic Acid (PFOS) was reported at a concentration of 6.4 µg/kg. This detection exceeds the respective NYSDEC Unrestricted Use SCO of 0.88 µg/kg.

2.5 SOIL GAS MONITORING PROBE INSTALLATIONS

During the September 30 to October 6, 2020 drilling program, a total of ten (10) soil gas monitoring probes (Vapor Probe) VP-1 to VP-10 were installed at the Site to evaluate potential impacts within in soil vapor, commonly referred to as soil gas.

Each soil vapor probe was installed within a 2.0-inch diameter borehole advanced via direct push tooling. The vapor probe was placed to sample the soil vapor from the subsurface within approximately 3.0-feet of the water table (as observed during the drilling program).

Each soil vapor sampling point was constructed using a 6.0-inch length of ½-inch diameter stainless steel wire mesh screen attached to ¼-inch diameter teflon-lined tubing. The screened portion was vertically centered within approximately 12-inches of #0 filter sand. The annular space above the screened interval was sealed with hydrated bentonite to within 2.0-feet of the ground surface. The annular space above the bentonite seal was backfilled with compacted native soil and completed with a steel, bolt-down road box set in a concrete pad.

A soil gas sampling event was conducted on December 22, 2020 and is detailed in the subsequent sections of this report. However, pending review of that data, the NYSDEC expanded the soil gas investigation to include installation of an additional ten (10) vapor probes VP-11 to VP-20. Installation of VP-11 to VP-20 was conducted between August 17 and 18, 2021 and was completed using a different method than the initial installation process. Alternatively, to using a drill rig, the boreholes advanced to install vapor probes VP-11 to VP-20 were performed using vacuum extraction methods. A 2.0-inch diameter borehole was advanced by vacuum extracting soil using a compressor and drum vacuum machine. Soil was extracted through a length of schedule 40 PVC and deposited directly into a 55-gallon drum. Once the desired borehole depth was achieved, approximately five (5) fbgs, the vapor probe was then installed using the same construction specifications as previously detailed.

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The location of all soil gas vapor probes VP-1 to VP-20 are presented on **Figure 7**. The construction specifications for each soil vapor point are included in the soil boring and well completion logs (**Attachment B**).

2.6 MONITORING WELL INSTALLATION

Following advancement of the onsite boring program, each of the six (6) soil borings were completed as a monitoring well. Soil borings SB-1 to SB-6 were designated as monitoring wells MW-1 to MW-6.

Each monitoring well was constructed of an appropriate length of 2-inch inner diameter (ID) schedule 40 polyvinyl chloride (PVC) plastic 10-slot well screen and solid riser. The annular space between the monitoring well screen and borehole wall was filled with number 1 filter pack sand. The sand filter pack extended approximately 2-feet above the well screen. The filter pack was subsequently sealed with bentonite chips that were hydrated before completing the monitoring well installation.

The drill casing was then extracted and each monitoring well was finished flush to grade with a steel, bolt-down road box set in a concrete pad. Construction specifications for each monitoring well are included in the soil boring and well completion logs (**Attachment B**).

2.7 WELL DEVELOPMENT

The newly installed monitoring wells were developed on October 7, 2020 by surging and bailing to remove fines and increase communication with the surrounding aquifer. Additionally, a peristaltic pump and disposable ¼ inch diameter tubing was utilized to evacuate purge water from the wells. A minimum of 10 well volumes were removed from each well.

Non-aqueous phase liquid (NAPL) was not observed during well development activities. Additionally, no petroleum or solvent related odors or visible sheen was observed in the purged groundwater. All development water was containerized in a 55-gallon drum and staged for offsite disposal.

3.0 SITE SURVEYING

On October 19, 2020, surveying was conducted by Brinnier & Larios PC of Kingston, New York as a subcontractor to Labella. Brinnier & Larios is a certified land surveyor licensed to practice in the State of New York.

The survey included the six (6) newly installed monitoring wells (MW-1 to MW-6), the four (4) surface soil locations and initial ten (10) soil gas vapor probe locations VP-1 to VP-10. The horizontal coordinates for each well location were tied to the New York State Plane, East (3101),

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North American Datum (NAD), 1983 coordinate system (NAD 83). The top of casing elevation for each well were established with respect to North American Vertical Datum (NAVD), 1988 (NAVD 88).

Additionally, survey data was collected for parcel boundaries and general site features within the study area. The data was used to produce a base map, stamped by the licensed surveyor, and provided to Labella. The surveyed base map has been used to produce figures within this report.

4.0 WELL GAUGING AND GROUNDWATER GRADIENT DETERMINATION

On October 19 and December 22, 2020 Labella completed separate groundwater gauging events of newly installed onsite monitoring wells MW-1 to MW-6.

Depth to groundwater measurements for all wells were collected using an electronic water level meter graduated in 0.01 feet intervals. All measurements were taken from the top of groundwater monitoring well casings. The water level meter was decontaminated between locations using acceptable industry practices and in accordance with the manufacturer.

All groundwater elevation data are referenced to the surveyed top of casing elevations. The groundwater gauging data for each event are presented on **Table 7** and illustrated on **Figure 8** and **Figure 9**, respectively.

On October 19, 2020, the average depth to groundwater was 8.06 feet below top of casing with an average elevation of 180.52 feet (NAVD 88). Groundwater flow on this date was calculated to be in a southeasterly direction and the average groundwater gradient within the measured well network was 0.006 ft/ft.

During the December 22, 2020 gauging event, the average depth to groundwater was 7.41 feet below top of casing with an average elevation of 181.17 feet. Groundwater flow on this date was calculated to be in a southeasterly direction and the average groundwater gradient within the measured well network was 0.005 ft/ft.

5.0 GROUNDWATER SAMPLING AND ANALYSIS

Between October 21 and October 22, 2020 groundwater samples were collected from the six (6) newly installed onsite monitoring wells (MW-1 to MW-6).

Groundwater sampling from each well was performed using modified low flow sampling techniques. Purging was accomplished using dedicated high-density polyethylene (HDPE) tubing (attached to a peristaltic pump) to draw groundwater from each well and into a flow-thru cell. The flow-thru cell was equipped with a multi-parameter water quality probe that recorded water quality field parameters (WQFPs) consisting of temperature, pH, specific conductance, dissolved

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oxygen, oxidation-reduction potential, and turbidity. The WQFPs and depth to water were collected at regular intervals while purging.

The October 21 to October 22, 2020 final measured WQFPs are presented on **Table 8**. Copies of the field sampling records and water quality parameters collected during purging are included in **Attachment D**.

Groundwater samples were retained following stabilization of the measured WQFPs. The samples were collected in appropriate bottleware supplied by the analytical laboratory, placed on ice in a cooler, and transported under proper chain of custody to Test America Laboratories.

The samples were analyzed for VOCs using the USEPA Method 8260. Analytical results were reported for the Target Compound List (TCL) and NYSDEC CP-51 list. One (1) randomly selected sample (MW-4) was further analyzed for SVOCs, PCBs, metals, pesticides, herbicides and PFAS by USEPA methods 8270D, 8082A, 6010C/7471B, 8081B, 8151A and modified 537, respectively.

5.1 GROUNDWATER SAMPLING RESULTS

The Laboratory analytical results for the October 21 to October 22, 2020 groundwater monitoring event are summarized below and presented in **Table 9** to **Table 14.** A VOC distribution map of select CVOC compounds in groundwater is presented as **Figure 10**. Refer to the laboratory analytical report in **Attachment E** for further details. A discussion of the groundwater sampling results is presented below:

- During well purging, water quality field parameters stabilized and groundwater turbidity reached less than 50 nephelometric turbidity units (NTU's) at all sampled monitoring wells.

- Monitoring well MW-6 indicated total VOC concentrations were below the laboratory reporting limit for each respective analyte and are considered non-detect (ND).

- Total VOCs above the laboratory reporting limit in monitoring wells (MW-1 to MW-5) ranged from 1.5 micrograms per liter (µg/L) to 12 µg/L in MW-2 and MW-5, respectively.

- The analyte Chloroform was reported in MW-2 and MW-3 at a concentration of 5.7 µg/L and 0.61 µg/L, respectively. Monitoring wells MW-4 and MW-5 also reported Chloroform at a concentration of 2.1 µg/L and 2.6 µg/L, respectively. However, the detections were below the NYSDEC groundwater quality standard (GWQS) of 7.0 µg/L.

- Tetrachloroethene was reported in monitoring wells MW-1, MW-2, MW-3 and MW-4 at concentrations of 1.6 µg/L, 0.88 µg/L, 2.4 µg/L and 1.2 µg/L, respectively. These

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detections are below the respective GWQS of 5.0 µg/L. However, MW-5 reported tetrachloroethene exceeding the GWQS at a concentration of 12 µg/L.

- No SVOCs, Pesticides, Herbicides or PCBs were detected above the laboratory reporting limit in the sample from MW-4.

- Monitoring well MW-4 reported total metals at a concentration of 394.1 µg/L. However, no detections were above the GWQS for any reported analyte.

- Emerging contaminants 1,4-Dioxane and PFAs were analyzed only in the sample from MW-4. The analyte 1,4-Dioxane was not detected above the laboratory reporting limit and is considered ND. The total reported concentration for PFAs was 229.5 µg/L in MW-4. The analyte PFOS was reported at a concentration of 24 µg/L. This detection is above the GWQS of 2.7 µg/L.

6.0 SOIL GAS SAMPLING AND RESULTS

Following the groundwater sampling event, sampling of soil gas vapor probes VP-1 to VP-10 was conducted on December 22, 2020. As previously discussed a preliminary review of the soil gas data collected during that event resulted in the installation of ten (10) additional soil gas vapor probes (VP-11 to VP-20) in August 2021. A soil gas sampling event for vapor probes VP-11 to VP-20 was conducted on September 17, 2021.

A discussion of the sampling methodology and results for both events is presented below.

6.1 METHODOLOGY

On December 22, 2020 and September 17, 2022 a total of 20 soil vapor samples were collected from VP-1 to VP-20. To ensure ambient air from the surface was not drawn into the soil vapor probe the bentonite seal was tested at each vapor point location prior to sample collection. Testing of the seal was conducted by extending an appropriate length of teflon tubing from the vapor point through a tracer gas enclosure. The tubing was sealed to the tracer gas enclosure and the atmosphere within the enclosure was enriched with helium gas. Once the tracer gas enclosure was enriched with helium, the vapor point was purged of approximately three volumes at a flow rate of less than 0.2 liters per minute (L/min) using a purge pump. After purging was completed, a tedlar bag was filled with soil vapor from the sampling point and the contents field screened with a helium detector to measure percent helium to test the integrity of the seal between the soil vapor sampling point and the surface. Once the seal was confirmed via helium testing, sampling of the soil gas vapor point commenced.

Soil vapor samples were collected using laboratory-supplied summa canisters and flow regulators at each location. Each flow regulator was laboratory-calibrated to obtain the soil vapor sample over a 1.0-hour duration. After collection, soil vapor samples were submitted via overnight

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courier to the Test Americas' Knoxville, Tennessee laboratory where they were analyzed via analytical Method TO-15 for the full list of VOCs.

6.2 SOIL GAS ANALYSIS RESULTS

The soil vapor laboratory analytical results for the December 22, 2020 and September 17, 2022 soil gas sampling event are summarized in **Table 15 and Table 16**, respectively. A VOC distribution map of soil vapor from the respective sampling events are presented as **Figure 11** and **Figure 12**. A copy of the soil vapor laboratory analytical reports are included as **Attachment F**.

New York State currently does not have any standards, criteria or guidance values for concentrations of compounds in soil vapor per the New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York – October, 2006.

The following discussion presents a comparison of the soil vapor data collected from December 22, 2020 and September 17, 2021 using the USEPA guidance values for target indoor air and shallow soil gas concentrations per Table 2A – Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating Intrusion to Indoor Air Pathway from Groundwater and Soils – November, 2002;

- In general, when reviewing the soil vapor laboratory analytical data, detected analytes appear to be primarily derived of chlorinated volatile organic compounds.
- Total VOCs detected above the laboratory reporting limit in soil gas samples ranged from 64 micrograms per cubic meter (µg/m^3) in VP-10 to 7,800 µg/m^3 in VP-11.
- The compound Chloroform was detected above the OSWER guidance value of 11 µg/m^3 in three (3) soil vapor samples ranged from 12 µg/m^3 in VP 16 to 290 µg/m^3 in VP 17.
- The analyte Tetrachloroethene was detected above the OSWER guidance value of 81 µg/m^3 in 17 soil vapor samples collected. The exceedance ranged from 130 µg/m^3 in VP-1 and VP-16 to 7,700 µg/m^3 in VP-11.
- Trichloroethene was detected above the OSWER guidance value of 2.2 µg/m^3 in VP-6, VP-11 and VP-12 at concentrations of 19 µg/m^3, 100 µg/$m^3$and 4.7 µg/m^3, respectively.
- The petroleum ranged compound 1,2,4-Trimethylbenzene was detected above the OSWER guidance value of 6.0 µg/m^3 at a concentration of 17 µg/m^3 in VP-12.
- No compounds exceeding the OSWER guidance values were detected above the laboratory reporting limit and are considered ND in both ambient outdoor air control samples collected from OA and OA-1.

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7.0 SOIL VAPOR INTRUSION INVESTIGATION

Based on the results of previous soil, groundwater and soil gas investigations, the NYSDEC and NYSDOH determined further investigation was necessary in order to evaluate if groundwater and/or soil contaminated with VOCs has affected indoor air quality through vapor intrusion. The area chosen for the study was predominantly commercial with a mix of residential properties. A total of eight (8) locations were selected for SVI evaluation. Sampling was performed between March 29 and 30, 2021.

7.1 SVI SCOPE OF WORK

The overall purpose of an SVI study is to evaluate whether or not the process of vapor intrusion is occurring at homes or businesses in the area where a presence of VOCs are known to exist in either groundwater or soil vapor. Tasks performed during the investigation included:

- Completion of a Structural Sampling Questionnaire and Building Inventory Logs;
- Collection of sub-slab, indoor basement, and ambient air samples from eight (8) locations;
- Collection of Quality Assurance/Quality Control (QA/QC) duplicate samples, and;
- Preparation of a summary report documenting the investigation.

7.2 METHODOLOGY

Independent designations are assigned to sampled structures to provide organization and continuity should future sampling be conducted. This is particularly useful to keep an SVI address private when multiple locations are sampled during a single event.

Below is a list of structures that were sampled for sub-slab and indoor air during the March 2021 sampling event along with the structure's sample location designation (i.e., the H number). The SVI sample locations are depicted on **Figure 13**.

- H1 – 25 Jansen (Residential Property)
- H2 – 15 Jansen (Residential Property)
- H3 – 322 Broadway (Burger King)
- H4 – 338 Broadway, Store #2 (AAA Uniforms)
- H5 – 338 Broadway, Store #1 (Sultanas Closet)
- H6 – 336 Broadway (Bob's Automotive)
- H7 – 342 Broadway (Kulture Restaurant)
- H8 – 344 Broadway (El Mercadito)

All sampling was conducted in accordance with the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006. During the sample collection, a NYSDOH Structural Sampling Questionnaire and Building Inventory Log was completed for each location. A copy of the completed Structure Sampling Questionnaire is provided as **Attachment G**.

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The sub-slab soil vapor samples were collected from semi-permanent vapor probes installed in structures with a concrete slab. The sub-slab soil vapor probe was installed using an electric drill and a Vapor Pin® kit. A length of ¼" diameter Teflon® lined tubing was attached to the Vapor Pin® to facilitate sampling. Prior to collection of a sub-slab vapor sample, the seal established around the Vapor Pin® was confirmed using a helium tracer gas method. Testing of the seal was conducted by extending an appropriate length of teflon tubing from the Vapor Pin® through a tracer gas enclosure. The tubing was sealed to the tracer gas enclosure and the atmosphere within the enclosure was enriched with helium gas. Once the tracer gas enclosure was enriched with helium, the Vapor Pin® was purged of approximately three volumes at a flow rate of less than 0.2 L/min using a purge pump. After purging was completed, the integrity of the seal between the Vapor Pin® and the surface was analyzed by filling a tedlar bag with soil vapor from the Vapor Pin® and the contents field screened with a helium detector to measure percent helium. Once the seal was confirmed via helium testing, sampling of the sub-slab vapor point commenced.

Indoor air and ambient outdoor air samples were collected directly by the sampling device located approximately five (5) feet above the ground surface.

The samples were collected using six-liter batch certified summa canisters equipped with laboratory-calibrated 24-hr (0.004 L/min) flow controllers. An outdoor ambient air sample was collected the day of sampling in order to obtain background conditions. After collection, samples were submitted to the Test America's Knoxville, Tennessee laboratory where they were analyzed in accordance with analytical Method TO-15 for the full list of VOCs.

7.3 SVI RESULTS

The Laboratory analytical results for the March 29 to March 30, 2021 SVI sampling event are summarized below. The SVI analytical results compared to the NYSDOH minimum decision matrix values as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006 are presented in **Table 17**. A copy of the laboratory analytical reports are included as **Appendix H**. A review of the SVI results for each individual structure is presented below:

Structure H1

- The H1 sub-slab sample reported multiple VOCs above the laboratory detection limit. The compound methylene chloride was detected in the sub-slab sample at a concentration of 280 µg/m^3, which exceeded the NYSDOH sub-slab vapor concentration minimum decision matrix value of 100 µg/m^3.

- The corresponding H1 indoor air sample reported methylene chloride at a concentration of 140 µg/m^3, which exceeded the NYSDOH minimum decision matrix value of 3.0 µg/m^3.

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- Overall, when comparing the sub-slab soil vapor and indoor air results for structure H1, mitigation is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Structure H2

- The H2 sub-slab sample reported multiple VOCs above the laboratory detection limit.
- The compound methylene chloride was detected above the respective NYSDOH minimum decision matrix values of 100 µg/m^3 and 3.0 µg/m^3 in both the sub-slab and corresponding indoor air sample at concentrations of 170 µg/m^3 and 130 µg/m^3, respectively.
- Overall, when comparing the sub-slab soil vapor and indoor air results for structure H2, mitigation is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Structure H3

- The H3 sub-slab sample reported multiple VOCs above the laboratory detection limit.
- The compound methylene chloride was detected above the respective NYSDOH minimum decision matrix values of 100 µg/m^3 and 3.0 µg/m^3 in both the sub-slab and corresponding indoor air sample at concentrations of 170 µg/m^3 and 120 µg/m^3, respectively.
- Overall, when comparing the sub-slab soil vapor and indoor air results for structure H3, mitigation is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Structure H4

- The H4 sub-slab sample reported multiple VOCs above the laboratory detection limit.
- The compound methylene chloride was detected above the respective NYSDOH minimum decision matrix values of 100 µg/m^3 and 3.0 µg/m^3 in both the sub-slab and corresponding indoor air sample at concentrations of 160 µg/m^3 and 130 µg/m^3, respectively.
- Overall, when comparing the sub-slab soil vapor and indoor air results for structure H4, mitigation is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Structure H5

- The H5 sub-slab sample reported multiple VOCs above the laboratory detection limit.

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- The compound methylene chloride was detected above the respective NYSDOH minimum decision matrix values of 100 µg/m^3 and 3.0 µg/m^3 in both the sub-slab and corresponding indoor air sample at concentrations of 170 µg/m^3 and 97 µg/m^3, respectively.

- The compound tetrachloroethene was also detected above the respective NYSDOH minimum decision matrix values of 100 µg/m^3 and 3.0 µg/m^3 in both the sub-slab and corresponding indoor air sample at concentrations of 220 µg/m^3 and 7.2 µg/m^3, respectively.

- Overall, when comparing the sub-slab soil vapor and indoor air results for structure H5, mitigation is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Structure H6

- The H6 sub-slab sample reported multiple VOCs above the laboratory detection limit.

- Tetrachloroethene was reported above the NYSDOH sub-slab vapor concentration minimum decision matrix value of 100 µg/m^3 in the sub-slab and the duplicate sub-slab at concentrations of 720 and 580 µg/m^3, respectively. The corresponding indoor air sample reported tetrachloroethene at a concentration of 89 µg/m^3 which exceeds the minimum decision matrix value of 3.0 µg/m^3 for indoor air

- A secondary set of sub-slab and indoor air samples were collected at structure H6. Tetrachloroethene was detected above the respective NYSDOH minimum decision matrix values in both the secondary sub-slab and corresponding indoor air sample at concentrations of 160 µg/m^3 and 78 µg/m^3, respectively.

- In addition, methylene chloride was detected above the NYSDOH sub-slab vapor concentration minimum decision matrix value of 100 µg/m^3 in the sub-slab and the duplicate sub-slab at concentrations of 130 and 110 µg/m^3, respectively. The corresponding indoor air sample was ND for methylene chloride.

- The secondary sub-slab sample also reported methylene chloride above the NYSDOH sub-slab vapor concentration minimum decision matrix value of 100 µg/m^{3}at a concentration of 410 µg/m^3. The corresponding secondary indoor air sample was ND for methylene chloride.

- Overall, when comparing the sub-slab soil vapor and indoor air results for structure H6, mitigation is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

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Structure H7

- The H7 sub-slab sample reported multiple VOCs above the laboratory detection limit.
- Methylene chloride was detected at a concentration 30 µg/m^3; this detection was below the respective NYSDOH minimum decision matrix values of 100 µg/m^3 in the sub-slab sample. The corresponding indoor air sample reported methylene chloride above the respective NYSDOH minimum decision matrix values of 3.0 µg/m^3 at a concentration of 40 µg/m^3.
- Overall, when comparing the sub-slab soil vapor and indoor air results for structure H7, identifying the source and resampling or mitigation is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

Structure H8

- The H8 sub-slab sample reported multiple VOCs above the laboratory detection limit.
- The compound methylene chloride was detected above the respective NYSDOH minimum decision matrix values of 100 µg/m^3 and 3.0 µg/m^3 in both the sub-slab and corresponding indoor air sample at concentrations of 110 µg/m^3 and 57 µg/m^3, respectively.
- Overall, when comparing the sub-slab soil vapor and indoor air results for structure H8, mitigation is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

8.0 SUPPLEMENTAL SUBSURFACE INVESTIGATION

Between May 16 and 23, 2023 a supplemental subsurface investigation (SSI) was conducted to further assess the potential source of CVOC impacts identified at the Site. The SSI focused on the Bob's Automotive building and exterior surroundings located at 336 Broadway. The intent of the investigation was to determine if the subsurface conditions at the Bob's Automotive property are a contributing factor to the source to previously identified Site impacts.

A summary of investigation activities performed during the SSI include the following:

- Geophysical survey and utility tracing;
- Installation of four (4) soil borings complete as temporary monitoring wells within the footprint of the Bob's Automotive building;
- Installation of four (4) soil borings complete as temporary monitoring wells at select locations on the property surrounding the building.

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- Collection of multiple soil samples at select depths from each soil boring for laboratory analysis; and
- Collection of grab groundwater samples from each temporary monitoring for laboratory analysis.

A total of eight (8) soil borings were and advanced during the investigation. Details are presented in the following section.

8.1 GEOPHYSICAL INVESTIGATION AND UTILITY TRACING

On May 16, 2023 Clean Globe Environmental, a subcontractor of Labella, performed a geophysical subsurface survey within accessible areas of the Bobs Automotive building and exterior portions of the property located at 336 Broadway in the Site. A Labella Geologist was onsite to oversee activities.

Clean Globe used an electromagnetic metal detector, ground penetration radar (GPR) and various utility locating instruments to scan detectable subsurface utilities and/or structures. The objective of the geophysical survey was to:

- Locate potential below-grade remnants of building structures, drums or underground storage tanks (USTs).
- Trace drainage pathways of floor drains
- Assess and mark-out locations for possible underground utilities or anomalies.
- Aid in determining the locations of soil borings to be installed during the supplemental investigation.

During the investigation, multiple underground utilities were identified and marked in the field with spray paint and flags to assist in the soil boring program. Two (2) floor drains located in the front of the building beneath vehicle lifts were identified and traced. The drainage path of the floor drains were found to converge into a single drain line and exit the front building. The drains appear to tie into the city sewer system along Broadway. No other drainage pipe was identified during the survey.

A small GPR anomaly was identified within the garage building at the transition from the garage bays located in 336 Broadway into the main building located at 388 Broadway. Due to interference, it was unable to be determined if the anomaly was metal conductive. The anomaly was indicative of an underground storage tank. A second metal anomaly was identified on the exterior located near the border of the Burger King parking lot. The anomaly only showed metalic conductive properties and was not detected via GPR scanning.

A map produced by Clean Globe showing the location of the identified features during the geophysical investigation is presented on **Figure 14**. A photographic record of general Investigation activities is presented in **Attachment A**.

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8.2 SOIL BORING ADVANCMENT

Between May 22 and 23, 2023 Core Down Drilling, LLC (CDD) of Brewster, New York, a subcontractor of Labella, on behalf of NYSDEC installed eight (8) soil borings and temporary monitoring wells (SB-7 through SB-14) at the Bob's Automotive property located at 336 Broadway. Soil borings SB-7 to SB-10 were located within the footprint of the building and soil borings SB-11 to SB-14 were located on the exterior to the rear of the property. Soil boring locations for the SSI were selected by the NYSDEC to achieve a more comprehensive coverage than the previous investigations provided. The soil boring locations advanced during the SSI are presented on **Figure 15**.

A track mounted 54DT Geoprobe® drill rig, equipped with a short mast and direct push technology was utilized during the soil boring advancement and temporary monitoring well installation. Each soil boring was advanced from the surface to approximately 16 fbgs, with some minor variation. The terminal depth was chosen based on previous site data to straddle the water table and terminate within the observed silt and clay confining layer. During boring activities, depth discrete soil samples were collected utilizing 4-foot macro-core acetate sleeves, two (2) inches in diameter. A Labella geologist characterized recovered soil samples in the field for color, grain size, moisture content, and presence of petroleum or solvent impacts.

After the soil samples were characterized, they were placed in re-sealable, airtight plastic bags and allowed to volatilize. The headspaces of samples were then screened for VOCs using a MiniRae 3000 photoionization detector (PID) equipped with a 10.6 eV bulb and calibrated to a benzene standard using 100 parts per million (ppm) isobutylene gas. Soil samples from borings SB-7, SB-8 and SB-12 exhibited elevated headspace readings (i.e. >5.0 ppm). The soil head space response from SB-7 was recorded at 9.2 ppm from the 13.5 to 16 fgbs interval. No staining or odor was observed. The headspace response from SB-8 was recorded at a concentration of 10.2 ppm from the 14 to 16 fbgs interval. A slight odor was observed in the sample; however no staining was present. Additionally, the headspace response of 7.2 ppm at SB-12 was observed in the 14 to 16 fgbs interval. No odor or staining was present.

All soil samples recovered from borings SB-9, SB-10, SB-11, SB-13 and SB-14 during the investigation did not exhibit elevated PID readings. Laboratory analysis of select soil samples retained from each boring are discussed in the following section.

Details for each soil boring are presented in the soil boring and well completion logs (**Attachment B**). A photographic record of general Investigation activities is presented in **Attachment A**.

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8.3 SOIL BORING SAMPLING AND LABORATORY ANALYSIS

Select soil samples were collected from each soil boring based on the following criteria. At Soil borings advanced within the Bob's Automotive building (SB-7 to SB-10), four (4) subsurface samples for laboratory analysis were collected as follows: One (1) sample designated as (A) was collected from immediately beneath the concrete floor slab; One (1) sample designated as (B) was collected from the vadose zone; one (1) sample designated as (C) was collected from the observed water table interface and one (1) sample designated as (D) was retained from the silt/clay confining layer located at the borings terminal depth.

Alternatively, soil samples from soil borings advanced on the exterior of the building (SB-11 to SB-14), three (3) subsurface samples for laboratory analysis were collected as follows: One (1) sample designated as (A) was collected from the vadose zone; one (1) sample designated as (B) was collected from the observed water table interface and one (1) sample designated as (C) was retained from the silt/clay confining layer located at the borings terminal depth.

Each sample selected for laboratory analysis was placed in the appropriate bottleware supplied by the analytical laboratory, placed on ice in a cooler, and transported under proper chain of custody to Con-Test a Pace Analytical® Laboratory of East Longmeadow, Massachusetts. Contest is an ELAP certified lab and holds certification #10899.

All submitted soil samples were analyzed for the NYSDEC full list VOCs by United States Environmental Protection Agency (USEPA) Method 8260C. Analytical results were reported for the Target Compound List (TCL) and NYSDEC Commissioner Policy (CP)-51 list.

The soil analytical results compared to the soil cleanup objectives published in the Title 6 New York Codes, Rules and Regulations (6 NYCRR) NYSDEC Unrestricted Use Soil Clean-up Objectives (SCOs) Subpart 375-6.8(a) and Commissioner's Policy-51 SCO (CP-51) are presented in **Table 18** and summarized below. The laboratory report is presented in **Attachment I**.

- Reported VOC concentrations above their respective laboratory reporting limits were detected in all soil samples collected from SB-7 to SB-14, with the exception of samples SB-13B, SB-13C, SB-14B and SB-14C. Additionally, concentrations of select VOC analytes from SB-7D, SB-8D, SB-11C and SB-12C were reported above the NYSDEC Unrestricted Use SCOs as per Subpart 375-6.8(a) or CP-51.
- Total VOCs ranged from 0.9 µg/kg in SB-13A to 111,900 µg/kg in SB-8D.
- The analyte Acetone was detected in multiple samples and ranged in concentration from 7.2 µg/kg in SB-11B to 43 µg/kg in SB-9B and SB-10C. All detections of Acetone above the laboratory reporting limit were below the respective NYSDEC Unrestricted Use SCO of 50 µg/kg.

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- Benzene detected only in SB-8A at a concentration of 0.5 µg/kg. This is well below the NYSDEC Unrestricted Use SCO of 60 µg/kg.
- The compound cis-1,2-Dichloroethylene was detected only in SB-9A at a concentration of 12 µg/kg. This is below the NYSDEC Unrestricted Use SCO of 250 µg/kg.
- Tetrachloroethene was detected above the laboratory reporting limit in 22 of 28 soil samples submitted. A total of four (4) samples reported PCE above the NYSDEC Unrestricted Use SCO of 1,300 µg/kg.
    - Concentrations of PCE exceeding the SCO were reported in SB-7D at 5,900 µg/kg, SB-8D at 110,000 µg/kg, SB-11C at 21,000 µg/kg, and SB-12C at 110,000 µg/kg.
    - All exceedances of PCE were encountered from the soil samples retained at the terminal depth of the respective borehole within the silt and clay confining layer.
- Trichloroethene was detected in five (5) of 28 soil samples submitted. Two (2) samples reported TCE above the NYSDEC Unrestricted Use SCO of 470 µg/kg.
    - Concentrations of TCE exceeding the SCO were reported in SB-8D at 1,900 µg/kg, and SB-12C at 1,700 µg/kg.
    - Additionally, as noted above, exceedances of TCE were encountered from the soil samples retained at the terminal depth of the respective borehole within the silt and clay confining layer.
- No other VOCs were detected above their respective laboratory reporting limit.

8.4 TEMPORARY MONITORING WELL INSTALLATION

To facilitate grab groundwater samples, each soil boring was completed as a temporary monitoring well. Temporary monitoring wells were constructed with a 10-foot length of 1-inch inner diameter (ID) schedule 40 polyvinyl chloride (PVC) plastic 10-slot well screen and an appropriate length of solid riser. The annular space between the monitoring well screen and borehole wall were not filled and no seal was installed. The temporary monitoring well was set to staddle the water table based on soil sample observations. No groundwater elevations or survey data were collected from the temporary wells.

Following sample collection each well was immediately removed; the borehole was filled with clean fill and the surface was restored to original conditions. Construction specifications for each temporary monitoring well are included in the soil boring and well completion logs (**Attachment B**).

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8.5 GROUNDWATER SAMPLING AND ANALYSIS

Between May 22 and May 23, 2023 groundwater samples were collected from the eight (8) temporary monitoring wells installed at SB-7 to SB-14.

Groundwater sampling from each well was performed using hand bailing methods. A new ¾-inch disposable HDPE bailer was used at each location. Several bailers of groundwater were purged from each temporary monitoring well prior to grab sample collection. However, traditional well development methods were not employed during the groundwater study. Groundwater quality parameters were not collected during the sampling event.

Grab groundwater samples were retained in appropriate bottleware supplied by the analytical laboratory, placed on ice in a cooler, and transported under proper chain of custody to Con-Test a Pace Analytical® Laboratory of East Longmeadow, Massachusetts. Contest is an ELAP certified lab and holds certification #10899.

The samples were analyzed for VOCs using USEPA Method 8260. Analytical results were reported for the Target Compound List (TCL) and NYSDEC Commissioner Policy (CP)-51 list.

8.6 GROUNDWATER SAMPLING RESULTS

The laboratory analytical results for the May 22 and May 23, 2023 groundwater monitoring event are summarized below and presented in **Table 19.** A VOC distribution map of select CVOC compounds in groundwater are presented on **Figure 16**. Refer to the laboratory analytical report in **Attachment J** for further details. A discussion of the groundwater sampling results is presented below:

- Total VOCs were reported above the laboratory reporting limit in the groundwater samples from all temporary monitoring wells SB-7 to SB-14. The total detected VOCS ranged from 0.97 µg/L to 147.9 µg/L in SB-10 and SB-14, respectively.

- Acetone was detected above the laboratory reporting limit in all borings (SB-7 to SB-14) except for SB-10 and SB-12. Reported concentrations ranged from 4.1 µg/L to 7.0 µg/L in SB-13 and SB-2, respectively. The reported detections were below the NYSDEC GWQS of 50 µg/L.

- The analyte Chloroform was reported in SB-7, SB-8, SB-9, and SB-11. Reported concentrations ranged from 0.27 µg/L to 0.45 µg/L in SB-11 and SB-9, respectively. The reported detections were below the NYSDEC GWQS of 7.0 µg/L.

- The analyte cis-1,2-Dichloroethylene was reported at a concentration of 0.44 µg/L and 130 µg/L in the samples collected from SB-9 and SB-14, Respectively. The detection of cis-1,2-Dichloroethylene reported in SB-14 is above the GWQS of 5.0 µg/L.

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- Tert-Butylbenzene was reported at a concentration of 0.16 µg/L in the sample collected from SB-13. This detection is below the GWQS of 5.0 µg/L.

- Tetrachloroethene was detected above the laboratory reporting limit in all borings (SB-7 to SB-14) except for SB-10. Reported concentrations ranged from 0.97 µg/L to 21 µg/L in SB-10 and SB-8, respectively. PCE was detected above the respective GWQS of 5 µg/L in SB7, SB-8, SB-9, and SB-11 at concentrations of 19 µg/L, 21 µg/L, 14, µg/L and, 10 µg/L, respectively.

- The analyte trans-1,2-Dichloroethylene was reported in SB-14 at a concentration of 0.47 µg/L. This detection is below the NYSDEC GWQS of 5.0 µg/L.

- Trichloroethylene was reported at concentrations of 0.3 µg/L, 0.22 µg/L and 6.6 µg/L in the samples collected from SB-9, SB-11 and SB-14, Respectively. The detection of TCE reported in SB-14 is above the GWQS of 5.0 µg/L.

- Vinyl Chloride was reported at a concentration of 1.8 µg/L in the sample collected from SB-13. This detection is below the GWQS of 2.0 µg/L.

9.0 DATA USABILITY SUMMARY REPORT

All Laboratory data acquired during investigation activities for the SC were validated by a third party. Alpha Geoscience (Alpha) of Clifton Park, New York validated the analytical data packages submitted to Labella by Test America. Analytical data packages are submitted as sample delivery groups (SDGs) based on the number of samples within each shipment received at the laboratory for analysis. Alpha reviewed the SDGs associated with the September 30 to October 6, 2020 soil boring and surface soil sampling event, December 2020 groundwater sampling event, December 2020 soil gas sampling event, March 29, 2021 SVI sampling event and September 17, 2021 soil gas sampling event. The data review was performed in February 2022 for completeness and compliance as defined by the requirements for NYSDEC Analytical Services Protocol Category B deliverables.

Data validation for the September 30 to October 6, 2020 soil sampling event consisted of laboratory SDG 480-176063-1. Validation was completed for 22 soil samples and two (2) quality assurance/quality control sample. All USEPA Method 8260C, 8270D, 8081B, 8082A, 8151A, 6010C, and 537 modified analysis data were determined to be acceptable with some issues indicated by qualifiers that are identified in the complete validation report.

Data validation for the October 21 to 22, 2020 groundwater sampling event consisted of laboratory SDG 480-177092-1. Validation was completed for 6 (six) groundwater samples, one

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(1) equipment blank and one (1) quality assurance/quality control sample. All USEPA Method 8260C, 8270D, 8081B, 8082A, 8151A, 6010C, and 537 modified analysis data were determined to be acceptable with additional qualifiers that are identified in the complete validation report.

Data validation for the December 22, 2020 soil gas sampling event consisted of laboratory SDG 140-21497-1. Validation was completed for 10 soil gas samples, one (1) ambient outdoor air and one (1) quality assurance/quality control sample. All USEPA Method TO-15 analysis data were determined to be acceptable with additional qualifiers that are identified in the complete validation report.

Data validation for the March 29 to March 30, 2021 Soil Vapor Intrusion sampling event consisted of laboratory SDG's 140-22588-1, 140-22589-1, 140-22590-1, 140-22591-1, 140-22595-1, 140-22596-1, 140-22597-1, and 140-22599.1. Validation was completed for 18 soil vapor intrusion samples, one (1) ambient outdoor air and one (1) quality assurance/quality control sample. All USEPA Method TO-15 analysis data were determined to be acceptable with additional qualifiers that are identified in the complete validation report.

Data validation for the September 17, 2021 soil gas sampling event consisted of laboratory SDG 140-24624-1. Validation was completed for 10 soil gas samples, one (1) ambient outdoor air and one (1) quality assurance/quality control sample. All USEPA Method TO-15 analysis data were determined to be acceptable with additional qualifiers that are identified in the complete validation report.

Data validation for the May 22 and May 23, 2023 soil and groundwater sampling events consisted of laboratory SDG's 23E3328, 23E3332, and 23E3116. Validation was completed for 28 soil samples, seven (7) groundwater samples and two (2) quality assurance/quality control sample. All USEPA Method 8260C analysis data were determined to be acceptable with additional qualifiers that are identified in the complete validation report.

Refer to the respective DUSR report for further details in **Attachment K**.

10.0 INVESTIGATION DERIVED WASTE

All Investigation derived waste generated during the offsite investigation and sampling activities were containerized in 55-gallon drums and disposed of offsite as non-hazardous waste. Waste disposal was performed by Mac-Son Industrial Services of Selkirk, New York. A total of 6 drums were generated. A copy of the disposal manifest is included as **Attachment L**.

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FIGURES

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N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 1

DATE: October, 2020

SCALE: NTS

Site Location Map

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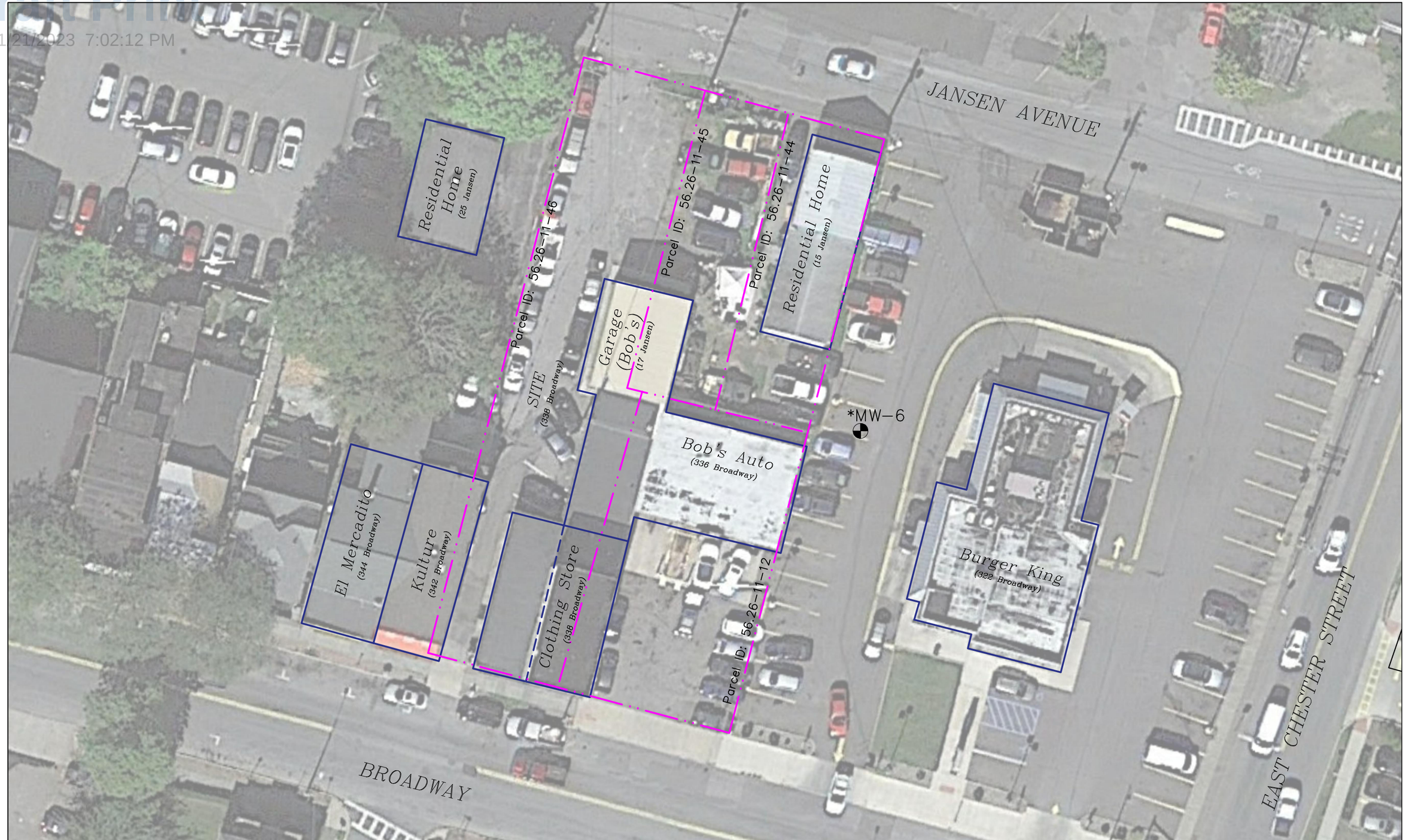

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Legend:

- Tax Parcel Boundary
- Existing Groundwater Monitoring Well
*MW-6 - This Location is Part of an Offsite Well Network

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 2

DATE: October, 2020 | SCALE: 1" = 75'

Site Map

Note: Aerial Image provided by Google Earth 2020

FIGURE 3

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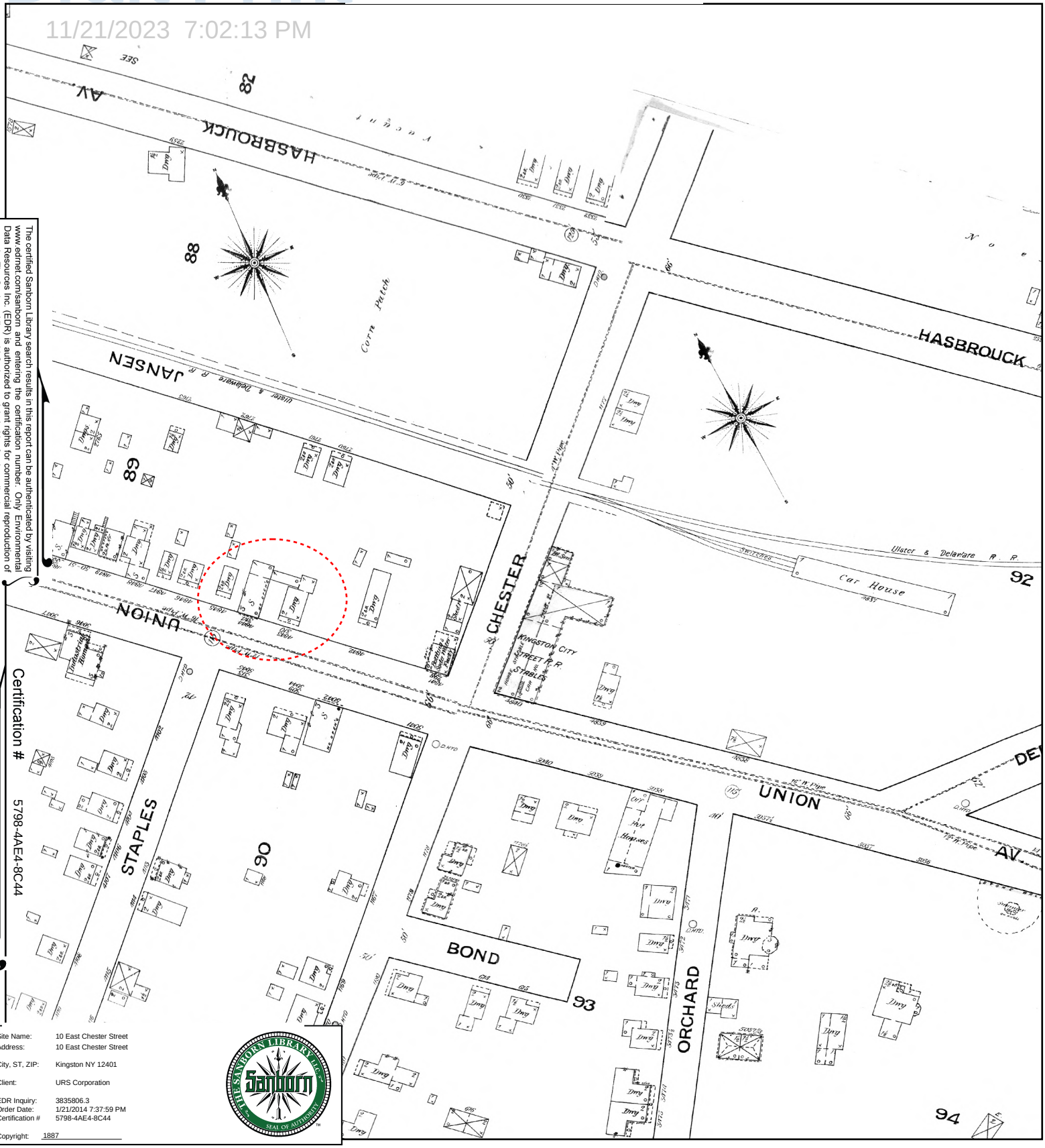

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Certification # 5798-4AE4-8C44

Site Name:	10 East Chester Street
Address:	10 East Chester Street
City, ST, ZIP:	Kingston NY 12401
Client:	URS Corporation
EDR Inquiry:	3835806.3
Order Date:	1/21/2014 7:37:59 PM
Certification #	5798-4AE4-8C44
Copyright:	1887

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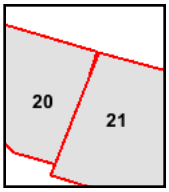

Volume 1, Sheet 20
Volume 1, Sheet 21

0 Feet 150 300 600

N

FIGURE 4

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1950 Certified Sanborn Map

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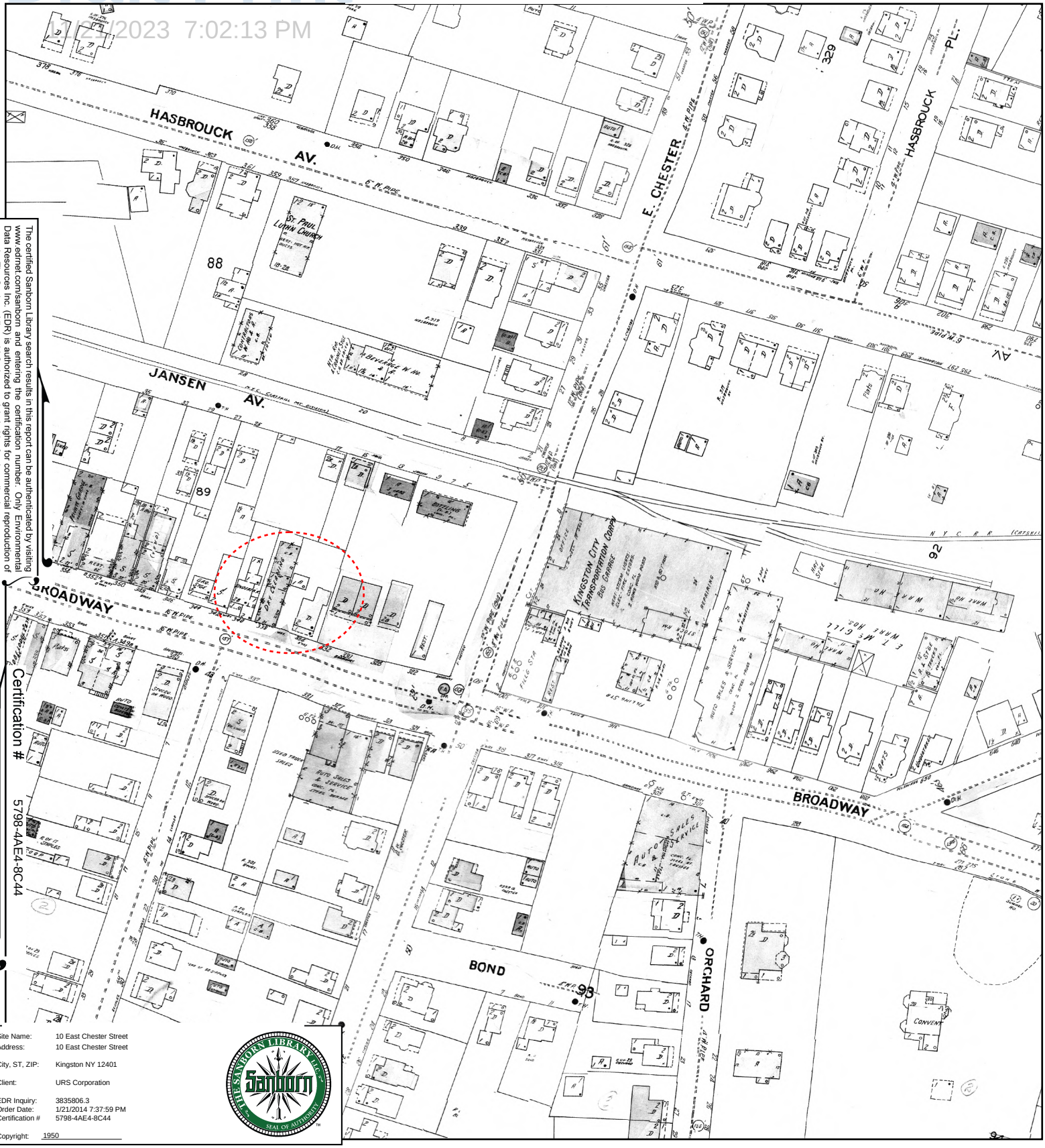

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Site Name:	10 East Chester Street
Address:	10 East Chester Street
City, ST, ZIP:	Kingston NY 12401
Client:	URS Corporation
EDR Inquiry:	3835806.3
Order Date:	1/21/2014 7:37:59 PM
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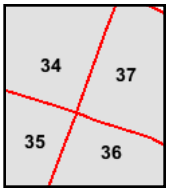

Volume 1, Sheet 36
Volume 1, Sheet 37
Volume 1, Sheet 34
Volume 1, Sheet 35

0 Feet 150 300 600

N

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Legend:

SB-1 ● - Soil Boring Location

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 5

DATE: October, 2020 | SCALE: 1" = 75'

Soil Boring Location Map

Note: Aerial Image provided by Google Earth 2020

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LaBella
Powered by partnership.

Legend:

SB–1 - Surface Soil Sample

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 6

DATE: October, 2020 | SCALE: 1" = 75'

Surface Soil Sample Location Map

Note: Aerial Image provided by Google Earth 2020

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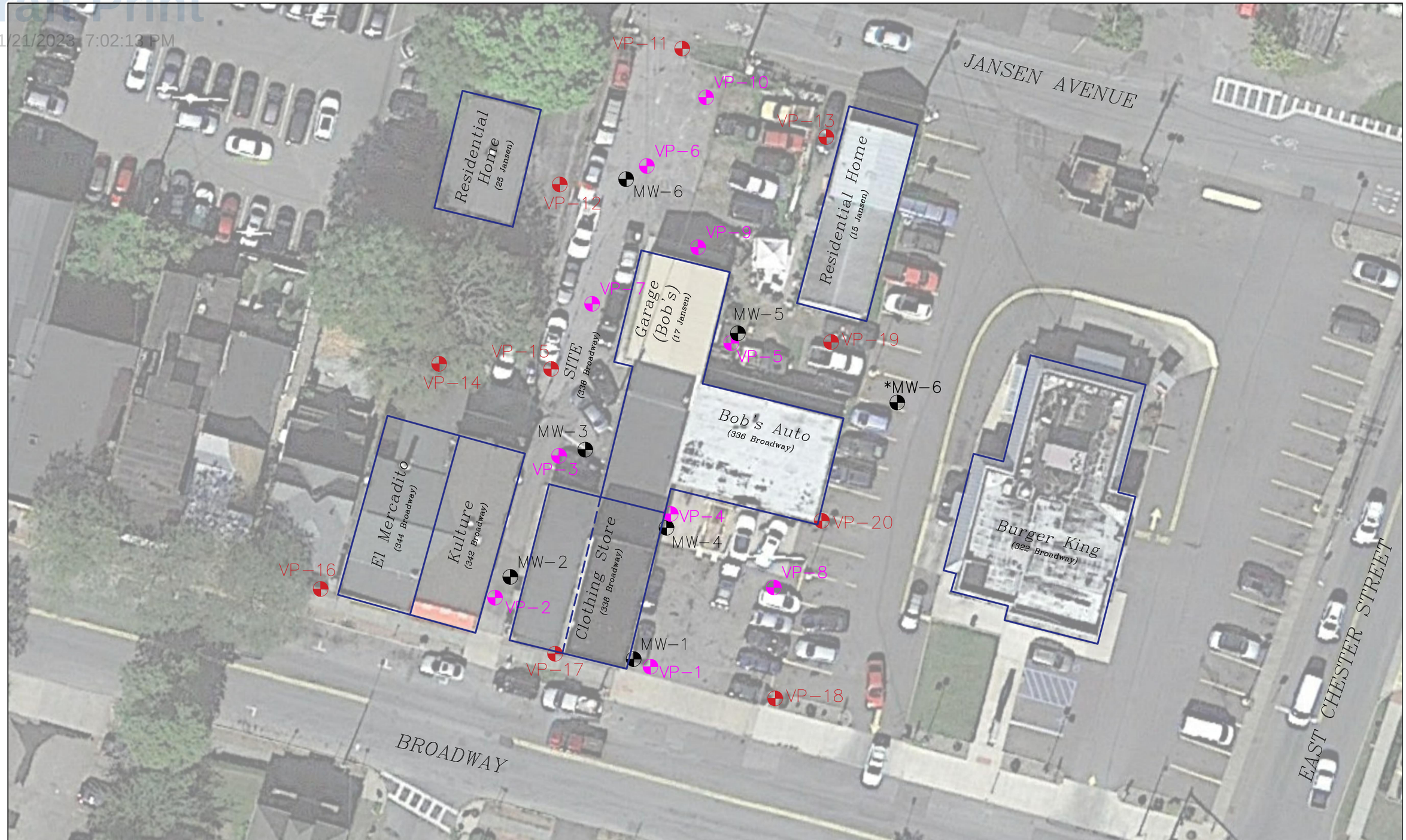

LaBella
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Legend:

- Soil Gas Vapor Probe Location (October 2020)
- Soil Gas Vapor Probe Location (August 2021)
- MW-1 - Groundwater Monitoring Well
- *MW-6 - This Location is Part of an Offsite Well Network (Not Used)

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 7

DATE: August, 2021 | SCALE: 1" = 30'

Soil Gas Vapor Probe Locations

Note: Aerial Image provided by Google Earth 2020

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JANSEN AVENUE

Residential Home (25 Jansen)

179.31**
MW-6

Residential Home (15 Jansen)

Garage (Bob's) (17 Jansen)

MW-5
180.93

SITE (336 Broadway)

*MW-6

MW-3
180.73

Bob's Auto (336 Broadway)

El Mercadito (344 Broadway)

Kulture (342 Broadway)

Clothing Store (338 Broadway)

180.54
MW-4

MW-2
180.87

Burger King (322 Broadway)

MW-1
180.76

180.30'

180.50'

180.70'

180.90'

BROADWAY

EAST CHESTER STREET

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Legend:

——— - Groundwater Contour (0.5' Interval)

– – – - Approximate Groundwater Contour

⊕ - Groundwater Monitoring Well

180.90' - Groundwater Elevation

*MW-6 - This Location is Part of an Offsite Well Network (Not Used)

** - Not Used in Groundwater Contour Determination

N

W E

S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 8

DATE: October 19, 2020

SCALE: 1" = 30'

Groundwater Contour Map

(October 19, 2020)

Note: Aerial Image provided by Google Earth 2020

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Legend:

——— - Groundwater Contour (0.5' Interval)

– – – - Approximate Groundwater Contour

181.04 - Groundwater Elevation

⊕ - Groundwater Monitoring Well

*MW-6 - This Location is Part of an Offsite Well Network (Not Used)

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 9

DATE: December 22, 2020

SCALE: 1" = 30'

Groundwater Contour Map

(December 22, 2020)

Note: Aerial Image provided by Google Earth 2020

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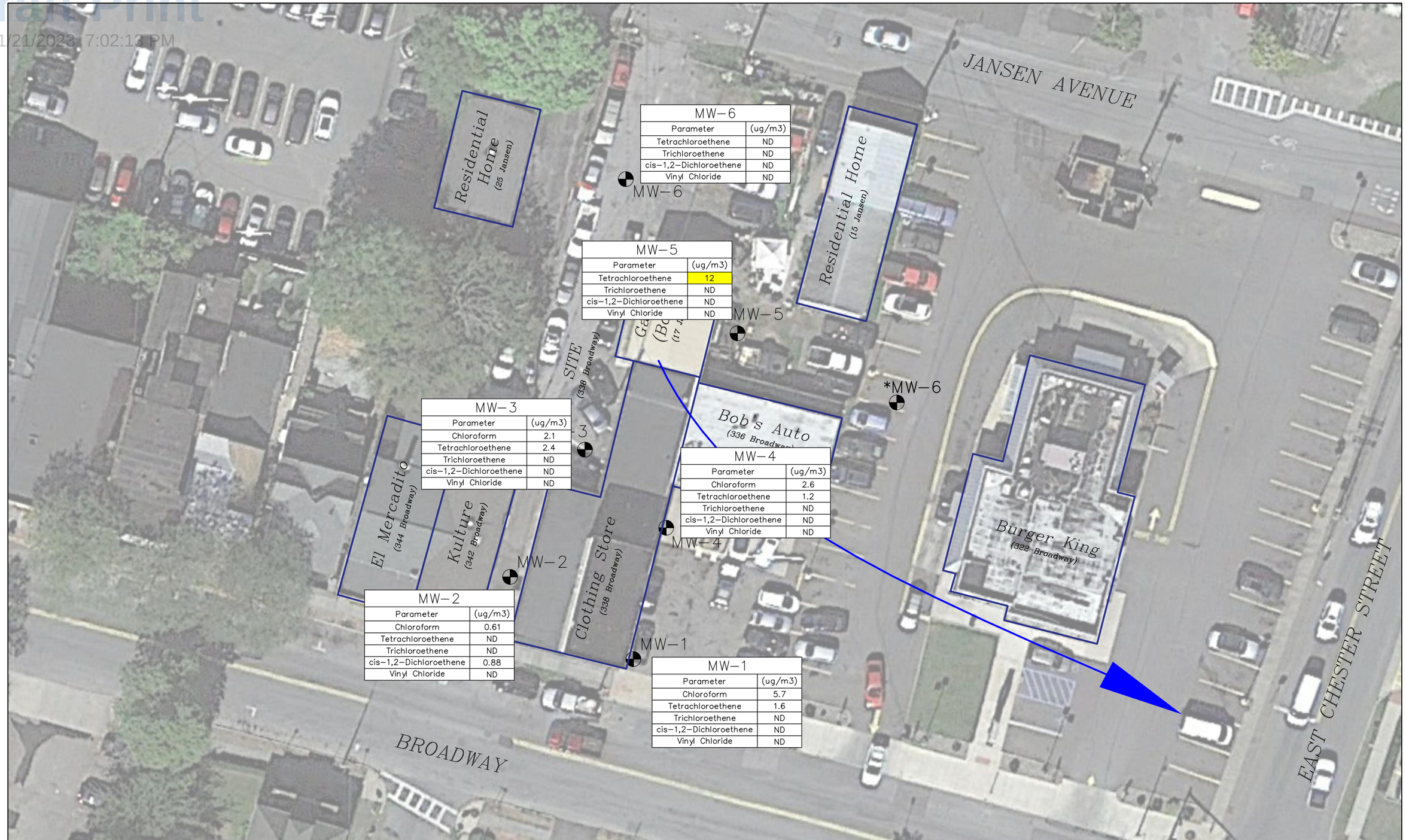

MW-6	
Parameter	(ug/m3)
Tetrachloroethene	ND
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

MW-5	
Parameter	(ug/m3)
Tetrachloroethene	12
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

MW-3	
Parameter	(ug/m3)
Chloroform	2.1
Tetrachloroethene	2.4
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

MW-4	
Parameter	(ug/m3)
Chloroform	2.6
Tetrachloroethene	1.2
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

MW-2	
Parameter	(ug/m3)
Chloroform	0.61
Tetrachloroethene	ND
Trichloroethene	ND
cis-1,2-Dichloroethene	0.88
Vinyl Chloride	ND

MW-1	
Parameter	(ug/m3)
Chloroform	5.7
Tetrachloroethene	1.6
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

LaBella
Powered by partnership.

Legend:

- Groundwater Monitoring Well
- *MW-6 - This Location is Part of an Offsite Well Network (Not Used)
- Groundwater Flow Direction
- Indicates Concentration Above GWQS

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 10

DATE: December 22, 2020 | SCALE: 1" = 30'

Groundwater VOC Concentration Map

(December 22, 2020)

Note: Aerial Image provided by Google Earth 2020

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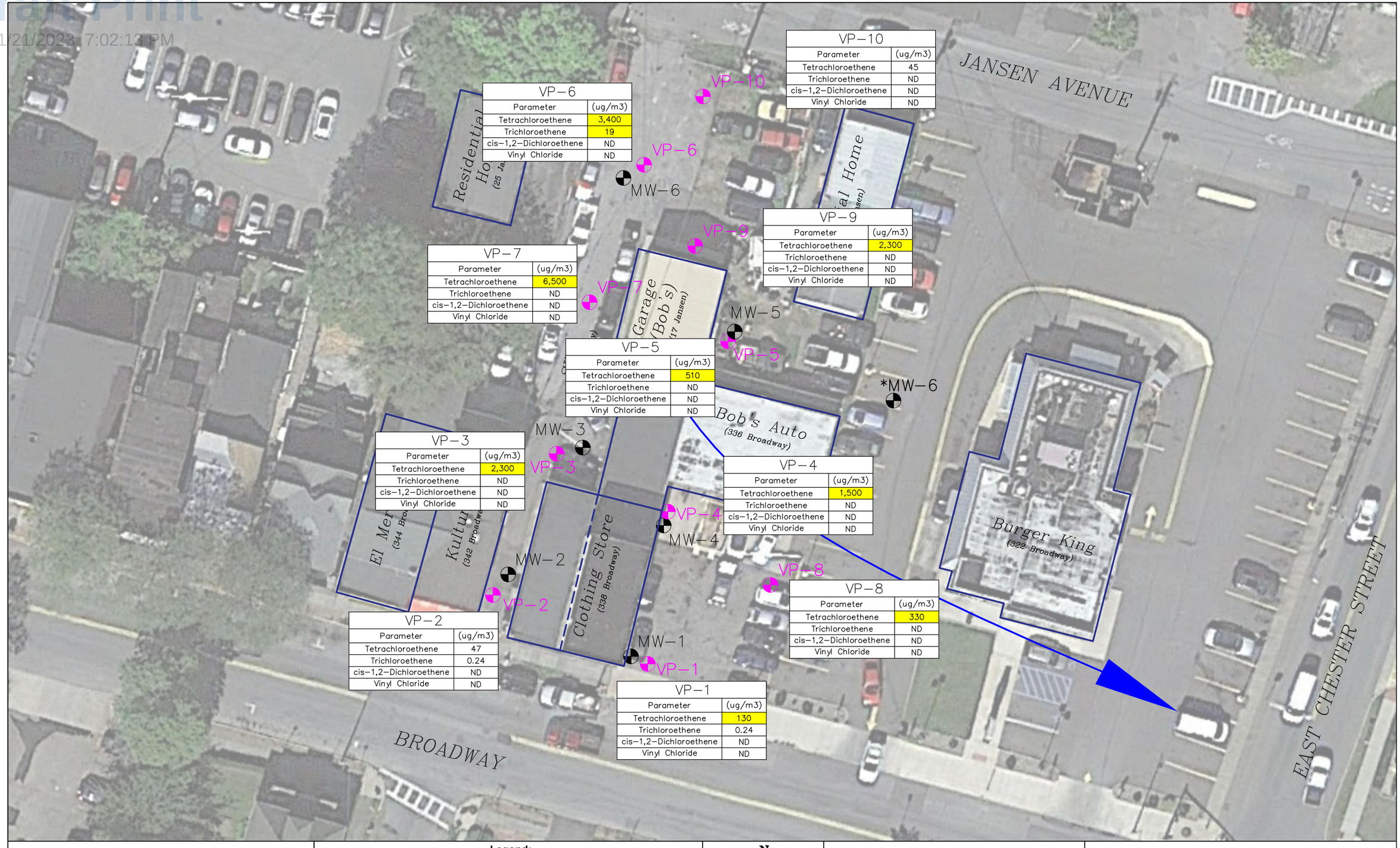

VP-10	
Parameter	(ug/m3)
Tetrachloroethene	45
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-6	
Parameter	(ug/m3)
Tetrachloroethene	3,400
Trichloroethene	19
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-9	
Parameter	(ug/m3)
Tetrachloroethene	2,300
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-7	
Parameter	(ug/m3)
Tetrachloroethene	6,500
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-5	
Parameter	(ug/m3)
Tetrachloroethene	510
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-3	
Parameter	(ug/m3)
Tetrachloroethene	2,300
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-4	
Parameter	(ug/m3)
Tetrachloroethene	1,500
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-8	
Parameter	(ug/m3)
Tetrachloroethene	330
Trichloroethene	ND
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-2	
Parameter	(ug/m3)
Tetrachloroethene	47
Trichloroethene	0.24
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

VP-1	
Parameter	(ug/m3)
Tetrachloroethene	130
Trichloroethene	0.24
cis-1,2-Dichloroethene	ND
Vinyl Chloride	ND

LaBella
Powered by partnership.

Legend:

- Groundwater Monitoring Well
- Soil Gas Vapor Probe Location
- *MW-6 - This Location is Part of an Offsite Well Network
- Groundwater Flow Direction
- Indicates Elevated Soil Gas VOC Concentration

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 11

DATE: December 22, 2020 | SCALE: 1" = 30'

Soil Gas VOC Concentration Map

(December 22, 2020)

Note: Aerial Image provided by Google Earth 2020

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VP–11	
Parameter	(ug/m3)
Tetrachloroethene	7,700
Trichloroethene	100
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–12	
Parameter	(ug/m3)
Tetrachloroethene	4,600
Trichloroethene	4.7
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–13	
Parameter	(ug/m3)
Tetrachloroethene	77
Trichloroethene	ND
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–14	
Parameter	(ug/m3)
Tetrachloroethene	430
Trichloroethene	ND
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–15	
Parameter	(ug/m3)
Tetrachloroethene	4,000
Trichloroethene	ND
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–16	
Parameter	(ug/m3)
Tetrachloroethene	130
Trichloroethene	ND
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–17	
Parameter	(ug/m3)
Tetrachloroethene	550
Trichloroethene	1.6
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–18	
Parameter	(ug/m3)
Tetrachloroethene	420
Trichloroethene	1.2
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–19	
Parameter	(ug/m3)
Tetrachloroethene	4,000
Trichloroethene	ND
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–20	
Parameter	(ug/m3)
Tetrachloroethene	2,300
Trichloroethene	ND
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

VP–11 VP–12 VP–13 VP–14 VP–15 VP–16 VP–17 VP–18 VP–19 VP–20

MW–1 MW–2 MW–3 MW–4 MW–5 MW–6 *MW–6

JANSEN AVENUE

Residential Home (15 Jansen)

Garage (Bob's) (17 Jansen)

SITE (336 Broadway)

Bob's Auto (336 Broadway)

El Mercadito (344 Broadway)

Kulture (342 Broadway)

Clothing Store (338 Broadway)

Burger King (322 Broadway)

BROADWAY

EAST CHESTER STREET

LaBella
Powered by partnership.

Legend:

- Groundwater Monitoring Well
- Soil Gas Vapor Probe Location
- *MW–6 - This Location is Part of an Offsite Well Network
- Groundwater Flow Direction
- Indicates Elevated Soil Gas VOC Concentration

N W E S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 12

DATE: September 17, 2021

SCALE: 1" = 30'

Soil Gas VOC Concentration Map

(September 17, 2021)

Note: Aerial Image provided by Google Earth 2020

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Legend:

H1 - Soil Vapor Intrusion (SVI) Structure Location

SVI Sample Location

N

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 13

DATE: April 18, 2022 | SCALE: 1" = 30'

SVI Sampling Structure Locations

Note: Aerial Image provided by Google Earth 2020

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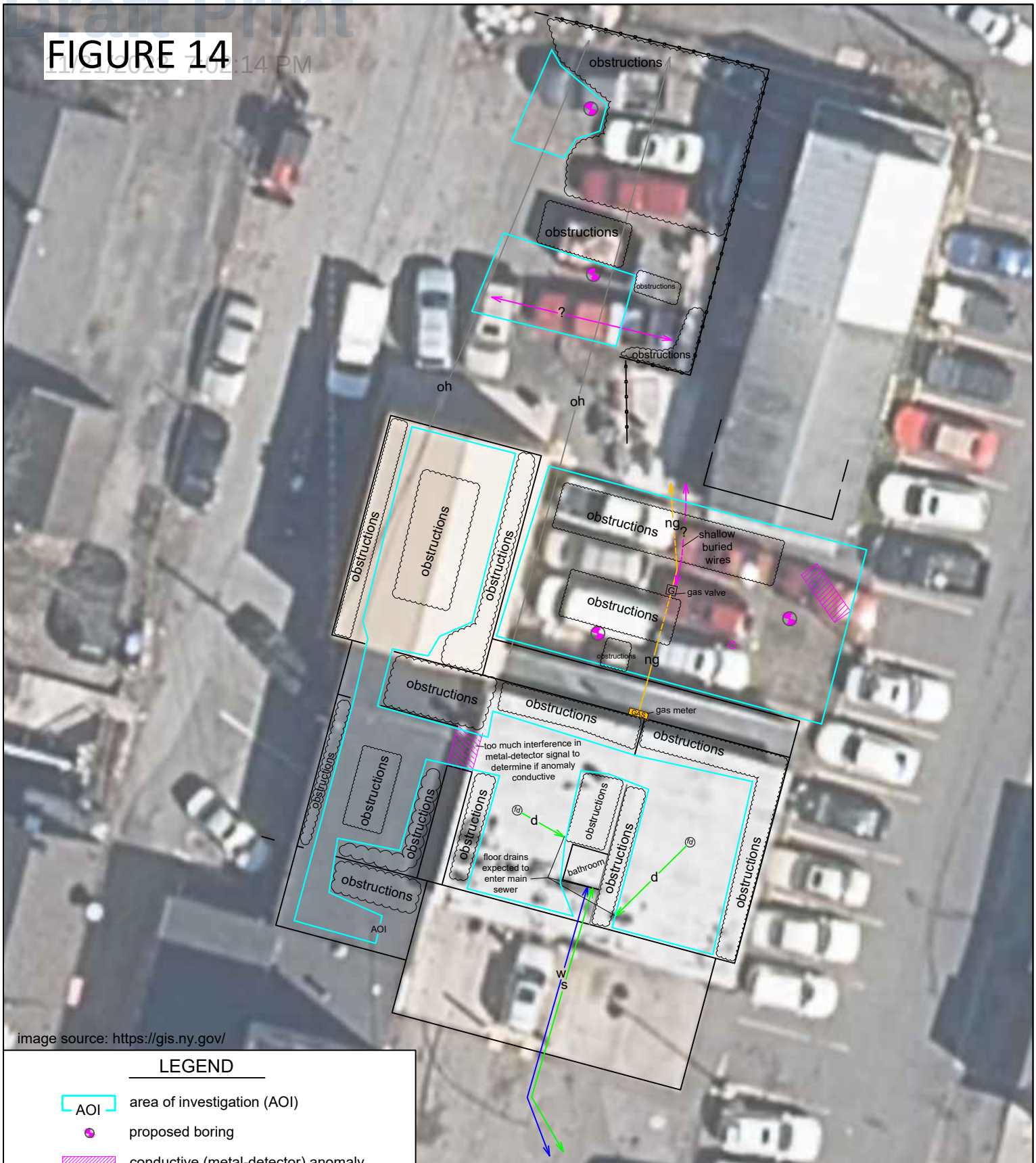
FIGURE 14


obstructions
obstructions
obstructions
?
obstructions
oh
oh
obstructions
obstructions
obstructions
obstructions
ng
?
shallow buried wires
gas valve
obstructions
obstructions
ng
obstructions
obstructions
obstructions
gas meter
too much interference in metal-detector signal to determine if anomaly conductive
obstructions
obstructions
obstructions
obstructions

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Legend:

SB–7 - Supplemental Soil Boring Location

MW–6 - Groundwater Monitoring Well

*MW–6 - This Location is Part of an Offsite Well Network

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 15

DATE: February, 2023 | SCALE: 1" = 75'

Supplemental Soil Boring Location Map

Note: Aerial Image provided by Google Earth 2020

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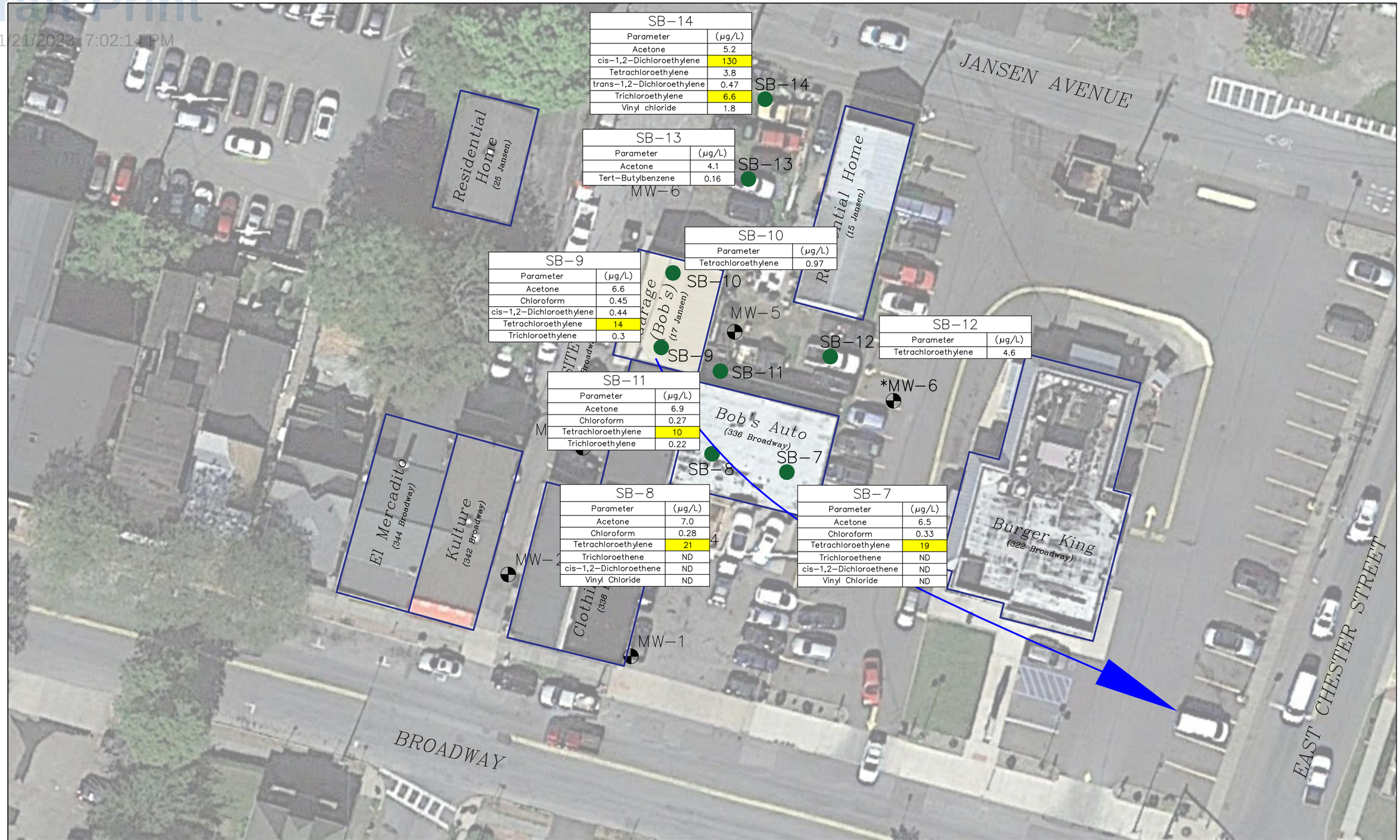

SB–14	
Parameter	(µg/L)
Acetone	5.2
cis–1,2–Dichloroethylene	130
Tetrachloroethylene	3.8
trans–1,2–Dichloroethylene	0.47
Trichloroethylene	6.6
Vinyl chloride	1.8

SB–13	
Parameter	(µg/L)
Acetone	4.1
Tert–Butylbenzene	0.16

SB–10	
Parameter	(µg/L)
Tetrachloroethylene	0.97

SB–9	
Parameter	(µg/L)
Acetone	6.6
Chloroform	0.45
cis–1,2–Dichloroethylene	0.44
Tetrachloroethylene	14
Trichloroethylene	0.3

SB–12	
Parameter	(µg/L)
Tetrachloroethylene	4.6

SB–11	
Parameter	(µg/L)
Acetone	6.9
Chloroform	0.27
Tetrachloroethylene	10
Trichloroethylene	0.22

SB–8	
Parameter	(µg/L)
Acetone	7.0
Chloroform	0.28
Tetrachloroethylene	21
Trichloroethene	ND
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

SB–7	
Parameter	(µg/L)
Acetone	6.5
Chloroform	0.33
Tetrachloroethylene	19
Trichloroethene	ND
cis–1,2–Dichloroethene	ND
Vinyl Chloride	ND

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Powered by partnership.

Legend:

- Groundwater Monitoring Well
- *MW–6 - This Location is Part of an Offsite Well Network (Not Used)
- Groundwater Flow Direction
- Indicates Concentration Above GWQS (Only compounds above reporting limits shown)

N
W E
S

338 Broadway
Kingston, New York
NYSDEC Site# 356058

FIGURE 16

DATE: May, 2023 | SCALE: 1" = 30'

Groundwater VOC Concentration Map

(December 22, 2020)

Note: Aerial Image provided by Google Earth 2020

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TABLES

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TABLE 1
LABORATORY SOIL ANALYTICAL RESULTS
Volatile Organic Compounds (8260)
September to October 2020

COMPOUNDS LIST	Unrestricted Use SCOs Subpart 375-6.8(a) or CP-51 SCO	Soil Sample Location																					
Sample ID		SB-1A	SB-1B	SB-1C	SB-2A	SB-2B	SB-2C	SB-3A	SB-3B	SB-3C	SB-4A	SB-4B	SB-4C	SB-5A	SB-5B	SB-5C	SB-6A	SB-6B	SB-6C	SURF-1	SURF-2	SURF-3	SURF-4	FD-1	FD-2
Date Sampled		6-Oct-20	6-Oct-20	6-Oct-20	30-Sep-20	30-Sep-20	30-Sep-20	30-Sep-20	30-Sep-20	30-Sep-20	5-Oct-20	5-Oct-20	5-Oct-20	2-Oct-20	2-Oct-20	2-Oct-20	1-Oct-20	1-Oct-20	1-Oct-20	6-Oct-20	6-Oct-20	6-Oct-20	6-Oct-20	2-Oct-20	6-Oct-20
8260C LIST VOCs	**(ug/Kg)**	**VOC Analytical Results (ug/Kg)**																							
1,1,1,2-Tetrachloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	680	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	270	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	330	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	ND	ND
1,2,3-Trichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3,600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	1,100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	8,400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2,400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorotoluene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50	ND	ND	17	ND	ND	17	ND	ND	6.2	ND	6.6	16	ND	ND	21	ND	21	16	ND	ND	ND	ND	ND	8.7
Benzene	60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	760	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	1,100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	370	ND	1.3	ND	ND	ND	ND	ND	ND	ND	ND	0.55	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	2,300	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	930	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	50	ND	ND	ND	2.7	3.0	ND	ND	3.4	4.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	12,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	12,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Propylbenzene	3,900	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	10,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	11,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	5,900	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	1,300	1.3	ND	ND	0.87	ND	ND	ND	ND	66	ND	ND	1.1	ND	2.3	81	1.9	ND	ND	ND	ND	2.6	ND	1.2	ND
Toluene	700	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	190	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	470	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL VOC	*	1.3	1.3	17	3.57	3.0	17	ND	3.4	76.5	ND	7.15	17.1	ND	2.3	103.9	1.9	21	16	ND	ND	2.6	0.7	1.2	8.7

Notes:

ND - Not Detected Above the Laboratory Reporting Limit

BOLD - values indicate exceedance of applicable NYSDEC guidance values

MtBE: Methyl tertiary-Butyl Ether

Soil Sample Analysis: Volatile Organic Compounds (VOCs) & MtBE by EPA Method 8260C

SCO: Soil Cleanup Objectives

Subpart 375-6.8(a) SCO - NYSDEC Remedial Program Soil Cleanup Objectives for Unrestricted Use

BTEX: Sum of Benzene, Toluene, Ethylbenzene and mixed Xylenes

* denotes that the total VOC concentrations is the sum of all reported VOCs by EPA 8260, except MtBE

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TABLE 2
LABORATORY SOIL ANALYTICAL RESULTS
Semi-Volatile Organic Compounds (8270)
September to October 2020

COMPOUNDS LIST	Unrestricted Use SCOs Subpart 375-6.8(a) or CP-51 SCO	Soil Sample Location		
Sample ID		SB-2B	SB-5C	SURF-3
Date Sampled		30-Sep-20	2-Oct-20	6-Oct-20
8260C LIST VOCs	**(ug/Kg)**	**SVOC Analytical Results (ug/Kg)**		
1,2,4-Trichlorobenzene	-	ND	ND	ND
1,2-Dichlorobenzene	1,100	ND	ND	ND
1,3-Dichlorobenzene	2,400	ND	ND	ND
1,4-Dichlorobenzene	1,800	ND	ND	ND
2,4,5-Trichlorophenol	-	ND	ND	ND
2,4,6-Trichlorophenol	-	ND	ND	ND
2,4-Dichlorophenol	-	ND	ND	ND
2,4-Dimethylphenol	-	ND	ND	ND
2,4-Dinitrophenol	-	ND	ND	ND
2,4-Dinitrotoluene	-	ND	ND	ND
2,6-Dinitrotoluene	-	ND	ND	ND
2-Chloronapthalene	-	ND	ND	ND
2-Chlorophenol	-	ND	ND	ND
2-Methylnaphthalene	-	ND	ND	ND
2-Methylphenol	-	ND	ND	ND
2-Nitroaniline	-	ND	ND	ND
2-Nitrophenol	-	ND	ND	ND
3,3'-Dichlorobenzidine	-	ND	ND	ND
3-Nitroaniline	-	ND	ND	ND
4,6-Dinitro-2-methylphenol	-	ND	ND	ND
4-Bromophenyl phenyl ether	-	ND	ND	ND
4-Chloro-3-methylphenol	-	ND	ND	ND
4-Chloroaniline	-	ND	ND	ND
4-Chlorophenyl phenyl ether	-	ND	ND	ND
4-Methylphenol	-	ND	ND	ND
4-Nitroaniline	-	ND	ND	ND
4-Nitrophenol	-	ND	ND	ND
Acenaphthene	20,000	ND	ND	ND
Acenaphthylene	100,000	ND	ND	ND
Anthracene	100,000	ND	ND	ND
Benz(a)anthracene	1,000	ND	ND	ND
Benzo(a)pyrene	1,000	ND	ND	ND
Benzo(b)fluoranthene	1,000	ND	ND	ND
Benzo(g,h,i)perylene	100,000	ND	ND	ND
Benzo(k)fluoranthene	8,000	ND	ND	ND
bis(2-chloroethoxy)methane	-	ND	ND	ND
bis(2-chloroethyl)ether	-	ND	ND	ND
bis(2-chloroisopropyl)ether	-	ND	ND	ND
bis(2-ethylhexyl)phthalate	-	ND	ND	ND
Butyl benzyl phthalate	-	ND	ND	ND
Carbazole	-	ND	ND	ND
Chrysene	1,000	ND	ND	ND
Dibenz(a,h)anthracene	330	ND	ND	ND
Dibenzofuran	-	ND	ND	ND
Diethyl phthalate	-	ND	ND	ND
Dimethyl phthalate	-	ND	ND	ND
Di-n-butyl phthalate	-	ND	ND	ND
Di-n-octyl phthalate	-	ND	ND	ND
Fluoranthene	100,000	ND	ND	3,600
Fluorene	30,000	ND	ND	ND
Hexachlorobenzene	-	ND	ND	ND
Hexachlorobutadiene	-	ND	ND	ND
Hexachlorocyclopentadiene	-	ND	ND	ND
Hexachloroethane	-	ND	ND	ND
Indeno(1,2,3-cd)pyrene	500	ND	ND	ND
Isophorone	-	ND	ND	ND
Naphthalene	12,000	ND	ND	ND
Nitrobenzene	-	ND	ND	ND
N-Nitroso-di-n-propylamine	-	ND	ND	ND
N-Nitrosodiphenylamine	-	ND	ND	ND
Pentachlorophenol	-	ND	ND	ND
Phenanthrene	100,000	ND	ND	ND
Phenol	-	ND	ND	ND
Pyrene	100,000	ND	ND	2,600
TOTAL SVOC	*	ND	ND	6,200

Notes:

ND - Not Detected Above the Laboratory Reporting Limit

BOLD - values indicate exceedance of applicable NYSDEC guidance values

Soil Sample Analysis: Semi-Volatile Organic Compounds (SVOCs) by EPA Method 8270D

SCO: Soil Cleanup Objectives

Subpart 375-6.8(a) SCO - NYSDEC Remedial Program Soil Cleanup Objectives for Unrestricted Use

* denotes that the total SVOC concentrations is the sum of all reported SVOCs by EPA 8270D, except MtBE

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TABLE 3
LABORATORY SOIL ANALYTICAL RESULTS
Pesticides/Herbicides (8081)/(8151)
September to October 2020

COMPOUNDS LIST	Unrestricted Use SCOs Subpart 375-6.8(a) or CP-51 SCO	Soil Sample Location		
Sample ID		SB-2B	SB-5C	SURF-3
Date Sampled		30-Sep-20	2-Oct-20	6-Oct-20
8081 List Pesticides	**ug/Kg**	**Pesticide Analytical Results (ug/Kg)**		
4,4'-DDD	3.3	ND	ND	**2,300**
4,4'-DDE	3.3	ND	ND	**410**
4,4'-DDT	3.3	ND	ND	**1,400**
Aldrin	5	ND	ND	ND
alpha-BHC	20	ND	ND	ND
alpha-Chlordane (cis-Chlordane)	94	ND	ND	ND
beta-BHC	36	ND	0.55	ND
delta-BHC	40	ND	ND	ND
Dieldrin	5	ND	ND	**110**
Endosulfan I	2400	ND	ND	ND
Endosulfan II	2400	ND	ND	ND
Endosulfan sulfate	2400	ND	ND	ND
Endrin	14	ND	ND	ND
Endrin aldehyde	-	ND	ND	64
Endrin ketone	-	ND	ND	ND
gamma-BHC (Lindane)	100	ND	ND	ND
Trans-Chlordane	-	ND	ND	40
Heptachlor	42	ND	ND	ND
Heptachlor epoxide	-	ND	ND	ND
Methoxychlor	-	ND	ND	120
Toxaphene	-	ND	ND	ND
8151 List Herbicides	**ug/Kg**	**Herbicide Analytical Results (ug/Kg)**		
2,4,5-T	-	ND	ND	ND
Silvex (2,4,5-TP)	3,800	ND	ND	ND
2,4-D	-	ND	ND	ND
Dichlorprop	-	ND	ND	ND
Pentachlorophenol	800	ND	ND	ND
Picloram	-	ND	ND	ND
TOTAL Pesticides/Herbicides	*	ND	0.55	4,444

Notes:

ND - Not Detected Above the Laboratory Reporting Limit

BOLD - values indicate exceedance of applicable NYSDEC guidance values

Soil Sample Analysis: Pesticides/Herbicides by EPA Methods 8081B and 8151A, respiectively

SCO: Soil Cleanup Objectives

Subpart 375-6.8(a) SCO - NYSDEC Remedial Program Soil Cleanup Objectives for Unrestricted Use

* denotes that the total Pesticide/Herbicide concentration is the sum of all reported Pesticides/Herbicides by EPA 8081B and 8151A, respectively

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TABLE 4
LABORATORY SOIL ANALYTICAL RESULTS
Polychlorinated Biphenyls (8082A)
September to October 2020

COMPOUNDS LIST	**Unrestricted Use SCOs Subpart 375-6.8(a) or CP-51 SCO**	**Soil Sample Location**		
Sample ID		SB-2B	SB-5C	SURF-3
Date Sampled		30-Sep-20	2-Oct-20	6-Oct-20
8082 List PCBs	**mg/kg**	**PCB Analytical Results (mg/Kg)**		
PCB-1016	0.100	ND	ND	ND
PCB-1221	0.100	ND	ND	ND
PCB-1232	0.100	ND	ND	ND
PCB-1242	0.100	ND	ND	ND
PCB-1248	0.100	ND	ND	ND
PCB-1254	0.100	ND	ND	ND
PCB-1260	0.100	ND	ND	ND
TOTAL VOC	*	ND	ND	ND

Notes:

ND - Not Detected Above the Laboratory Reporting Limit

BOLD - values indicate exceedance of applicable NYSDEC guidance values

Soil Sample Analysis: Polychlorinated Biphenyls (PCBs) by EPA Method 8082A

SCO: Soil Cleanup Objectives

Subpart 375-6.8(a) SCO - NYSDEC Remedial Program Soil Cleanup Objectives for Unrestricted Use

* denotes that the total PCB concentrations is the sum of all reported PCBs by EPA 8082A

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TABLE 5
LABORATORY SOIL ANALYTICAL RESULTS
Metals (6010)/(7471)
September to October 2020

COMPOUNDS LIST	Unrestricted Use SCOs Subpart 375-6.8(a) or CP-51 SCO	Soil Sample Location		
Sample ID		SB-2B	SB-5C	SURF-3
Date Sampled		30-Sep-20	2-Oct-20	6-Oct-20
6010/7471 List Metals	**mg/kg**	**Metal Analytical Results (mg/kg)**		
Aluminum	-	8,180	16,300	8,200
Antimony	-	ND	ND	ND
Arsenic	13	5	3.9	5.9
Barium	350	34.8	92.4	121
Beryllium	7	0.35	0.84	0.4
Cadmium	3	0.07	0.082	1.0
Calcium	-	377	5,530	48,300
Chromium	-	10	22	19.7
Cobalt	-	6.5	14	6.0
Copper	50	9.5	22.5	**51.9**
Iron	-	15,700	28,000	15,700
Lead	63	8.4	19.3	**365**
Magnesium	-	2,580	6,740	3,460
Manganese	1,600	554	519	264
Nickel	30	16.4	**36.8**	21.4
Potassium	-	1,000	3,250	1,350
Selenium	4	ND	ND	ND
Silver	2	ND	ND	0.59
Sodium	-	92.5	143	80
Thallium	-	ND	ND	ND
Vanadium	-	11.1	29.4	21.3
Zinc	109	38.2	73.2	**508**
Mercury	0.18	ND	0.031	**0.27**
TOTAL Metals	*	28,624	60,796	78,476

Notes:

ND - Not Detected Above the Laboratory Reporting Limit

BOLD - values indicate exceedance of applicable NYSDEC guidance values

Soil Sample Analysis: Metals by EPA Methods 6010C and 7471B, respiectively

SCO: Soil Cleanup Objectives

Subpart 375-6.8(a) SCO - NYSDEC Remedial Program Soil Cleanup Objectives for Unrestricted Use

* denotes that the total Metals concentration is the sum of all reported Metals by EPA 6010C and 7471B, respectively

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TABLE 6
LABORATORY SOIL ANALYTICAL RESULTS
Per-and Polyfluoroalkyl Substances
September to October 2020

Compound List		Unrestricted Use SCOs Subpart 375 June, 2021 SCO	Soil Sample Location		
Sample ID			SB-2B	SB-5C	SURF-3
Date Sampled			9/30/2020	10/2/2020	10/6/2020
1,4-Dioxane (ug/Kg)		-	ND	ND	ND
PFAs (ng/l)	**Acronym**	**ug/Kg**	**PFAS Analytical Results (ug/kg)**		
Perfluorobutanoic acid	PFBA	-	ND	ND	ND
Perfluoropentanoic acid	PFPeA	-	0.055	ND	0.2
Perfluorohexanoic acid	PFHxA	-	0.53	ND	0.061
Perfluoroheptanoic acid	PFHpA	-	ND	ND	0.089
Perfluorooctanoic acid	PFOA	0.66	0.046	0.018	0.49
Perfluorononanoic acid	PFNA	-	ND	ND	0.16
Perfluorodecanoic acid	PFDA	-	ND	ND	0.33
Perfluoroundecanoic acid	PFUnA	-	ND	ND	0.35
Perfluorododecanoic acid	PFDoA	-	ND	ND	0.37
Perfluorotridecanoic acid	PFTriA	-	ND	ND	0.18
Perfluorotetradecanoic acid	PFTeA	-	ND	ND	0.18
Perfluorobutanesulfonic acid	PFBS	-	0.015	ND	0.18
Perfluorohexanesulfonic acid	PFHxS	-	ND	ND	0.088
Perfluoroheptanesulfonic acid	PFHpS	-	ND	ND	0.025
Perfluorooctanesulfonic acid	PFOS	0.88	0.14	**ND**	**6.4**
Perfluorodecanesulfonic acid	PFDS	-	ND	ND	0.14
Perfluorooctanesulfonamide	PFOSA	-	ND	ND	0.2
N-methylperfluorooctanesulfonamidoacetic acid	NMeFOSAA	-	ND	ND	0.29
N-ethylperfluorooctanesulfonamidoacetic acid	NEtFOSAA	-	ND	ND	0.83
1H,1H,2H,2H-perfluorooctanesulfonic acid	6:2 FTS	-	ND	ND	ND
1H,1H,2H,2H-perfluorodecanesulfonic acid	8:2 FTS	-	ND	ND	ND
Total PFAs		*	0.786	0.018	10.563

Notes:

ND - Not Detected Above the Laboratory Reporting Limit

BOLD - values indicate exceedance of applicable NYSDEC guidance values

1,4-Dioxane concentrations in micrograms per liter (ug/Kg) or, parts per billion (ppb)

PFAs concentrations in nanograms per liter (ug/Kg) or, parts per billion (ppb)

* denotes that the total PFAs concentration is the sum of all reported PFAs compound C35:C41

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TABLE 7
GROUNDWATER ELEVATIONS

MONITORING WELL DESIGNATION		MW-1	MW-2	MW-3	MW-4	MW-5	MW-6
TOP OF CASING		188.66	189.69	189.09	188.92	188.34	186.81
Date		**GROUNDWATER ELEVATIONS**					
10/19/2020	DTW	7.90	8.82	8.36	8.38	7.41	7.50
	GW Elev	180.76	180.87	180.73	180.54	180.93	179.31
12/22/2021	DTW	7.62	8.32	7.88	7.99	7.08	5.59
	GW Elev	181.04	181.37	181.21	180.93	181.26	181.22

Notes:
GW Elev = Groundwater Elevation (ft.)
DTW = Depth to water (ft.)
TOC data from Brinner & Larios survey conducted 10/19/2020

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TABLE 8
FINAL GROUNDWATER QUALITY MEASUREMENTS
October 21 and 22, 2020

Well ID	Date Sampled	Groundwater Quality Parameter					
		Turbidity (NTU)	pH	Temperature (C°)	Dissolved Oxygen (mg/L)	Conductivity (mS/cm)	ORP (mV)
MW-1	10/22/2020	19	7.88	19.6	1.80	255	55.7
MW-2	10/21/2020	14	7.61	19.0	3.60	2,100	78.1
MW-3	10/21/2020	29	7.25	17.8	3.40	1,178	63.3
MW-4	10/22/2020	18	7.52	18.1	3.79	1,317	50.1
MW-5	10/21/2020	11	7.10	17.6	0.62	581	73.1
MW-6	10/21/2020	14	7.37	19.2	2.54	1,269	58.9

Notes:
All values are reported as final measurement prior to sampling
NTU - Nephelometric Turbidity Unit
mg/L - Milligrams per Liter
mS/cm - MicroSiemens per centimeter
ORP - Oxygen Reducing Potential
mV - milliVolts

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TABLE 9
LABORATORY GROUNDWATER ANALYTICAL RESULTS
Volatile Organic Compounds
October 21 and 22, 2020

| Well ID | Date Sampled | Compound List - 8260 Full List | | |

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TABLE 10
LABORATORY GROUNDWATER ANALYTICAL RESULTS
Semi-Volatile Organic Compounds
October 22, 2020

| Well ID | Date Sampled | Compound List - 8270 Full List | | |

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TABLE 11
LABORATORY GROUNDWATER ANALYTICAL RESULTS
Pesticide and Herbicide Compounds
October 22, 2020

Well ID	Date Sampled	Compound List - 8081B/8151A Full List																										
		4,4'-DDD	4,4'-DDE	4,4'-DDT	Aldrin	alpha-BHC	cis-Chlordane	beta-BHC	delta-BHC	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulfate	Endrin	Endrin Aldehyde	gamma-BHC (lindane)	trans-Chlordane	Heptachlor	Heptachlor Epoxide	Methoxychlor	Toxaphene	2,4,5-T	Silvex (2,4,5-TP	2,4-D	Dichlorprop	Pentachlorophenol	Picloram	Total Pesticide/Hermbicide
SCGs (µg/L)		0.3	0.2	0.2	NL	0.01	0.05	0.04	0.04	0.004	NL	NL	NL	NL	5	0.05	0.05	0.04	0.03	35	0.06	35	NL	50	NL	5	50	-
MW-4	10/22/2020	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
All values are reported in micrograms per liter (µg/L or ppb)
Standards, Criteria, and Guidance Values (SCGs) for groundwater – Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).
BOLD - values indicate exceedance of applicable NYSDEC guidance values
ND: Not Detected Above Applicable Laboratory Detection Limits

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TABLE 12
LABORATORY GROUNDWATER ANALYTICAL RESULTS
Total Metals Compounds
October 22, 2020

Well ID	Date Sampled	Compound List - 8081B/8151A Full List																						
		Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc	Total Metals
SCGs (µg/L)		100	3	25	1000	3	5	NL	50	5	200	300	25	35,000	300	0.7	100	NL	10	50	20,000	0.50	NL	2,000	-
MW-4	10/22/2020	2.4	ND	ND	0.11	ND	ND	94	0.0058	0.0015	0.0033	3.0	0.0046	10.2	0.17	ND	0.0048	6.3	ND	ND	278	ND	0.0035	0.014	394.1

Notes:

All values are reported in micrograms per liter (µg/L or ppb)

Standards, Criteria, and Guidance Values (SCGs) for groundwater – Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).

BOLD - values indicate exceedance of applicable NYSDEC guidance values

ND: Not Detected Above Applicable Laboratory Detection Limits

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TABLE 13
LABORATORY GROUNDWATER ANALYTICAL RESULTS
Polychlorinated Biphenyl Compounds
October 22, 2020

Well ID	Date Sampled	Compound List - 8082A Full List							
		PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260	Total PCBs
SCGs (µg/L)		NL	NL	NL	NL	NL	NL	NL	0.09
MW-4	10/22/2020	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
All values are reported in micrograms per liter (µg/L or ppb)
Standards, Criteria, and Guidance Values (SCGs) for groundwater – Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).
BOLD - values indicate exceedance of applicable NYSDEC guidance values
ND: Not Detected Above Applicable Laboratory Detection Limits

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TABLE 14
LABORATORY GROUNDWATER ANALYTICAL RESULTS
Per-and Polyfluoroalkyl Substances
October 22, 2020

Compound List		SCGs	Groundwater Samples
Well ID			MW-4
Date Sampled			10/22/2020
1,4-Dioxane (ug/l)		0.35	ND
PFAs Compounds	Acronym	ng/L	ng/L
Perfluorobutanoic acid	PFBA	-	7.3
Perfluoropentanoic acid	PFPeA	-	19
Perfluorohexanoic acid	PFHxA	-	23
Perfluoroheptanoic acid	PFHpA	-	14
Perfluorooctanoic acid	PFOA	6.7	63
Perfluorononanoic acid	PFNA	-	3.3
Perfluorodecanoic acid	PFDA	-	1.0
Perfluoroundecanoic acid	PFUnA	-	ND
Perfluorododecanoic acid	PFDoA	-	ND
Perfluorotridecanoic acid	PFTriA	-	ND
Perfluorotetradecanoic acid	PFTeA	-	ND
Perfluorobutanesulfonic acid	PFBS	-	7.7
Perfluorohexanesulfonic acid	PFHxS	-	61
Perfluoroheptanesulfonic acid	PFHpS	-	1.2
Perfluorooctanesulfonic acid	PFOS	2.7	**24**
Perfluorodecanesulfonic acid	PFDS	-	5.0
Perfluorooctanesulfonamide	PFOSA	-	ND
N-methylperfluorooctanesulfonamidoacetic acid	NMeFOSAA	-	ND
N-ethylperfluorooctanesulfonamidoacetic acid	NEtFOSAA	-	ND
1H,1H,2H,2H-perfluorooctanesulfonic acid	6:2 FTS	-	ND
1H,1H,2H,2H-perfluorodecanesulfonic acid	8:2 FTS	-	ND
Total PFAs		*	229.5

Notes:

ND: Not Detected Above Applicable Laboratory Detection Limits

BOLD - values indicate exceedance of applicable NYSDEC guidance values

1,4-Dioxane concentrations in micrograms per liter (ug/l) or, parts per billion (ppb)

PFAs concentrations in nanograms per liter (ng/l) or, parts per trillion (ppt)

Standards, Criteria, and Guidance Values (SCGs) for groundwater – 2021 Addendum to June 1998 Division of Water Technical and Operation Guidance Series (TOGS 1.1.1)

* denotes that the total PFAs concentration is the sum of all reported PFAs compounds by EPA 537 (modified)

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TABLE 15
LABORATORY SOIL VAPOR ANALYTICAL RESULTS
Volatile Organic Compounds (TO-15)
December 22, 2020

COMPOUNDS LIST	USEPA OSWER Vapor Intrusion Guidance Values	SOIL VAPOR SAMPLES										
Sample ID		VP-1	VP-2	VP-3	VP-4	VP-5	VP-6	VP-7	VP-8	VP-9	VP-10	OA-1
Date Sampled		22-Dec-20	22-Dec-20	22-Dec-20	22-Dec-20	22-Dec-20	22-Dec-20	22-Dec-20	22-Dec-20	22-Dec-20	22-Dec-20	22-Dec-20
TO-15 LL - VOC LIST	**(ug/m3)**	**VOC Analytical Results (ug/m3)**										
Benzene	31	ND	0.36	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	220	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tert-butyl alchohol	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzne	60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	90	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.49	1.5
Chloroform	11	**20**	2.6	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	*	ND	ND	ND	ND	ND	ND	ND	ND	56	ND	ND
1,2-Dibromoethane	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	200	ND	2.0	ND	ND	ND	ND	ND	5.8	ND	0.42	2.8
1,1-Dichloroethane	500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	70	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloro-1,1,2,2-tetraflouroethane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethanol	*	8.1	13	ND	ND	ND	ND	ND	ND	ND	13	12
Ethylbenzene	220	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexane (n-Hexane)	200	1.3	2.9	ND	ND	ND	ND	ND	ND	ND	0.87	ND
Methylene chloride	520	19	12	ND	ND	ND	ND	ND	ND	ND	3.5	ND
4-Methyl-2-pentanone (MIBK)	80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether (MtBE)	3,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	81	**130**	47	**2,300**	**1,500**	**510**	**3,400**	**6,500**	**330**	**2,300**	45	ND
Toluene	400	0.8	1.2	ND	ND	ND	ND	ND	ND	ND	ND	0.9
1,2,4-Trichlorobenzene	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	2,200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	150	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	2.2	0.24	0.24	ND	ND	ND	**19**	ND	ND	ND	ND	ND
Trichlorofluoromethane	700	1.9	1.5	ND	ND	ND	ND	ND	3.5	ND	1.2	1.9
1,1,2-Trichlorotrifluoroethane	30,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2,4-Trimethylpentane	*	ND	ND	ND	500	ND	ND	ND	ND	1,800	ND	ND
Vinyl Chloride	28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	7,000	0.40	0.49	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	7,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		TOTAL CONCENTRATIONS (ug/m3)										
***TOTAL VOCs**	-	182	83	2,300	2,000	510	3,419	6,500	339	4,156	64	19

Notes:

ND: Not Detected Above Applicable Laboratory Detection Limits

USEPA Vapor Intrusion Guidance = Target Indoor Air and Target Shallow Soil Gas concentrations per Table 2A - OSWER Draft Guidance for Evaluating Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) – November, 2002.

* Indicates no Vapor Intrusion Guidance Value.

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TABLE 16
LABORATORY SOIL VAPOR ANALYTICAL RESULTS
Volatile Organic Compounds (TO-15)
September 17, 2021

COMPOUNDS LIST	USEPA OSWER Vapor Intrusion Guidance Values	SOIL VAPOR SAMPLES										
Sample ID		VP-11	VP-12	VP-13	VP-14	VP-15	VP-16	VP-17	VP-18	VP-19	VP-20	OA
Date Sampled		17-Sep-21	17-Sep-21	17-Sep-21	17-Sep-21	17-Sep-21	17-Sep-21	17-Sep-21	17-Sep-21	17-Sep-21	17-Sep-21	17-Sep-21
TO-15 LL - VOC LIST	**(ug/m3)**	**VOC Analytical Results (ug/m3)**										
Benzene	31	ND	1.2	ND	0.78	ND	ND	ND	ND	ND	ND	0.85
Benzyl Chloride	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	220	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	1,000	ND	14	ND	3.8	ND	2.2	ND	ND	ND	ND	ND
Tert-butyl alchohol	*	ND	4.7	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.65
Chlorobenzne	60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	90	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.4
Chloroform	11	ND	2.6	ND	3.4	ND	**12**	**290**	6.2	ND	ND	ND
Cyclohexane	*	ND	ND	ND	ND	ND	ND	ND	ND	56	ND	ND
1,2-Dibromoethane	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	200	ND	1.3	2.4	1.6	ND	1.3	2.6	2.6	ND	ND	1.8
1,1-Dichloroethane	500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	70	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloro-1,1,2,2-tetraflouroethane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethanol	*	ND	20	ND	13	ND	8.3	ND	ND	ND	ND	35
Ethylbenzene	220	ND	12	ND	11	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexane (n-Hexane)	200	ND	3.8	ND	ND	ND	1.3	ND	ND	ND	ND	4.7
Methylene chloride	520	ND	9.3	ND	ND	ND	5.2	ND	8.9	ND	ND	18
4-Methyl-2-pentanone (MIBK)	80	ND	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether (MtBE)	3,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	1,000	ND	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	4.2	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	81	**7,700**	**4,600**	77	**430**	**4,000**	**130**	**550**	**420**	**4,000**	**2,300**	ND
Toluene	400	ND	35	1.4	23	ND	1.6	ND	3.3	ND	ND	ND
1,2,4-Trichlorobenzene	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	2,200	ND	ND	ND	ND	ND	0.61	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	150	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	2.2	**100**	**4.7**	ND	ND	ND	ND	1.6	1.2	ND	ND	ND
Trichlorofluoromethane	700	ND	1.7	1.5	1.3	ND	1.7	1.9	3.1	ND	ND	2.1
1,1,2-Trichlorotrifluoroethane	30,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	6	ND	**17**	ND	16	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	6	ND	4.0	ND	4.4	ND	ND	ND	ND	ND	ND	ND
2,2,4-Trimethylpentane	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	7,000	ND	31	ND	28	ND	ND	ND	ND	ND	ND	1.4
o-Xylene	7,000	ND	11	ND	11	ND	ND	ND	ND	ND	ND	5.6
		TOTAL CONCENTRATIONS (ug/m3)										
***TOTAL VOCs**	-	7,800	4,780	84	547	4,000	164	846	445	4,056	2,300	73

Notes:

ND: Not Detected Above Applicable Laboratory Detection Limits

USEPA Vapor Intrusion Guidance = Target Indoor Air and Target Shallow Soil Gas concentrations per Table 2A - OSWER Draft Guidance for Evaluating Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) – November, 2002.

* Indicates no Vapor Intrusion Guidance Value.

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TABLE 17
LABORATORY SOIL VAPOR INTRUSION ANALYTICAL RESULTS
Volatile Organic Compounds (TO-15)
April 19, 2022

Sample ID	NYSDOH Sub-Slab Vapor Concentration Decision Matrix (minimum action level) [1]	NYSDOH Indoor Air Concentration (minimum action level) [1]	H1_SS_338BWY_2022	H1_IA_338BWY_2022	H2_SS_338BWY_2022	H2_IA_338BWY_2022	H2_OA_338BWY_2022	H3_SS_338BWY_2022	H3_IA_338BWY_2022	H4_SS_338BWY_2022	H4_IA_338BWY_2022	H5_SS_338BWY_2022	H5_IA_338BWY_2022	H6_SS_338BWY_2022	H6-SS_DUPE_338BWY_2022	H6_IA_338BWY_2022	H6_SS2_338BWY_2022	H6_IA2_338BWY_2022	H6_IA2_Dupe_338BWY_2022	H7_SS_338BWY_2022	H7_IA_338BWY_2022	H8_SS_338BWY_2022	H8_IA_338BWY_2022
Sample Type			Sub-Slab	Indoor Air	Sub-Slab	Indoor Air	Outdoor Air	Sub-Slab	Indoor Air	Sub-Slab	Indoor Air	Sub-Slab	Indoor Air	Sub-Slab	Sub-Slab Dupe	Indoor Air	Sub-Slab	Indoor Air	Indoor Air	Sub-Slab	Indoor Air	Indoor Air	Indoor Air
Sample Date			4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022	4/19/2022
1,1 Dichloroethylene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	100***	3***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2,- Tetrachloroethane	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichlorotrifluoroethane	NL	NL	ND	0.59 J	ND	0.65 J	0.63 J	ND	0.65 J	ND	0.6 J	ND	0.63 J	ND	ND	0.66 J	ND	0.64 J	0.64 J	ND	0.59 J	ND	0.54 J
1,1-Dichloroethene	6**	0.2**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	NL	NL	ND	0.099 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	NL	NL	1.7	ND	2.0	4.5	0.1 J	ND	0.13 J	1.4	1.5	ND	3.3	8.8	8.6	15	ND	27.00	27	ND	0.18	ND	0.14 J
1,2-Dibromoethane (EDB)	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	NL	NL	ND	ND	ND	0.34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorotetrafluoroethane	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	NL	NL	0.40 J	ND	0.57	1.1	ND	ND	ND	0.37 J	0.48	0.57	0.78	2.4	2.3	3.8	0.77	7.2	7.3	ND	0.63	ND	ND
1,3-Butadiene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	NL	NL	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	NL	NL	41	12	18	1.7 J	1.1 J	31	1.7 J	31	ND	29	2.1 J	13	14	2.7 J	14	3.30 J	3.6 J	31	1.9 J	31	1.3 J
2-Hexanone (MBK)	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Ethyltoluene	NL	NL	0.37 J	ND	0.39 J	1.3	ND	ND	ND	ND	0.42	0.47 J	0.8	1.9	2.5	4.0	0.83	7.4	7.5	ND	ND	0.67	ND
4-Methyl-2-pentanone (MIBK)	NL	NL	0.70	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.9	ND	ND	ND	ND
Acetone	NL	NL	28	26	14	ND	7.8	20	11	26	63	50	510	78	83	2,200	97	2,900	3,200	27	7.0	19	8.0
Benzene	NL	NL	0.30 J	0.30	0.76	4.8	0.37	0.33	0.78	0.09 J	0.67	0.55	1.9	2.3	2.2	11	1.7	23	24	0.38	0.86	0.26 J	0.59
Benzyl chloride	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	NL	NL	ND	ND	ND	ND	ND	ND	ND	2.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	NL	NL	ND	ND	ND	ND	ND	ND	ND	0.1 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	6 **	0.2**	ND	0.49	ND	0.42	0.46	ND	0.50	ND	0.47	ND	0.46	ND	ND	0.46	ND	0.48	0.47	ND	0.45	ND	0.46
Chlorobenzene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	NL	NL	0.65	ND	ND	0.34	ND	0.66	ND	92	3.7	1.1	0.28	ND	ND	ND	1.1	ND	ND	23	0.21	33	0.52
Chloromethane	NL	NL	ND	1.1	ND	0.95	1.2	ND	1.2	ND	0.92	ND	1.1	ND	ND	1.2	ND	1.4	1.4	ND	0.91	ND	0.91
cis-1,2-Dichloroethene	6**	0.2**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	NL	NL	ND	ND	ND	6.4	ND	ND	ND	ND	0.82	ND	1.5	1.1	1.2	9.6	1.1	22	24	ND	ND	ND	ND
Dibromochloromethane	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	NL	NL	2.5	2.4	2.6	2.5	2.5	2.6	2.8	2.4	2.4	2.4	2.5	2.3	2.5	2.5	2.5	2.6	2.6	2.4	2.4	2.3	2.5
Ethanol	NL	NL	4.3 J	5.7	13	110	35	20	130	13	89	16	120	13	22	190	5.8 J	330	370	11	11	12	18
Ethyl Acetate	NL	NL	2.1 J	ND	ND	ND	ND	3.3	ND	ND	0.78 J	ND	1.3	ND	ND	1.3	ND	ND	ND	ND	1.0 J	ND	0.95 J
Ethylbenzene	NL	NL	0.78	ND	1.6	3.7	0.09 J	0.42 J	0.09 J	0.71	0.81	1.0	1.5	4.8	4.8	8.8	1.6	16	17	0.32 J	0.13 J	0.44	0.11 J
Heptane	NL	NL	0.42	0.13	1.1	5.9	0.16 J	0.28 J	0.26	0.53	1.4	1.7	4.8	6.9	6.4	40	9.1	56	56	ND	0.35	0.75	0.36
Hexachlorobutadiene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexane	NL	NL	3.0 J	1.7	5.3 J	20	1.2 J	3.5 J	1.7 J	5.5 J	2.5 J	4.1 J	7.3	6.3 J	6.2 J	36	5.9 J	79	85	ND	1.3 J	ND	1.3 J
Isopropanol	NL	NL	75	1.0	100	1.4 J	0.69 J	160	19	240	6.7	130	18	59	65	13	33	19	19	160	0.63 J	150	1.3 J
Methyl tert-butyl ether	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	100***	3***/60*	ND	1.7	4.5	1.1 J	ND	2.0 J	0.77 J	5	1.2	1.6 J	2.2	ND	ND	2.2	ND	2.0	1.3	ND	ND	ND	ND
m&p-Xylene	NL	NL	2.2	0.20 J	5.0	13	0.27 J	1.1	0.30 J	2.2	2.8	3.5	5.1	18	17	31	5.2	55	55	0.93	0.4	1.3	0.32
Naphthalene	NL	NL	1.1	ND	ND	0.32	ND	ND	ND	0.18 J	0.41 J	0.88	0.59	0.56	1.3	ND	2.7	ND	ND	0.27	ND	ND	ND
o-Xylene	NL	NL	ND	0.094 J	1.9	4.9	0.1 J	0.52	0.01 J	1.1	1.3	1.6	2.4	7.6	7.7	13	2.2	24	25	0.49	0.16	0.65	0.12 J
Propene	NL	NL	ND	0.21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	NL	NL	0.12	ND	0.26 J	0.50	ND	ND	0.11 J	ND	0.19	0.32 J	0.40	0.40 J	0.43	0.75	ND	0.8	0.83	ND	0.08 J	ND	ND
Tetrachloroethylene (PCE)	100***	3***/30*	9.8	ND	23	0.27	ND	8.2	0.69	16	7.7	240	14	1,300	1,700	63	3,800	260	280	5.0	0.34	2.2	0.39
Tetrahydrofuran	NL	NL	5.1	ND	ND	1.3	ND	0.63 J	ND	0.57 J	ND	0.6 J	ND	ND	ND	ND	ND	ND	ND	0.80 J	0.83 J	ND	0.26 J
Toluene	NL	NL	7.9	ND	9.4	25	1.0	3.2	0.7	4.4	5.9	31	58	180	180	480	81	450	490	2.1	0.84	2.4	0.6
trans-1,2-Dichloroethene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	0.25	0.42	1.5	2.6	2.7	8.2	14	27	27	ND	ND	ND	ND
trans-1,3-Dichloropropene	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene (TCE)	6**	0.2**/2*	ND	1.4 J	ND	1.4 J	ND	ND	ND	ND	ND	0.63	ND	2.9	2.8	ND	9.3	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	NL	NL	1.4 J	ND	ND	1.4	1.3 J	1.3 J	1.5	1.5 J	1.4	1.3 J	1.4	1.3 J	1.3 J	1.4	1.4 J	1.3	1.3	1.2 J	1.3	1.5 J	1.5
Vinyl Acetate	NL	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Chloride	6****	NL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
Concentrations in micrograms per cubic meter (ug/m^3)
NL = not listed
J = estimated concentration
E = exceed calibration range
Samples analyzed for VOCs by USEPA Method TO-15
< indicates the concentration was not detected above the reporting limit
(1) *New York State Department of Health (NYSDOH), Guidance for Evaluating Soil Vapor Intrusion in the State of New York* , October 2006 and subsequent updates. [Note: This Guidance uses a combination of indoor air and sub-slab soil vapor when comparing to the matrices. In addition, for compounds not listed in the matrices an overall site approach is employed which utilizes the USEPA BASE Database (see 2. below) as typical background for commercial buildings and also uses the outdoor air sample, refer to Guidance document for details.]
(2) USEPA Building Assessment and Survey Evaluation (BASE) Database (90th Percentile). As recommended in Section 3.2.4 of the NYSDOH Guidance (Refer to Footnote "1") this database is referenced for the indoor air sampling results. This database is also referenced to provide initial benchmarks for comparison to the air sampling data and does not represent regulatory standards or compliance values.
* = Air Guideline Values obtained from Table 3.1, NYSDOH, Guidance for Evaluating Soil Vapor Intrusion in the State of New York and updates in September 2013 for PCE and August 2015 for TCE.
** = Guideline Value obtained from Soil Vapor/Indoor Air Matrix A (minimum action level), NYSDOH, Guidance for Evaluating Soil Vapor Intrusion in the State of New York May 2017.
*** = Guidance Value obtained from Soil Vapor/Indoor Air Matrix B (minimum action level), NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York May 2017.
**** = Guidance Value obtained from Soil Vapor/Indoor Air Matrix C (minimum action level), NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York May 2017.

***NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York* , May 2017 Decision Matrices Notes:**

NO FURTHER ACTION:
No additional actions are recommended to address human exposures

IDENTIFY SOURCE(S) AND RESAMPLE OR MITIGATE:
We recommend that reasonable and practical actions be taken to identify the source(s) affecting the indoor air quality and that actions be implemented to reduce indoor air concentrations to within background ranges. For example, if an indoor or outdoor air source is identified, we recommend the appropriate party implement actions to reduce the levels. In the event that indoor or outdoor sources are not readily

MONITOR:
We recommend monitoring (sampling on a recurring basis), including but not necessarily limited to sub-slab vapor, basement air and outdoor air sampling, to determine whether concentrations in the indoor air or sub-slab vapor have changed and/or to evaluate temporal influences. Monitoring might also be recommend to determine whether existing building conditions (e.g., positive pressure heating, ventilation and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined based on site-, building-, and analyte-specific information, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until

MITIGATE:
We recommend mitigation to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building-specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental

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TABLE 18
LABORATORY SOIL ANALYTICAL RESULTS
Volatile Organic Compounds (8260)
May 22 and 23, 2023

COMPOUNDS LIST	Unrestricted Use SCOs Subpart 375-6.8(a) or CP-51 SCO	Soil Sample Location																											
Sample Location		Interior of Building																Exterior of Building											
Sample ID		SB-7A	SB-7B	SB-7C	SB-7D	SB-8A	SB-8B	SB-8C	SB-8D	SB-9A	SB-9B	SB-9C	SB-9D	SB-10A	SB-10B	SB-10C	SB-10D	SB-11A	SB-11B	SB-11C	SB-12A	SB-12B	SB-12C	SB-13A	SB-13B	SB-13C	SB-14A	SB-14B	SB-14C
Date Sampled		5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/22/23	5/23/23	5/23/23	5/23/23	5/22/23	5/22/23	5/22/23	5/23/23	5/23/23	5/23/23	5/23/23	5/23/23	5/23/23	5/23/23
Depth (fbg)		0.50	6	9	13.5	0.5	6.0	9.0	13.8	0.7	6.0	9.0	13.0	2.0	7.0	8.0	10.2	6.0	8.0	13.8	6.0	8.0	13.8	6.0	11.0	13.1	4.0	6.0	8.0
PID Reading (ppm)		1.2	1.7	2.4	9.2	1.2	1.7	2.3	10.1	4.1	2.9	2.0	2.1	1.30	2.3	4.0	2.1	1.2	2.1	4.5	0.7	0.8	7.2	1.6	1.2	1.5	2.5	1.2	1.2
8260C LIST VOCs	**(ug/Kg)**	**VOC Analytical Results (ug/Kg)**																											
1,1,1-Trichloroethane	680	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	270	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	330	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3,600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane (DBCP)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	1,100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	8,400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2,400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1,800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4 Dioxane	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	120	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone (MBK)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	50	13	10	8.3	7.9	14	10	13	ND	38	43	16	ND	39	27	43	ND	17	7.2	ND	24	11	ND	ND	ND	ND	10	ND	ND
Benzene	60	ND	ND	ND	ND	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	760	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	1,100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	370	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethylene	250	ND	ND	ND	ND	ND	ND	ND	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane (Freon 12)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	1,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene (Cumene)	2,300	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Acetate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl tert-butyl ether	930	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Cyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	12,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	12,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	3,900	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene (p-Cymene)	10,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	11,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	5,900	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene (PCE)	1,300	12	2.2	4.7	**5,900**	52	2.9	3.4	**110,000**	280	9.2	2.9	71	75	12	6.1	1.9	1.0	2.2	**21,000**	0.9	ND	**110,000**	0.9	ND	ND	ND	ND	ND
Toluene	700	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	190	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene (TCE)	470	ND	ND	ND	ND	ND	ND	ND	**1,900**	4.4	ND	ND	1.5	ND	ND	ND	ND	ND	ND	19	ND	ND	**1,700**	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane (Freon 11)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total	260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL VOC	*	25	12.2	13	5907.9	66.5	12.9	16.4	111,900	334.4	52.2	18.9	72.5	114	39	49.1	1.9	18	9.4	21,019	24.9	11	111,700	0.9	0	0	10	0	0

Sample Location Key

Interior of Building: A = immediataly beneath floor slab, B = within vadose zone exhibiting highest PID bias, C = groundwater interface, D = top of clay/silt confining layer

Exterior of Building: A = within vadose zone exhibiting highest PID bias, B = groundwater interface, C = top of clay/silt confining layer

Notes:

Laboratory data reporting and list configuratin provided by Contest Labs Note: data have been converted from mg/Kg to ug/Kg for consistency with previous reporting

ND - Not Detected Above the Laboratory Reporting Limit

BOLD - values indicate exceedance of applicable NYSDEC guidance values

MtBE: Methyl tertiary-Butyl Ether

Soil Sample Analysis: Volatile Organic Compounds (VOCs) & MtBE by EPA Method 8260C

SCO: Soil Cleanup Objectives

Subpart 375-6.8(a) SCO - NYSDEC Remedial Program Soil Cleanup Objectives for Unrestricted Use

BTEX: Sum of Benzene, Toluene, Ethylbenzene and mixed Xylenes

* denotes that the total VOC concentrations is the sum of all reported VOCs by EPA 8260, except MtBE

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TABLE 19
LABORATORY GROUNDWATER ANALYTICAL RESULTS
Volatile Organic Compounds
May 22 and 23, 2023

| Well ID | Date Sampled | Compound List - 8260 Full List | | |