



Environment

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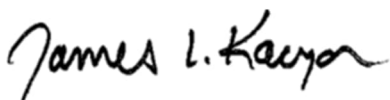
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July 2022

# Remedial Design Work Plan

**NYSEG - Auburn Green St. MGP Site**  
**Auburn, Cayuga County, New York**  
**NYSDEC Site # 7-06-009**

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## Engineering Certification

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



Matthew Thorpe  
Registered Professional Engineer  
New York License No. 090842

Date

## 1.0 Introduction

On behalf of New York State Electric & Gas Corporation (NYSEG), AECOM USA, Inc. (AECOM) has prepared this Remedial Design Work Plan (RDWP) for the remediation of impacted soils and groundwater at the NYSEG - Auburn Green St. Manufactured Gas Plant (MGP) Site (Site) located in Auburn, Cayuga County, New York (Figure 1-1). Figure 1-2 shows the layout of the Site. This RDWP provides the guidelines to implement the remedy selected by the New York State Department of Environmental Conservation (NYSDEC) in accordance with the Record of Decision (ROD) (NYSDEC, July 8, 2020) and the Administrative Order on Consent (CO) (Index No. D0-0002-9309) between NYSDCE and NYSEG (NYSDEC, March 30, 1994) and subsequent Amended and Restated Order on Consent (ARMSCO) (NYSDEC, 2016). This work plan has been prepared in accordance with NYSDCE's Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC, 2010a).

In July 2020, NYSDCE issued a ROD for the site, which established a remedial action for the on-site and off-site impacted materials. The Final Remedial Design will be prepared as specified in this work plan in accordance with the requirements of DER-10.

### 1.1 DER-10 Requirements

A copy of the ROD has been included as Appendix A of this document to satisfy the following requirements of Section 5.2 (b) of DER-10:

- Summary of the Site Characterization Report (AECOM, 2016).
- Summary of sampling results collected up to the date of the publication of the ROD.
- Figures identifying all areas where the remedial action will be conducted.
- Figures showing the vertical and horizontal extent of the area to be remediated.

In accordance with the CO and DER-10, the RDWP includes the preparation/submittal of the following information:

- Remedial Design Work Plan (this document).
- Schedule to implement the Remedial Design.
- Description of field activities (i.e., pre-design investigation [PDI]).

### 1.2 Nature and Extent of Contamination

As specified in DER-10, if the Site Characterization Report (AECOM, 2016) and Feasibility Study (AECOM, 2019) have been approved by NYSDCE and a ROD has been issued, no summary of nature and extent of contamination is required in the RDWP. A copy of the ROD is included in Appendix A.

### **1.3 Selected Remedy**

As specified in DER-10, if the Remedial Investigation Report and Feasibility Study have been approved by NYSDEC and a ROD has been issued, no summary of the selected remedy is required in the RDWP. A copy of the ROD is included in Appendix A.

### **1.4 Standards, Criteria, and Guidance**

Remedial actions are required to meet applicable environmental laws, regulations, standards, and guidance. Potentially applicable standards, criteria, and guidance (SCGs) for the site are listed in Tables 1-1, 1-2, and 1-3, which list chemical-specific, action-specific, and location-specific SCGs, respectively as well as other documents which are to be considered (TBC) when evaluating remedial objectives and technologies.

## 2.0 Design Investigations

A PDI will be completed to collect additional information required to complete the remedial design. The investigation will have the following objectives:

- Confirm distribution of contaminants of concern and understand oxidation/reduction (“redox”) conditions in groundwater to support delineation of the treatment area in the remedial design;
- Evaluate groundwater flow direction and velocity to support remedial design;
- Perform a field-scale biosparging pilot study to determine physical parameters for the remedial design and confirm feasibility of biosparging to meet remedial action objectives;
- Refine horizontal delineation of surface soil impacts;
- Evaluate the current substation cover material; and,
- Update the survey.

To meet these objectives, the following activities are planned:

- On August 31, 2021 and September 28, 2021, two wells (MW-9 and MW-10) were installed to approximately 20 feet below ground surface in the vicinity of MW-4 under a NYSDEC preliminary/conditional approval of the initial version of this RDWP (August 2021). Based on geophysical surveys and observations of lithology at these two borings, it has been determined that MW-4, previously interpreted to be inside the former gas holder, is actually located outside the former gas holder. MW-9, originally intended to be located within the former gas holder, is also located outside the former gas holder footprint. MW-10 is located inside the former gas holder.
- Following initial data reduction of the MW-9 and MW-10 installation data, a technical meeting was held with NYSDEC on November 1, 2021. Pursuant to that meeting, two additional wells were requested: MW-11, to be installed within the footprint of the former gas holder; and, MW-12, as an additional site characterization well to be installed downgradient of the former gas holder near the northeast property corner.

The four new wells (two installed fall 2021 (MW-9 and MW-10) and two to be installed summer 2022 (MW-11 and MW-12)) will support the field-scale biosparging pilot study and site-wide groundwater monitoring activities. Soil borings were/will be continuously logged to verify the elevation of lithologic units, confirm placement of the well screens, and update lithologic cross-section for the pilot study test area.

- An elevation and location survey of the new wells will be completed.
- Under the preliminary/conditional approval of the RDWP (August 2021), groundwater samples from eight existing monitoring wells (MW-1 to MW-8) and two new wells (MW-9 and MW-10) were collected between September 29, 2021 and October 4, 2021 to assess distribution of groundwater contaminants of concern and redox potential conditions. The most recent prior groundwater monitoring event for MW-1 through MW-8 was May 2014. The groundwater sampling event also provides baseline groundwater quality for the field-scale biosparging pilot study and design of oxygen-releasing compound (ORC) wells.

- The baseline groundwater monitoring data were also discussed during the technical meeting held with NYSDEC on November 1, 2021. Pursuant to that meeting, an additional round of groundwater monitoring was requested for spring 2022 to assess potential seasonal variations in groundwater quality. This round will be conducted to include additional new wells MW-11 and MW-12.
- Post-pilot study groundwater samples will be collected from a minimum of nine wells in the vicinity of and downgradient of the biosparging pilot study area (MW-1, MW-2, MW-3, MW-4, MW-7, MW-9, MW-10, MW-11, and MW-12).
- Depth-to-water will be measured, and groundwater elevations calculated to determine the direction and magnitude of hydraulic gradients in the shallow aquifer.
- Slug tests will be conducted at a minimum of five wells in the vicinity of the pilot study area to estimate the hydraulic conductivity of the shallow aquifer. Hydraulic conductivity of the wells will be used to confirm feasibility of biosparging and estimate groundwater velocity in support of the design of the biosparging and ORC wells.
- A field-scale biosparging pilot study will be performed to evaluate the ability of an air injection well (i.e., biosparging well) to distribute dissolved oxygen and meet the oxygen demand in the shallow aquifer. One of the new wells (MW-9) was installed as a biosparging well. A minimum of two other new wells (MW-10 and MW-11) will be observation wells that will be used along with select existing monitoring wells to monitor the distribution of dissolved oxygen and changes to groundwater quality during the study.

Results from the pilot study will be used to estimate the radius of influence of injected air at the biosparging well at various air flow rates, which is a critical parameter for the remedial design. In addition, results from groundwater monitoring, including new well MW-12, will be used in the assessment of potential oxygen-releasing compound (ORC) wells.

- A minimum of one additional surface soil sample will be collected (SS-13) in a limited area west of the substation fence.
- The extent of the crushed stone fill inside the substation fence will be confirmed to ensure it is sufficient for a site cover.

Details of the PDI are presented in the Pre-Design Investigation Work Plan (PDIWP) included in Appendix B.

### 3.0 Design Scope

The selected remedy for the Site described in the ROD includes the following site-specific items:

- A PDI pilot scale study will be conducted as part of the remedial design to more clearly define design parameters for enhanced bioremediation.
- A PDI of the upper foot of surface soils west of the substation fence to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover.
- All soils in the upper foot which exceed the Commercial Use Soil Cleanup Objectives (SCO) as defined by 6 NYCRR Part 375-6.8 will be excavated and transported off-site for disposal. Approximately 27 cubic yards of contaminated soil west of the substation fence is estimated to be removed from the site.
- Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the site.
- A site cover will be required to allow for commercial use of the site in areas where the upper one foot of exposed surface soil exceeds the applicable SCOs. Where a soil cover is to be used it will be a minimum of one foot of soil placed over a demarcation layer, with the upper six inches of soil of sufficient quality to maintain a vegetative layer. Soil cover material, including any fill material brought to the site, will meet the SCOs for cover material for the use of the site as set forth in 6 NYCRR Part 375-6.7(d). Substitution of other materials and components may be allowed where such components already exist or are a component of the tangible property to be placed as part of site redevelopment. Such components may include, but are not necessarily limited to: pavement, concrete, paved surface parking areas, sidewalks, building foundations, building slabs, and crushed stone.
- In-situ enhanced biodegradation will be employed to treat volatile organic chemicals (VOCs) in groundwater potentially within as well as in close proximity to (via biosparging) and further downgradient (via ORC) of the subsurface former MGP gas holder. The biological breakdown of contaminants through aerobic respiration will be enhanced by increasing the dissolved oxygen concentration in groundwater.

Should the biosparging technology prove to be implementable following reduction of PDI data, additional biosparging treatment wells will be designed and installed for full-scale implementation within and potentially in close proximity to the footprint of the former gas holder. ORC wells may be installed outside the former gas holder on the downgradient perimeter (northeast side) of the Site. The location and screen depth of the respective types of treatment wells will be determined during the design and will be installed as part of the remedial action.

- Two biosparging pilot study wells (MW-9 and MW-10) have been installed and samples collected for groundwater analyses as part of the initial mobilization of the PDI under a preliminary/conditional approval of the RDWP (August 2021).
- A meeting to discuss the information obtained from the installation of MW-9 and MW-10 and the baseline groundwater monitoring event was conducted between NYSDEC, New York State Department of Health (NYSDOH), NYSEG, and AECOM on November 1, 2021. Based

on discussions in this meeting, additional PDI scope was added to the PDI as compared to the August 2021 submittal. The additional scope includes:

- Install an additional groundwater monitoring well (MW-11) in the vicinity of Site Characterization subsurface boring SB-02 and an additional groundwater monitoring well (MW-12) downgradient of the former gas holder near the northeast property boundary.
- Collect a 2022 round of groundwater samples for site COCs from existing and new wells (MW-1 through MW-12) to supplement the baseline PDI groundwater data and to evaluate potential variations in groundwater quality between fall and spring/summer conditions.
- The biosparging pilot study will be performed with MW-9 as the injection well, acknowledging the injection well is located outside the former gas holder where benzene concentrations at MW-4 indicate treatment is needed (detections have ranged from 1,200 µg/L - 3,200 µg/L; the groundwater standard is 1 µg/L [NYSDEC, 1998]).
- Post-remedy groundwater monitoring will be required within and downgradient of the treatment zone for contaminants of concern as well as dissolved oxygen and redox potential. A minimum of two additional groundwater monitoring wells (MW-13 and MW-14) may be installed on the north side of Water Street, extending the monitoring well network. If required, these wells will be installed during the remedial action phase of work.

In addition, the following green remediation principles and techniques will be incorporated into the remedial design to the extent feasible:

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

In addition to the design activities, the ROD includes a requirement that a Monitored Natural Attenuation (MNA) monitoring program, institutional and engineering controls, and a Site Management Plan (SMP) be implemented. These are discussed in Section 6. A more detailed description of the remedial construction activities required to implement this remedy are provided below.



### 3.1 Design Description

The following section describes the elements of the design basis that apply to all phases of the remedial design. The specific design basis for each phase of the work is then described. Figure 3-1 shows the layout of the anticipated soil excavation and the layout of the in-situ enhanced biodegradation/biosparge treatability study area as well as the potential location of downgradient ORC wells as presented in the Feasibility Study (2019) (see also Figure 3-1A). The locations of the PDI proposed wells MW-9, MW-10, MW-11, and MW-12 are added to the figure in support of this work plan.

#### 3.1.1 Site Preparation

The Site will be prepared for the required remedial action and restoration work. The Site preparation activities include: mobilization; installation of erosion and sedimentation controls; installation of temporary site facilities; utility location, protection, and relocation if necessary; and implementation of traffic controls.

Engineering controls to control odors, erosion, and storm water along with the community air monitoring system will be mobilized, setup and installed prior to the start of intrusive activities. Construction and installation of the in-situ bioremediation system will be performed by AECOM and subcontractors with AECOM oversight. Subcontractors will be mobilized to the Site for drilling biosparging and monitoring wells and installation of the biosparging treatment system and infrastructure.

#### 3.1.2 Excavation

As specified in the ROD, all soils in the upper foot which exceed the commercial SCOs as defined by 6 NYCRR 357-6.8 will be excavated and transported off-site for disposal. Only arsenic was identified as a contaminant of concern in surface soil. It is estimated that 27 CY of contaminated soil will be excavated from the area shown on Figure 3-1. As the figure shows, soil will be excavated from within the limits of the following: an area bounded on the west-northwest by a concrete sidewalk, on the east-southeast by the substation fence, and at the northeastern limit by a driveway entering a gate into the substation and SS-12 (compliant result for arsenic).

The inside of the substation fence bounding the excavation is covered with crushed stone, providing a limit to the presence of surface soil. As such, only the southern limit of the proposed excavation area is not bounded by a physical feature or a compliant sample.

The PDI will verify these conditions visually and if confirmed, collect a minimum of one surface soil sample (SS-13) approximately 10 feet south of the southern limit of the previously sampled area between the substation fence and the sidewalk. Also, during the PDI, the extent of the crushed stone fill inside the substation fence will be confirmed to be sufficient for a site cover.

#### 3.1.3 Backfill and Soil Cover

DER-10 requires construction of a soil cover along with a demarcation layer in all remediated locations where soil which exceeds Unrestricted Use SCOs remains at the completion of remedial construction. At the site, soil covers will be required in all locations where impacted soil is excavated. A site cover will be required to allow for commercial use of the site in areas where the upper one foot of exposed surface soil exceeds the applicable SCOs. Where a soil cover is to be used outside the substation fence, it will be a minimum of one foot of soil placed over a demarcation layer, with the upper six inches of soil of sufficient quality to maintain a vegetative layer.

DER-10 specifies that, before it is used as backfill, clean off-site material must be tested to show it meets applicable SCOs for the area where it will be placed. The ROD identified the soil cover material as follows: Soil cover material, including any fill material brought to the site, will meet the SCOs for cover material for the use of the site as set forth in 6 NYCRR Part 375-6.7(d) along with concurrence of NYSDEC. Substitution of other materials and components may be allowed where such components already exist or are a component of the tangible property to be placed as part of site redevelopment. Such components may include, but are not necessarily limited to: pavement, concrete, paved surface parking areas, sidewalks, building foundations, building slabs, and crushed stone. DER-10 also specifies the required frequency of testing and required laboratory analyses. Any coarse grained backfill will meet the requirements of DER-10, Section 5.4(e)(5)(i): if the grain size distribution of the fill is shown to contain less than 10 percent by weight of particles that pass the #80 sieve, no laboratory chemical testing may be required.

The PDI described in the PDIWP in Appendix B includes a sampling program to pre-characterize soil in the upper foot of surface soils in a limited area west of the substation fence line to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover within the substation fence line.

### **3.1.4 In-situ Bioremediation**

Following completion of the pre-design investigation work, the following information will be used to develop the remedial design for the biosparging remediation system:

- the nature and extent of the dissolved plume that will be treated by aerobic biooxidation via in-situ biosparging,
- the estimated radius of influence (ROI) for distribution of dissolved oxygen at specified air injection flow rates, and
- the depth and construction of air injection wells.

The remedial design for the in-situ biosparging system will include the following:

- the number, spacing, and location of the biosparging injection wells required to treat the specified treatment area;
- the design and depths of the biosparging injection wells;
- the estimated operation process for the biosparging injection wells that will include the proposed flow rates, on-off cycle timing of biosparging injection wells, groupings of biosparging injection wells into legs for air injection cycling, and the required total air injection rate to be supplied by the biosparging system compressor and controls;
- design specifications for the biosparging system including compressor type and size and the location and size of the air distribution infrastructure;
- a process flow diagram showing the air distribution system and proposed controls;
- the operation and maintenance plan for the biosparging system; and
- the performance monitoring plan for the biosparging system.

The remedial design for the in-situ ORC system may include the following:

- the number, spacing, and location of the ORC injection wells required to treat the specified treatment area;
- the design including diameters and depths of the ORC wells;
- length and diameter of ORC filter socks specifications and deployment details (Naltex™ Flex-Guard vs PVC Canisters including number and length of ORC sock deployments per well);
- Frequency of ORC changeout;
- the operation and maintenance plan for the ORC system; and,
- the performance monitoring plan for the ORC system.

#### **3.1.4.1 Groundwater Monitoring / In-situ Treatment Wells**

Groundwater monitoring wells and in-situ groundwater treatment wells (biosparging and ORC) are anticipated to be installed as part of the PDI or remedial action. The anticipated wells include:

- a minimum of three biosparging pilot study wells (MW-9, MW-10, and MW-11) to be installed during the PDI (see PDIWP for details);
- biosparging wells installed during the remedial action within or in close proximity to the footprint of the former gas holder (number, location, and installation details to be determined based on the PDI and design);
- a minimum of one new well (MW-12) will be installed downgradient of the former gas holder in the area of a series of potential ORC wells which may be installed depending on groundwater quality observed onsite during the PDI; if required, the ORC wells would be installed during the remedial action outside the former gas holder on the downgradient perimeter (northeast side) of the Site (number, location, and installation details to be determined based on the PDI and design);
- a minimum of two additional site monitoring wells (MW-13 and MW-14) may be installed during the remedial action on the north side of Water Street, depending on groundwater quality observed onsite during the PDI (see below for anticipated installation details).

The approximate locations of these wells are presented in Figure 3-1.

The default method for advancing overburden borings for monitoring well installation will be using 4¼-inch hollow-stem augers (HSAs). The HSAs will be advanced to the target depth (to be determined during the remedial design) for well installation. Single-cased monitoring wells are the default monitoring well type. These wells will be constructed of 2-inch, schedule 40, flush-threaded, PVC casing and appropriately sized factory-slot 10-slot PVC well screen.

Upon completion of borehole advancement, the well screen and riser pipe will be inserted into the HSAs and set to the desired depth. A clean sand filter pack consisting of Morie sand (or equivalent), sized to match the screen and formation, will be placed into the annular space around the screen from approximately one foot below the screen to a minimum 2 feet above the top of the screen. A minimum one-foot thick bentonite (pellet or chip) seal will be placed above the filter pack and allowed to hydrate. If the bentonite seal is in a saturated zone, native groundwater will be allowed to hydrate the seal for 30 minutes. If the bentonite seal is in an unsaturated zone, potable water obtained from a certified source will be added slowly to the borehole for 30 minutes to promote hydration. The remaining

borehole annulus will be grouted using cement-bentonite grout (94 pounds cement, 5 pounds powdered bentonite, 6.5 gallons water; thoroughly mix cement and water prior to adding bentonite). Grout will be tremmied into the annular space extending from the bentonite seal to just below ground surface. Wells are anticipated to be completed as flushmount wells.

#### **3.1.4.2 Well Development**

Each new well will be developed to remove fine grained soils introduced during the drilling process and to improve hydraulic connection between the formation and the well screen. A suitable pump will be selected for development at each well (i.e., Watterra pump, peristaltic, or submersible). Pump selection will depend upon monitoring well casing diameter, depth to water, anticipated drawdown, volume of water required to be removed, and access well or electric power supply.

During development, the field personnel will record development information in a project notebook or on a well development form. Periodic readings (every 0.5 to 1 well volume) will include depth to water, pumping rate, temperature, pH, conductivity, and turbidity. The goal of development will be to remove a minimum of five casing volumes of water and achieve a turbidity reading of 50 nephelometric units (NTU) or less. If these development goals have not been achieved after two hours of development, the field personnel will notify the AECOM Project Manager for further instructions. Wells will be allowed to sit for a minimum of 72 hours after development prior to sampling.

#### **3.1.5 On-site Waste Management**

To the extent possible, all excavated soil will be loaded directly into trucks for off-site transportation to a permitted treatment or disposal facility. In the event of construction sequencing, off-site disposal facility scheduling issues, or waste characterization procedures, it may be necessary to store waste material on-site prior to loading and shipment.

To the extent practicable, stockpile areas will be located over areas to be excavated, thus limiting the requirement of extensive liners and berms. If stockpile areas are placed in non-impacted or restored areas, berms and liners will be used to protect underlying materials from becoming impacted.

Debris generated during excavation in the operations area may require decontamination staging areas to meet facility acceptance requirements. Decontamination will take place using brushes, steam cleaners, and/or pressure washers. Decontamination water, as well as residuals from dewatering activities, will be temporarily stored in appropriate 55-gallon drums and transported to an appropriate off-site disposal facility as required.

#### **3.1.6 Off-site Transportation, Treatment, and Disposal**

Excavated impacted soil will be transported to a permitted off-site landfill for disposal. If waste characterization sampling and analysis confirms this expectation, excavated soil will be managed as solid wastes at permitted off-site disposal facilities. Final selection of approved waste management facilities will take place during design.

Transportation of impacted materials from the Site will be performed in accordance with all regulatory requirements and in accordance with the Transportation Plan provided by the Engineer as part of the final design documentation. Waste shipments will be documented using the required waste manifests.

### **3.1.7 Excavation Dewatering and Water Management**

Dewatering is not expected to be necessary at the site given the shallow nature of the construction and known depths to groundwater. If dewatering is necessary due to rainwater collection, a sump will be dug in the excavation and pumps of proper sizing and capacity will be used to transfer runoff to a holding tank or 55-gallon drums. Collected water would be characterized and transported to an appropriate off-site disposal facility as required.

### **3.1.8 Site Restoration**

As specified in the ROD, clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil and establish the designed grades at the site and seeded with appropriate grass or other plants. Tree and shrub plantings will be considered during design. The City of Auburn standard specifications will be followed for restoration of any areas that fall within a city right-of way.

### **3.1.9 Odor, Vapor, and Dust Control**

Odor, vapor, and dust control will be conducted for this project due to the proximity to residential and commercial buildings. A variety of engineering controls will be available to control odors, vapors, and dust. Those controls will include, but will not necessarily be limited to, wetting soils with water to control dust, use of biosolve solution and limiting the size of excavations, or covering contaminated soils with plastic sheeting.

### **3.1.10 Waste Characterization**

Soil that has been impacted by MGP residues will be classified as non-hazardous industrial waste unless they are determined to exhibit the characteristics of ignitability, corrosivity, reactivity, or toxicity characteristics leaching procedure (TCLP) benzene, as determined by laboratory testing. If they do exhibit one or more of these characteristics, they will be classified as RCRA hazardous wastes. The exception to this will be soils that exhibit only the TCLP benzene characteristic which will be sent for thermal treatment – such soils will be designated as Conditionally Exempt MGP Remediation Waste per *“Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment From Former Manufactured Gas Plants”* (DER-4; NYSDEC, 2002). Soils will be characterized for waste disposal prior to excavation.

The RD will identify potential waste disposal facilities for impacted soils. The waste characterization analytical parameters for each facility will be provided in the RD for information for the remedial contractor. Selection of a facility and transport for disposal will be part of the remedial action contractors' scope of work. The RD will recommend pre-characterization of impacted soils so that excavated soil can be direct loaded for off-site shipment.

### **3.1.11 Air Monitoring**

Community and work zone air monitoring will be performed per NYSDOH and Occupational Safety and Health Administration (OSHA) requirements, and according to the site-specific health and safety plan (HASP) to be generated by the selected contractor and CAMP. The contaminants of concern are VOCs and particulates.

Community air monitoring will be continuous during activities capable of generating dust or releasing odors or vapors, such as soil erosion fencing installation, excavation and handling of impacted soils,

and backfilling and grading. Monitoring will be periodic during non-intrusive activities such as mobilization and site clearing.

Summaries of all air monitoring data will be provided on a weekly basis to NYSDEC/NYSDOH to facilitate the transfer of information related to protection of the local community.

### **3.1.12 Erosion and Sediment Control**

Upland remediation activities will not disturb an area greater than one acre in size. Therefore, the project will not need to meet the substantive requirements of SPDES General Construction Stormwater Permit GP—0-08-001 for Construction Activity (GP-02-01, April 2008). However, erosion will be prevented and sediment will be controlled during all site earthwork activities in accordance with applicable New York State Division of Water guidance via installation of Best Management Practices (BMPs). Minimum BMPs include but are not limited to: silt fence; hay bales, equipment decontamination pad; and geotextile catch basin protection. Storm water run-off will be controlled in a manner to prevent contact with impacted soils. Any storm water that does contact impacted soils will be collected and transported off-site to an approved water handling facility. Additional erosion control materials will be kept on site to immediately repair any deficiencies that are discovered during the inspections.

### **3.1.13 Decontamination**

During and upon completion of remediation activities, decontamination of equipment will be performed in order to prevent contaminated material from being spread off site during waste hauling activities, and to prevent the spreading of impacted material to un-impacted areas of the site. Trucks used for transport of excavated material will be decontaminated using dry decontamination methods (i.e., removal of loose material with a broom or brush) to limit the volume of decontamination water which will require treatment and disposal. These methods, along with parking of trucks on plastic sheeting during loading, will effectively prevent the spread of contaminated materials onto roadways during transport to disposal facilities. If impacted waste materials are inadvertently spread such materials must be cleaned immediately.

Decontamination of the earth-moving and drilling equipment will occur at the completion of their respective phase of work and prior to the handling of clean backfill or de-mobilization off site. The method of equipment decontamination will consist of pressure washing to remove any impacted soil. Decontamination water generated during cleaning of tools and equipment will be collected in on-site surge tanks and disposed of at an approved water handling facility. Water generated from decontaminating personnel will be minimal due to the availability of disposable personal protective equipment (PPE) such as Tyvek coveralls, booties, and nitrile gloves. The volume of decontamination water generated from personnel decontamination is assumed to be minimal compared to equipment decontamination water.

## **3.2 Design Basis**

### **3.2.1 Remedial Goals**

The remedial goals for the Site have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. As stated in the ROD, "The selected remedy is protective of human health and the environment, complies with state and federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. The remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to

the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.”

In accordance with the ROD(s), the remedial action objectives (RAOs) for this Site are:

- Groundwater
  - RAOs for Public Health Protection
    - Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
    - Prevent contact with, or inhalation of volatiles, from contaminated groundwater.
  - RAOs for Environmental Protection
    - Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
    - Prevent the discharge of contaminants to surface water.
    - Remove the source of ground or surface water contamination.
- Soil
  - RAOs for Public Health Protection
    - Prevent ingestion/direct contact with contaminated soil.
    - Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.
  - RAOs for Environmental Protection
    - Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Soil Vapor
  - RAOs for Public Health Protection
    - Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

### 3.2.2 Property Access

A portion of the work required to implement the remedial action will take place on property which does not belong to NYSEG. PDI activity on property owned by City of Auburn will be coordinated through City of Auburn Engineering Department, 24 South Street, Auburn, NY. Figure 3-2 shows the parcel boundary for NYSEG property and right-of-way owned by City of Auburn that will be accessed during the PDI.

If MW-13 and MW-14 are determined to be installed in the New York State Department of Transportation (NYSDOT) Right-of-Way, access in accordance with the NYSDOT will need to be acquired as part of the remedial action.

### 3.2.3 Utilities

The selected remedial contractor will coordinate with Dig Safely New York to identify and verify the location of subsurface utilities within the work limits. Following mark-out, proposed boring or excavation locations will be staked out to ensure that the locations will be free and clear of underground utilities. During the excavation work, the utilities may need to be relocated or protected to allow access of excavation equipment. Utility relocation and protection will be addressed within the remedial design.

### 3.2.4 Environmental Monitoring and Controls

Environmental controls will need to be installed to ensure that the work activities do not spread impacted soils and MGP waste outside the impacted areas and maintain the protection of human health and the environment throughout the remedial operations. These items will be covered in more detail in the Transportation Plan, CAMP, and HASP for the Site. These items will be submitted as part of the design.

### 3.2.5 Green Remediation

NYSDEC DER-31: Green Remediation (NYSDEC, 2010b) provides some examples of best practices and techniques that could be applied during all phases of remediation (see Attachment 1 of DER-31). In addition, NYSDEC expects that the techniques identified below will be implemented at sites unless a site-specific evaluation demonstrates impracticability or favors an alternative green approach:

Practice/Technique	Potential Benefits <sup>1</sup>	Applicable to this Remedy <sup>2</sup>
Use renewable energy where possible or purchase Renewable Energy Credits (RECs)	Reduce/supplement purchased energy use	<b>P</b>
Use of remediation technologies with an intermittent energy supply (i.e., energy use during peak energy generation only)	Reduce energy use	<b>P</b>
Incorporate green building design	Reduce future use impacts	<b>P</b>
Reuse existing buildings and infrastructure to reduce waste	Reduce waste and material use	<b>P</b>
Reuse and Recycle construction and demolition (C&D) debris and other materials (i.e., grind waste wood and other organics for on-site use)	Reduce waste and material use	<b>X</b>
Design cover systems to be usable (i.e., habitat or recreation)	Reduce construction impacts of future development	<b>X</b>
Reduce vehicle idling	Reduce air emissions and fuel use	<b>X</b>
Use of Low Sulfur Diesel Fuel (LSDF) or alternate fuels (i.e., biodiesel or E85)	Reduce air emissions	<b>X</b>
Sequence work to minimize double-handling of materials	Reduce construction impacts	<b>X</b>
Use energy efficient systems and office equipment in the job trailer	Reduce energy use	<b>X</b>

<sup>1</sup> Potential benefits listed are not all inclusive and will vary dependent upon the site and implementation of the practice or technique.

<sup>2</sup> P – Potentially applicable practices/techniques will be evaluated in the remedial design.



Detailed plans and specifications for the entire remedy will be prepared in accordance with DER-31 as part of the design activities. DER-31 compliant practices and requirements will be clearly identified and provided to NYSDEC in the 50 percent and 100 percent design submittals. In addition, DER-31 reporting requirements will be further defined and provided to NYSDEC in the 50 percent and 100 percent design submittals.

### **3.3 Design Documents**

A remedial design will be prepared consistent with the requirements of DER-10 and the ROD. Design documents will be prepared for the 50% and 100% design stages:

- The 50% design will be prepared for submittal to NYSDEC to provide an understanding of the design concept. The 50% design will include a draft Remedial Design Report (RDR), draft Quality Assurance Project Plan (QAPP), draft drawings, and draft Division 2 (technical) specifications.
- The 100% design will provide a final Remedial Design Report for ultimate NYSDEC review and approval. The RDR will include revised versions of the 50% documents, final technical specifications, additional detail drawings, and draft project plans. Project plans will include Community Emergency Response and Community Air Monitoring Plans prepared consistent with DER-10. Additional project plans will include erosion control plan, and soil management plan. Any permit documents from other agencies that have been obtained will also be included. The design will then be revised based on NYSDEC comments.

## **4.0 Permitting and Other Authorizations**

In addition to performance requirements established to ensure that the design of the remedial action meets the remedial action objectives set in the ROD (NYSDEC, 2020), the design will also be prepared to meet permitting and other regulatory requirements of local, state, and federal laws and regulations. As specified in Appendix 7B of the DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010a), NYSDEC may be able to grant some exemptions from state permits required for completion of this remedial action, provided the substantive requirements of the permit programs are followed.

### **4.1 City of Auburn Excavation Permit**

One aspect of the proposed remedial activities will occur east of Hulbert Street and west of the western NYSEG property line along Hulbert Street. The proposed activity in this area is shallow soil excavation between the NYSEG fence and Hulbert Street sidewalk. A City of Auburn excavation permit will be required for shallow excavation in the city-owned right-of-way. Plans will need to be submitted along with the City of Auburn permit form. Plans prepared during the Remedial Design will specify how the areas will be restored in accordance with the city's standard specifications.

### **4.2 City of Auburn Sidewalk Permit**

The proposed remedial project may require a sidewalk permit. If any sidewalk work is required, there is a separate sidewalk permit and the sidewalk would also have to be restored to specification. Advance notice of the work schedule will also be required.

### **4.3 NYSDOT Use and Occupancy Permit**

If it is determined MW-13 and MW-14 are required, the wells are anticipated to be installed in property owned by NYSDOT along the north side of Water Street. NYSDOT may require a Use and Occupancy Permit to install wells on this property. Determination will be made during development of the remedial design. Permits shall be expeditiously filed and obtained by NYSEG.

### **4.4 NYSDEC SPDES General Permit for Stormwater Discharge**

As specified in the federal Clean Water Act, storm water discharges from construction activities where more than one acre is disturbed are required to obtain a National Pollutant Discharge Elimination System (NPDES) construction storm water permit. New York's State Pollutant Discharge Elimination System (SPDES) has been authorized to issue required permits under this program. The remedial work at the Auburn Green Street site will not disturb more than one acre of area so a NPDES/SPDES Permit may not be required. For stormwater controls see Section 3.1.12 above.

### **4.5 Local Permits and Approvals**

At an early stage in the design process, NYSEG will meet with local representatives to discuss and obtain permits and approvals prior to the implementation of the work. The anticipated local permits are discussed under Section 4.1 and 4.2, above.

## 5.0 Schedule

The schedule for remedial design activities is included in Figure 5-1.

## 6.0 Post-Construction Plans

In addition to the remedial construction activities described in Section 3, the ROD also requires implementation of MNA and institutional and engineering controls once remedial construction is complete.

### 6.1 Monitored Natural Attenuation (MNA)

Groundwater contamination remaining after active remediation will be addressed through an MNA program. The elements of the groundwater monitoring program for MNA indicators may include the following elements (to be modified as needed during the remedial design and final SMP):

- Groundwater will be periodically monitored as determined by NYSDEC and NYSEG for site related contamination and for MNA indicators (as determined during the remedial design) to provide an understanding of the biological breakdown of Site contaminants. The recommended monitoring frequency will be determined during the remedial design.
- Monitoring wells will be selected by concurrence between NYSDEC and NYSEG such that the full limits of groundwater contamination are contained within the monitoring well network.
- MNA sampling results will be summarized as required by post-remedy monitoring plans and submitted to the NYSDEC for concurrence.

### 6.2 Institutional and Engineering Controls

Institutional controls will be implemented in the form of an environmental easement for the controlled property that:

- Requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls.
- Will allow the use and development of the controlled property for commercial or industrial use.
- Restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH.
- Requires compliance with the Department approved SMP.

Elements of the remedial action which require ongoing operation, maintenance, or monitoring are considered engineering controls. The site cover constructed over portions of the site as required by the ROD is an engineering control.

### 6.3 Site Management Plan

An SMP is required, which includes the following elements:

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

- An Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination.
- A provision for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible. The nature and extent of contamination in areas where access was previously limited or unavailable will be immediately and thoroughly investigated pursuant to a plan approved by the Department. Based on the investigation results and the Department determination of the need for a remedy, a Remedial Action Work Plan (RAWP) will be developed for the final remedy for the site, including removal and/or treatment of any source areas to the extent feasible. Citizen Participation Plan (CPP) activities will continue through this process. Any necessary remediation will be completed prior to, or in association with, redevelopment. This includes the area beneath the active electrical substation, in the event that the electrical substation is to be removed temporarily or permanently from the site.
- Descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions.
- A provision for evaluation of the potential for soil vapor intrusion for any new buildings developed onsite, including provision for implementing actions recommended to address exposures related to soil vapor intrusion.
- Provisions for the management and inspection of the identified engineering controls.
- Maintaining site access controls and Department notification.
- Periodic reviews and certification of the institutional and/or engineering controls.
- A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:
  - Monitoring of groundwater to assess the performance and effectiveness of the remedy.
  - A schedule of monitoring and frequency of submittals to the Department.
  - Monitoring and /or control for vapor intrusion for any buildings developed on the site as required.

A copy of the SMP will be provided to the appropriate property owners.

## 7.0 References

AECOM, 2016. Site Characterization Report – Auburn Green Street Former MGP Gas Holder Site, dated August 2016.

AECOM, 2019. Feasibility Study Report – NYSEG Auburn Green Street Former Manufactured Gas Plant Holder Site, April 2019.

AECOM, 2020. Final Feasibility Study Supplement – Evaluation of Anaerobic and Aerobic Technologies within Former Gas Holder, February 2020.

NYSDEC, 1994. Order on Consent, Index No. D0-0002-9309, between the Department and New York State Electric & Gas Corporation, executed on March 30, 1994.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values, Division of Water Technical and Operational Guidance Series (1.1.1). October 1998 and revisions.

NYSDEC, 2002. DER-4, Management of Coal Tar Waste and Coal Tar Contaminated Soils and Sediment From Former Manufactured Gas Plants ("MGP"s), January 2002.

NYSDEC, 2004. 6 NYCRR 703.5(f) Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations. Revised June 2004.

NYSDEC, 2006a. NYCRR Part 370 – 374 and Part 376 Environmental Remediation Programs.

NYSDEC, 2006b. 6 NYCRR Part 375 Environmental Remediation Programs Subparts 375-1 to 375- 4 & 375-6. December 2006.

NYSDEC, 2010a. DER-10, Technical Guidance for Site Investigation and Remediation. May 2010.

NYSDEC, 2010b. DER-31, Green Remediation, September 2010.

NYSDEC, 2016. Amended and Restated Multi-Site Order on Consent Index No. D0-0002-9309, between the Department and New York State Electric & Gas Corporation, executed on December 5, 2016.

NYSDEC, 2020. Record of Decision, Auburn Green St. MGP Manufactured Gas Plan Program Auburn, Cayuga County, Site No. 706009, July 2020.

## Tables

Table 1-1

## Chemical-Specific Standards, Criteria, and Guidance

NYSEG - Auburn Green St. MGP Site  
Auburn, Cayuga County, New York

Media	Requirements	Citation	Description	SCG or TBC	Comment
Soil	NYSDEC Soil Cleanup Objectives (SCOs) for Inactive Hazardous Waste Sites	6 NYCRR Part 375 Subpart 375-6 and NYSDEC DER-10, May 2010	Establishes recommended soil cleanup objectives, soil cleanup objectives for protection of groundwater quality, and groundwater standards/criteria.	SCG	Specified screening-level goals may be applicable in determining site-specific soil objectives.
	NYSDEC Guidance for implementing SCOs	NYSDEC Policy Memorandum on Soil Cleanup Guidance CP-51, October 2010 and 6 NYCRR Part 375	Provides guidance on use of SCOs.	TBC	Guidance may be applicable to site-specific soil cleanup alternatives. Provides modification to SCOs for MGP sites.
	NYSDEC Remedial Program Soil Cleanup Objectives (SCOs)	6 NYCRR Part 375 Subpart 375-6	Establishes soil screening-level objectives based on residential, commercial, and industrial land use; protection of ecological resources; and protection of groundwater quality.	SCG	Specified screening-level goals may be applicable in determining site-specific soil objectives.
Groundwater	NYSDEC Groundwater Objectives	6 NYCRR Part 700-706 NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5	Establishes guidance or standard values for groundwater quality objectives.	SCG	May be applicable in determining site-specific groundwater objectives.
Soil Vapor	NYSDOH Soil Vapor Intrusion Decision Matrices	NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006, May 2017 Update	Provides guidance for evaluating indoor air and sub-slab concentrations of organic compounds.	TBC	Guidance may be applicable to existing or new buildings constructed on and downgradient of the site.

**Notes:**

SCG = Standards, Criteria, and Guidance

TBC = Other Criteria To Be Considered



Table 1-2

## Action-Specific Standards, Criteria, and Guidance

**NYSEG - Auburn Green St. MGP Site**  
**Auburn, Cayuga County, New York**

Action	Requirements	Citation	Description	SCG or TBC	Comment
Water Treatment Discharge	NYSDEC Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations	Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1, 1.1.2	Compilation of ambient water quality standards and guidance values for toxic and non-conventional pollutants for use in NYSDEC programs (i.e., SPDES).	TBC	These standards and guidance values are potentially applicable in establishing discharge limitations to surface waters.
	NYSDEC Industrial SPDES Permit Drafting Strategy for Surface Waters	TOGS 1.2.1	Guidance for developing effluent and monitoring limits for point source releases to surface water.	TBC	These standards and guidance values are potentially applicable in establishing discharge limitations to surface waters.
	Clean Water Act	Section 401	Water Quality Certification.	SCG	Potentially Applicable.
	SPDES	6 NYCRR Parts 750-01, 750-02	Requirements for obtaining a SPDES permit and requirements for operating in accordance with a SPDES permit.	SCG	Potentially Applicable to constructing and operating a water treatment system for discharge to surface water.
	Town Sewer Division	TOGS 1.3.8	Limits on new or changed discharges to Publicly Owned Treatment Works (POTWs), strict requirements regarding bioaccumulative and persistent substances, plus other considerations.	TBC	Potentially Applicable to constructing and operating a water treatment system for discharge to Publicly Owned Treatment Works.
Construction Stormwater	SPDES Permit	NYSDEC SPDES General Permit for Stormwater Discharge	Requirements to protect stormwater from construction impacts including preparation of a Stormwater Pollution Prevention Plan (SWPPP).	SCG	Not Applicable. Land disturbance area is less than one acre.
In-Situ Treatment of Soils and Groundwater	Underground Injection Control Program	40 CFR Part 144	Includes requirements for injection of chemicals.	SCG	Potentially Applicable for In-Situ Chemical Oxidation.
	NYSDEC Ambient Water Quality Standards and Guidance Values	Division of Water Technical and Operational Guidance Series (TOGS) 2.1.2	Applicability of SPDES permits and groundwater effluent standards to the use of underground injection/recirculation as a remediation measure.	SCG	Applicable.
Indoor Air	NYSDOH Background Air Levels	Draft Guidance for Evaluating Soil Vapor Intrusion in the State of New York	Includes a database of background indoor air concentrations and description of decision making process for remediation of indoor air impacts.	TBC	Not Applicable. No exposures have been identified.
Waste Management	Solid Waste Management Facility	6 NYCRR 360	Includes solid waste management facility requirements.	SCG	Applicable if soil is removed.
	Waste Transporter Permits	6 NYCRR 364	Regulates collection, transport and delivery of regulated waste. Requires that wastes be transported by permitted waste haulers.	SCG	Applicable if soil is removed.
		TAGM 4032	Disposal of Drill Cuttings.	SCG	Applicable during the installation of injection points or new monitoring wells.
MGP-Impacted Soil	Management of soil and sediment contaminated with coal tar from Manufactured Gas Plants	NYSDEC TAGM 4060 and NYSDEC TAGM 4061 (DER-4)	This guidance outlines the criteria for MGP coal tar waste. Soils and sediment only exhibiting the toxicity characteristic for benzene (D018) may be conditionally excluded from the requirements of 6 NYCRR Parts 370-374 and 376 when they are destined for permanent thermal treatment.	SCG	Applicable for off-site treatment and disposal of soil.
Hazardous Waste	<b>Federal: Resource Conservation and Recovery Act (RCRA) Subtitle C – Hazardous Waste Management</b>				
	Generation, Management, and Treatment of Hazardous Waste	40 CFR Parts 261-265	Outlines criteria for determining if a solid waste is a hazardous waste and establishes requirements for hazardous waste management.	SCG	Because of New York State policy for management of wastes from MGP sites, no hazardous wastes will be generated as part of implementation of the remedial actions. Not Applicable.
	<b>State: NYSDEC Division of Hazardous Substances Regulation</b>				
	New York State Hazardous Waste Management Regulations	6 NYCRR Parts 370-376	Outlines criteria for determining if a solid waste is a hazardous waste and establishes a hazardous waste management program.	SCG	Because of New York State policy for management of wastes from MGP sites, no hazardous wastes will be generated as part of implementation of the remedial actions. Not Applicable.
Off-site Management of Non-hazardous Waste	RCRA Subtitle C & D	42 U.S.C. Section 6901 <i>et seq.</i> 40 CFR parts 260 through 273 (Subtitle C) 40 CFR parts 239 through 259 (Subtitle D)	State and local governments, in accordance with EPA's guidance, are the primary planning, regulating, and implementing entities for the management of non-hazardous solid waste, such as household garbage and non-hazardous industrial solid waste.	SCG	Applicable

Table 1-2

## Action-Specific Standards, Criteria, and Guidance

**NYSEG - Auburn Green St. MGP Site  
Auburn, Cayuga County, New York**

Action	Requirements	Citation	Description	SCG or TBC	Comment
Air Emissions	<i>Clean Air Act (CAA)</i>				
	New Source Review (NSR) and Prevention of Significant Deterioration (PSD) Requirements	40 CFR Part 52	New sources or modifications which emit greater than the defined threshold for listed pollutants must perform ambient impact analysis and install controls which meet best available control technology (BACT).	SCG	Not applicable. No new sources will be generated.
	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	40 CFR Part 61; 40 CFR Part 63	Source-specific regulations which establish emissions standards for hazardous air pollutants (HAPs).	SCG	Not applicable.
	New York State Air Pollution Control Regulations	6 NYCRR Parts 120, 200-203, 207, 211, 212, 219, Air Guide-1	Establishes emissions standards and permitting requirements for new sources of air pollutants and specific contaminants.	SCG	Requirements would be applicable to remediation alternatives that result in emissions of air contaminants, including particulate matter and toxic air contaminants.
	New York State Ambient Air Quality Standards	6 NYCRR Part 257	Establishes state ambient air quality standards and guidelines for protection of public health.	SCG	Applicable in evaluating air impacts during remediation activities. Establishes short-term exposure action limits for occupational exposure.
	Fugitive Dust Suppression and Particulate Monitoring	NYSDEC HWR-89-TAGM 4031	Fugitive dust suppression and particulate monitoring during source area remedial activities.	SCG	For implementation under a site health and safety plan and Community Air Monitoring Plan during remedial activities. Applicable to Site disturbance activities.
	Community Air Monitoring Plan (CAMP)	NYSDOH	Air Quality Requirements.	SCG	Applicable to Site construction activities.
Work Near Overhead Power Lines	Safety and Health Regulations for Construction	Occupational Safety and Health Administration (OSHA) 29 CFR Part 1926, Subpart K; Part 1926.550(a)(15)	Establishes minimum clearances and grounding requirements for work near electrical equipment and for the operation of cranes and derricks in the vicinity of electrical distribution and transmission lines.	SCG	The minimum required clearances will be maintained and equipment grounding will be established when work is performed in the vicinity of overhead power lines.
	Worker Protection - Safety and Health	New York State Department of Labor (NYSDOL) High-Voltage Proximity Act, Code Rule 57, Section 202-h	Establishes minimum clearances and grounding requirements for work near high-voltage power lines.	SCG	The minimum required clearances will be maintained and equipment grounding will be established when work is performed in the vicinity of overhead power lines.
Institutional Controls	Institution of an Environmental Easement	NYSDEC Policy on Environmental Easements: Environmental Conservation Law (ECL) Article 71, Title 36	NYSDEC has developed a draft standard form and procedure for establishing environmental easements.	TBC	Institutional controls will be established in accordance with NYSDEC policy
Monitored Natural Attenuation	Provides specific requirement for implementation of MNA	<i>Use of MNA at Superfund, RCRA Corrective Action and UST Sites</i> (USEPA, 1997)	This guidance document establishes the technical basis for implementing MNA.	TBC	Monitored Natural attenuation will be implemented in accordance with USEPA guidance
Site Management Plan (SMP)	Template document intended to expedite development and approval of a site-specific SMP by providing format and general content guidelines.	<i>Site Management Plan Template</i> (NYSDEC, April 2009)	NYSDEC has developed a Site Management Plan template for remedial projects performed under the management of the NYSDEC Division of Environmental Remediation.	TBC	An SMP will be utilized following remedial action, to address the means for implementing the Institutional Controls and Engineering Controls that will be required by an Environmental Easement for the Site.
Land Disturbing Activities	Excavation of impacted soil	DER-10; Technical Guidance for Site Investigation and Remediation	Requirements for collection and analysis of compliance and documentation samples.	TBC	Applicable.
			Requirements for CAMP implementation.	TBC	Applicable.
	Backfill/Soil Cover	6 NYCRR Part 375 and DER-10; Technical Guidance for Site Investigation and Remediation	Requirements for procedures to ensure that imported backfill is not impacted by COC.	TBC	Applicable.

**Notes:**

SCG = Standards, Criteria, and Guidance

TBC = Other Criteria To Be Considered

Table 1-3

## Location-Specific Standards, Criteria, and Guidance

**NYSEG - Auburn Green St. MGP Site**  
**Auburn, Cayuga County, New York**

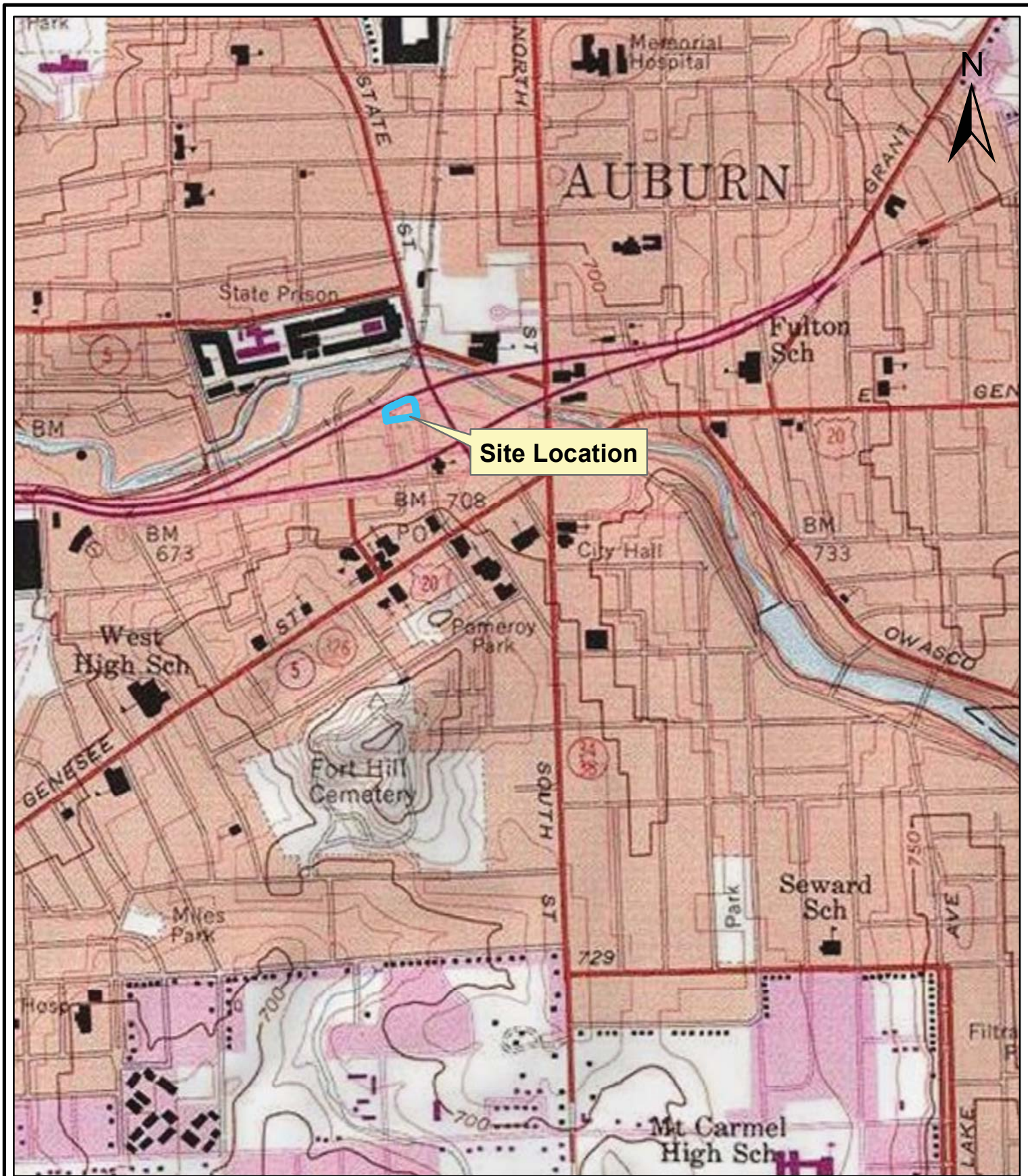
Location	Requirements	Citation	Description	SCG or TBC	Comment
Entire Site	Cayuga County	General Regulations	County transportation and Site use regulations.	TBC	Requirements of County, Town, and City would be applicable to all remediation alternatives, especially those requiring transportation.
		Redevelopment Plans	None identified.	TBC	The master plan for redevelopment will have to be considered when considering future land use at the Site.
	City of Auburn	General Ordinances	City regulations regarding transportation, noise, zoning, building permits, etc.	TBC	Requirements of County, Town, and City would be applicable to all remediation alternatives, especially those requiring transportation.
Floodplains	Executive Order 11988 - Floodplain Management	40 CFR Part 6, Subpart A; 40 CFR Part 6.302	Activities taking place within floodplains must be done to avoid adverse impacts and preserve the beneficial values in floodplains.	SCG	Applicable.
	Floodplain Management Regulations	6 NYCRR Part 500	Establishes floodplain management requirements.	SCG	Applicable.
	100-year Floodplain Regulations	Federal Emergency Management Agency	Administers floodplain management requirements.	SCG	Applicable.
Critical Habitat	Endangered Species Act and Fish and Wildlife Coordination Act	16 USC 661; 16 USC 1531	Actions must be taken to conserve critical habitat in areas where there are endangered or threatened species.	SCG	No endangered or threatened species were identified at the Site. Not applicable.
Historic Preservation	National Historic Preservation Act	16 USC 470	Establishes requirements for the identification and preservation of historic and cultural resources.	SCG	Applicable to the management of historic or archeological artifacts identified on the Site. A "No Findings" determination is required prior to excavation.
	New York State Department of Parks, Recreation, and Historic Preservation (SHPO)	Historic Preservation Act	Establishes requirements for the identification and preservation of historic and cultural resources.	SCG	Applicable to the management of historic or archeological artifacts identified on the Site. A "No Findings" determination is required prior to excavation.

**Notes:**


SCG = Standards, Criteria, and Guidance

TBC = Other Criteria To Be Considered

## Figures



# Legend

 Approximate Site Boundary

0 700 1,400 2,800 Feet



NYSEG - Auburn Green St. MGP Site  
Green Street  
Auburn, Cayuga County, New York

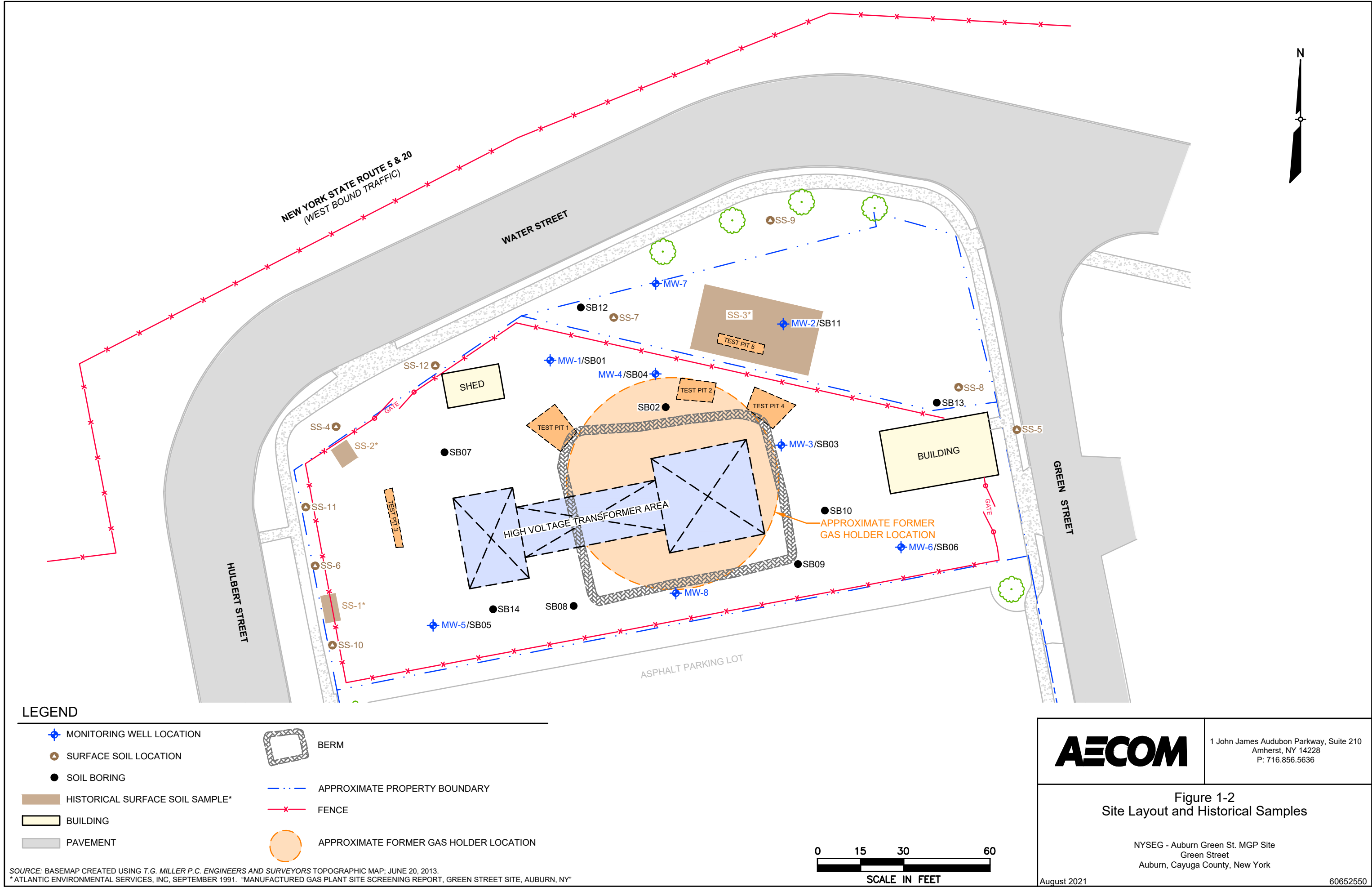
Figure 1-1

Site Location Map

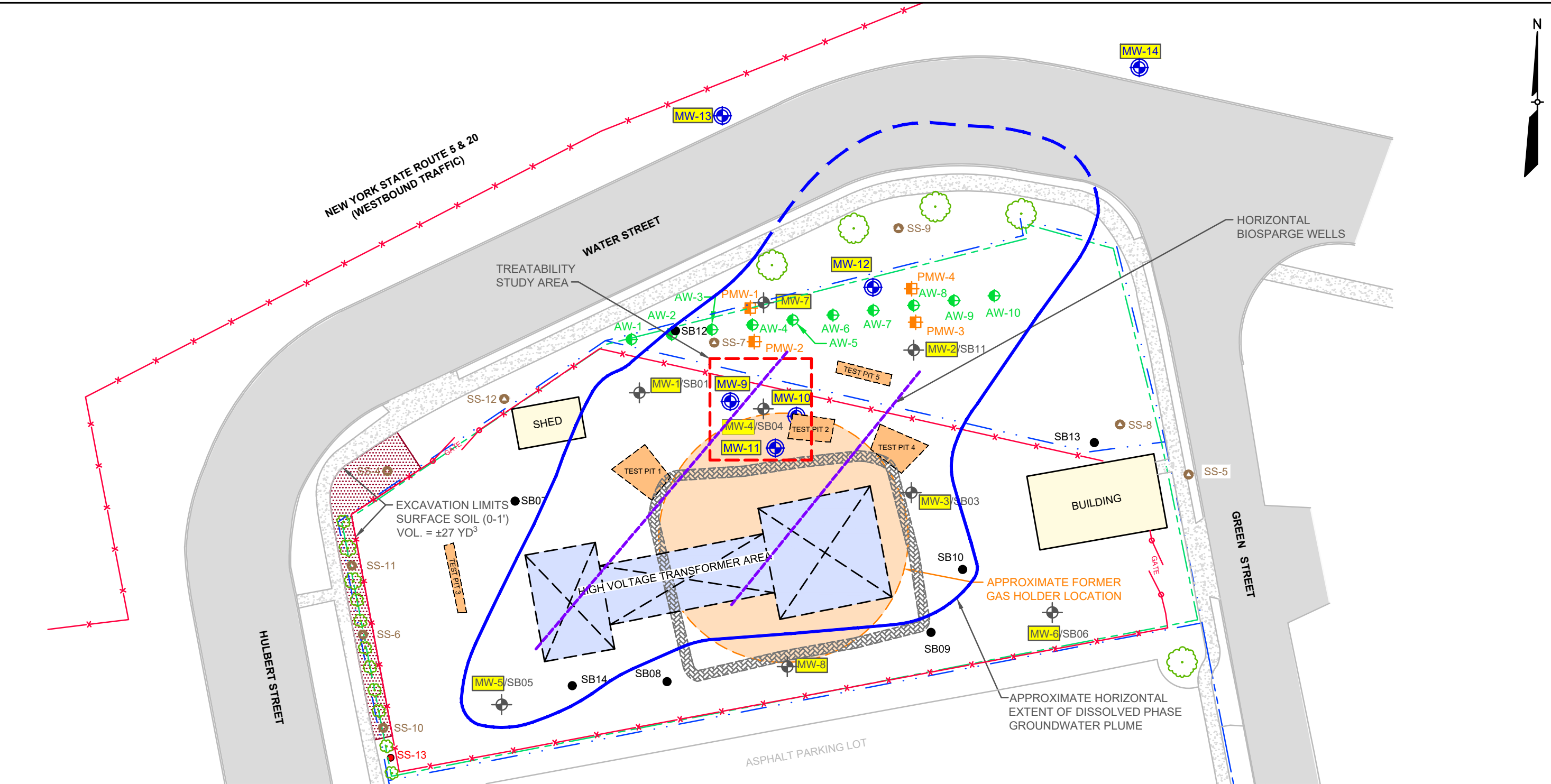
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April 2022





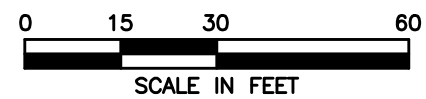
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# LEGEND

- |                                   |  |   |
|-----------------------------------|--|---|
| EXISTING MONITORING WELL LOCATION | APPROXIMATE PROPERTY BOUNDARY  | PROPOSED MONITORING WELL                    |
| SURFACE SOIL SAMPLE LOCATION      | EXTENT OF SITE COVER SYSTEM  | PROPOSED SURFACE SOIL SAMPLE LOCATION       |
| SOIL BORING                       | CHAIN LINK FENCE   | EXCAVATION LIMITS SURFACE SOIL (0-1')       |
| BUILDING                          | APPROXIMATE FORMER GAS HOLDER LOCATION   | O <sub>2</sub> PERFORMANCE MONITORING WELLS |
| ASPHALT PAVEMENT                  | MONITORING WELLS SAMPLED QUARTERLY YEAR 1; SEMI-ANNUALLY YEAR 2; ANNUALLY THEREAFTER | O <sub>2</sub> APPLICATION WELL             |
| SIDEWALK                          |  |   |
| BERM                              |  |   |

SOURCE: BASEMAP CREATED USING T.G. MILLER P.C. ENGINEERS AND SURVEYORS TOPOGRAPHIC MAP; JUNE 20, 2013.



**AECOM**

1 John James Audubon Parkway, Suite 210  
Amherst, NY 14228  
P: 716.856.5636

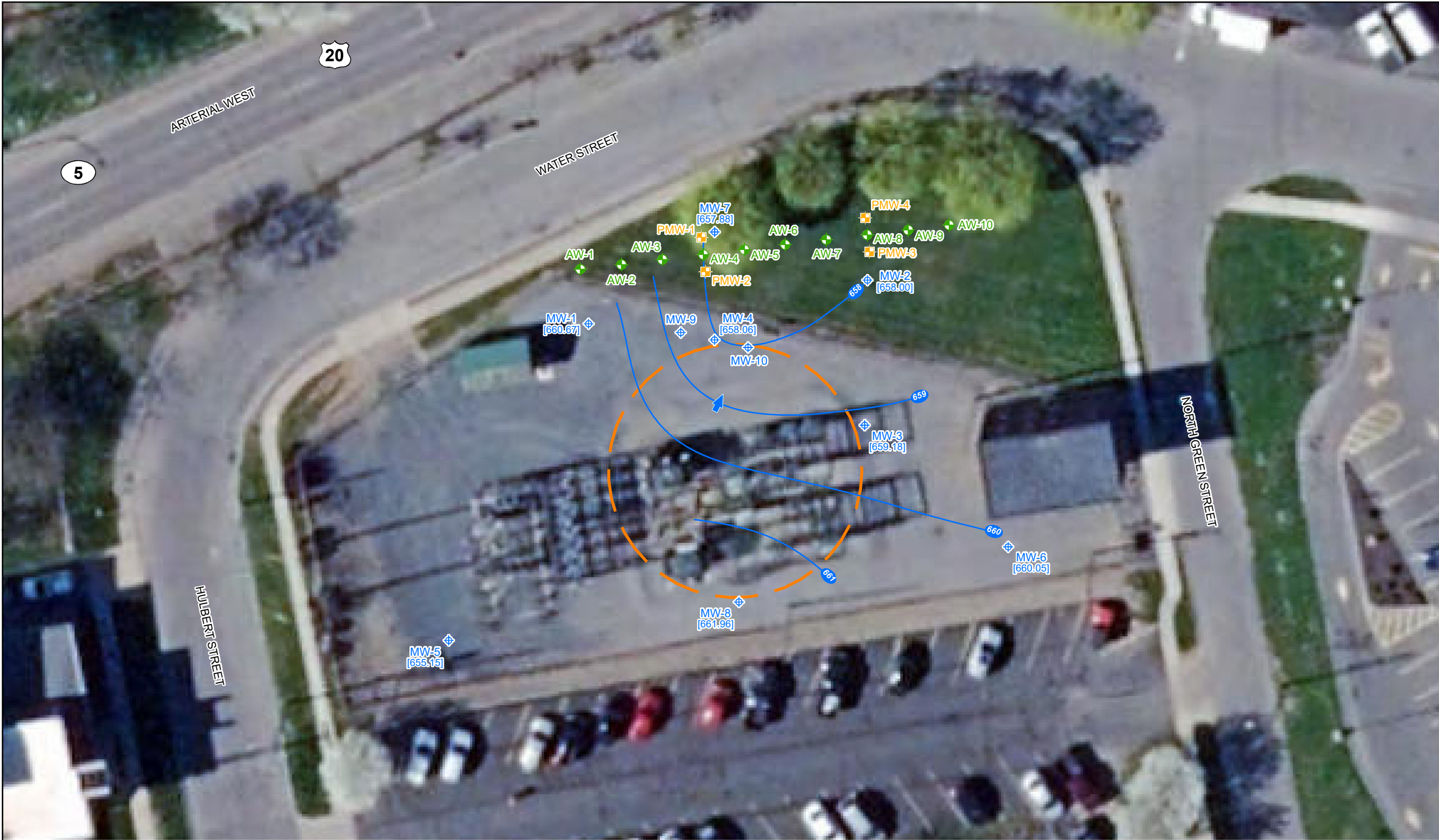
Figure 3-1  
Remedial Action Layout

NYSEG - Auburn Green St. MGP Site  
Green Street  
Auburn, Cayuga County, New York

August 2021

60652550





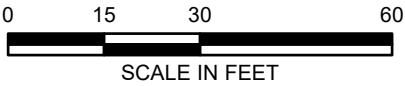
LEGEND

- PROPOSED O<sub>2</sub> PERFORMANCE MONITORING WELL
- PROPOSED O<sub>2</sub> APPLICATION WELL
- MONITORING WELL LOCATION
- [658.00] GROUNDWATER RESULT (feet NAVD 88)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- GROUNDWATER ELEVATION CONTOUR
- APPROXIMATE FORMER GAS HOLDER LOCATION

NOTES

- GROUNDWATER ELEVATIONS MEASURED ON OCTOBER 4, 2021.
- MW-5 GROUNDWATER ELEVATION WAS NOT INCLUDED IN CONTOURING. THIS WELL ELEVATION IS BELIEVED TO REPRESENT A DIFFERENT WATER LAYER WITH A LOWER HYDRAULIC HEAD COMPARED TO OTHER SITE WELLS.
- MW-9 AND MW-10 WERE NOT INCLUDED IN CONTOURING AS THEY HAVE NOT BEEN SURVEYED YET.

SOURCES: NYS ITS GIS Program Office, Orthoimagery, 2018



**AECOM**

1 John James Audubon Parkway, Suite 210  
Amherst, NY 14228  
P: 716.856.5636

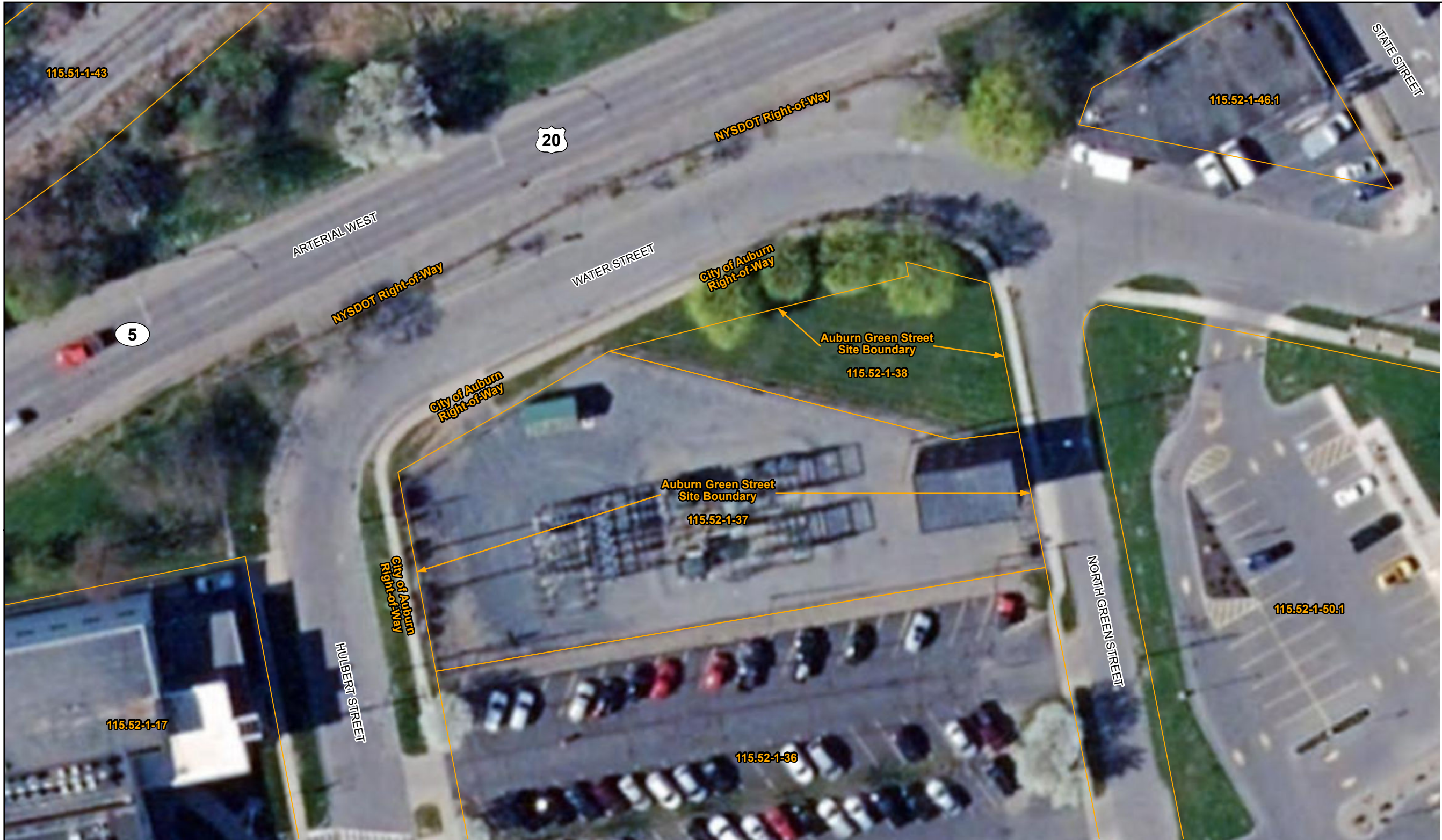
Figure 3-1A  
Groundwater Elevation Contours Map  
(October 4, 2021)

NYSEG - Auburn Green St. MGP Site  
Green Street  
Auburn, Cayuga County, New York

June 2022

60652550



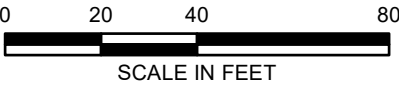


LEGEND

 TAX PARCEL BOUNDARY

NOTE: For the remedial design investigation, only City of Auburn property will be accessed (i.e., location SS-13, see Figure 3-1). Monitoring well locations MW-13 and MW-14 are shown for information, only; if needed, the wells will be installed during the remedial action and acquiring access will be an element of the remedial action.

SOURCES: ESRI World Imagery; NYS ITS GIS Program Office, NYS Tax Parcels for Public Use, 2022



**AECOM**

1 John James Audubon Parkway, Suite 210  
Amherst, NY 14228  
P: 716.856.5636

Figure 3-2  
Area Parcel Map

NYSEG - Auburn Green St. MGP Site  
Green Street  
Auburn, Cayuga County, New York

April 2022

60652550

# **Appendix A**

## **Record of Decision**

# **RECORD OF DECISION**

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**NYSEG - Auburn Green St. MGP  
Manufactured Gas Plan Program  
Auburn, Cayuga County  
Site No. 706009  
July 2020**



**Prepared by  
Division of Environmental Remediation  
New York State Department of Environmental Conservation**



# **DECLARATION STATEMENT - RECORD OF DECISION**

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NYSEG - Auburn Green St. MGP  
Manufactured Gas Plant Program  
Auburn, Cayuga County  
Site No. 706009  
July 2020

## **Statement of Purpose and Basis**

This document presents the remedy for the NYSEG - Auburn Green St. MGP site, an inactive hazardous waste disposal site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375, and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the NYSEG - Auburn Green St. MGP site and the public's input to the proposed remedy presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

## **Description of Selected Remedy**

The elements of the selected remedy are as follows:

### **1. Remedial Design**

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

- A pilot scale studies will be conducted to more clearly define design parameters for enhanced bioremediation;
- A pre-design investigation of the upper foot of surface soils to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover;
- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;

- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction.

## 2. Excavation

To accommodate the site cover described in remedy element 4, all soils in the upper foot which exceed the commercial SCOs as defined by 6 NYCRR Part 375-6.8 will be excavated and transported off-site for disposal. Approximately 27 cubic yards of contaminated soil will be removed from the site. A pre-design investigation of the upper foot of surface soils will be completed to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover.

## 3. Backfill

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

## 4. Cover System

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

## 5. Enhanced Bioremediation

In-situ enhanced biodegradation will be employed to treat VOCs in groundwater within and outside of the subsurface former MGP gas holder. The biological breakdown of contaminants through aerobic respiration will be enhanced by increasing the dissolved oxygen concentration in groundwater. Prior to the full implementation of this technology, on-site pilot scale studies will be conducted to more clearly define design parameters. Between the pilot and the full-scale

implementations, treatment wells will be installed. The screen depth of treatment wells be determined during the design.

Groundwater monitoring will be required within and downgradient of the treatment zone for contaminants of concern as well as dissolved oxygen and oxidation/reduction potential.

#### 6. Monitored Natural Attenuation (MNA)

Groundwater contamination (remaining after active remediation) will be addressed with MNA. Groundwater will be monitored for site related contamination and also for MNA indicators which will provide an understanding of the (biological activity) breaking down the contamination. MNA will require the installation of additional monitoring wells so that the full limits of groundwater contamination are contained within the monitoring well network. It is anticipated that contamination downgradient of the holder will decrease to levels below groundwater standards in a reasonable period of time (5 to 10 years). Reports of the attenuation will be provided every year.

#### 7. Institutional Controls

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

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

#### 8. Site Management Plan

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

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

Institutional Controls: The Environmental Easement discussed in Paragraph 7 above.

Engineering Controls: The soil cover discussed in Paragraph 4 above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in

areas of remaining contamination;

- a provision for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible. The nature and extent of contamination in areas where access was previously limited or unavailable will be immediately and thoroughly investigated pursuant to a plan approved by the Department. Based on the investigation results and the Department determination of the need for a remedy, a Remedial Action Work Plan (RAWP) will be developed for the final remedy for the site, including removal and/or treatment of any source areas to the extent feasible. Citizen Participation Plan (CPP) activities will continue through this process. Any necessary remediation will be completed prior to, or in association with, redevelopment. This includes the area beneath the active electrical substation, in the event that the electrical substation is removed temporarily or permanently from the site;
- descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department; and
- monitoring for vapor intrusion for any buildings on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

### **New York State Department of Health Acceptance**

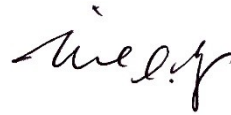
The New York State Department of Health (NYSDOH) concurs that the remedy for this site is protective of human health.

## **Declaration**

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

July 8, 2020

Date



Michael J. Ryan, P.E., Director  
Division of Environmental Remediation



# **RECORD OF DECISION**

**NYSEG - Auburn Green St. MGP  
Manufactured Gas Plant Program  
Auburn, Cayuga County  
Site No. 706009  
July 2020**

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## **SECTION 1: SUMMARY AND PURPOSE**

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of hazardous wastes at this site, as more fully described in this document, has contaminated various environmental media. Contaminants include hazardous waste and/or petroleum.

The New York State Manufactured Gas Plant Program (also known as the MGP Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

## **SECTION 2: CITIZEN PARTICIPATION**

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repositories:

Seymour Library  
176 Genesee Street  
Auburn, NY 13021  
Phone: (315) 252-2571

DEC Info Locator: <https://www.dec.ny.gov/data/DecDocs/706009/>

A public meeting was scheduled to present the findings of the remedial investigation (RI) and the feasibility study (FS) along with a summary of the proposed remedy. The public meeting was canceled in accordance with Executive Order 202.15 which suspended in-person public meetings related to proposed site remedies in order to limit community spread of COVID-19. The public comment period was extended to allow the public additional time to comment on the proposed remedy in the absence of a public meeting.

Comments on the remedy received during the comment period are summarized and addressed in the responsiveness summary section of the ROD.

### **Receive Site Citizen Participation Information By Email**

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Manufactured Gas Plant Program, Environmental Restoration Program, Brownfield Cleanup Program and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at <http://www.dec.ny.gov/chemical/61092.html>

### **SECTION 3: SITE DESCRIPTION AND HISTORY**

**Location:** The NYSEG Auburn Green St. MGP site is a 0.6-acre rectangular shaped area located in a mixed commercial/residential area of the City of Auburn, Cayuga County. The site is bordered by Green Street to the east, Water Street to the north, Hulbert Street to the west, and a parking lot to the south. The site is approximately 500 feet southeast of the NYSEG Auburn McMaster St. MGP site (Site No. 706010).

**Site Features:** The site is comprised of two adjacent parcels. The southern parcel contains an active electrical substation. The southern parcel also contains a brick building and a small shed. These buildings are not regularly occupied and are used for storage. The southern parcel is secured by a chain-link fence. The northern parcel is vacant and covered with grass and trees. There is no fence surrounding the northern parcel. The foundation and lower walls of a former MGP gas holder is present beneath the surface of the site.

**Current Zoning and Land Use:** The site is zoned for commercial use (C-2: Central Commercial) by the City of Auburn and is currently a NYSEG electric substation. The substation was constructed in 1950.

**Past Use of the Site:** The site formerly contained a Manufactured Gas Plant (MGP) distribution holder. This holder received gas generated at the Auburn McMaster MGP and possibly the Clark Street MGP sites for distribution. The 100,000 cubic feet distribution holder was constructed in 1890 and was partially demolished between 1930 and 1941. The site was then used as an auto sales and service shop, and as a portion of an adjacent lumber yard.

Site Geology Hydrology: The site lies on relatively flat terrain approximately 500 feet south of the Owasco Outlet. Site soils consist of a fill layer which generally ranges from 5 to 7 feet in depth underlain by a sandy silt layer which generally ranges from 3 to 8 feet in thickness. Beneath the sandy silt layer is a native silty/clay layer which generally ranges from 3 to 8 feet in thickness. Bedrock was encountered at approximately 20 feet below grade throughout the site.

The overburden groundwater table is present at depths between 5 and 14 feet below grade and groundwater generally flows northeast across the site towards the Owasco Outlet. A monitoring well in the southwest corner of the site had water levels consistently lower than other site wells indicating possible radial groundwater flow from the site. The water level in this well is believed to represent a different water layer with a lower hydraulic head compared to the other site wells and could be indicative of local groundwater mounding near the former MGP gas holder. The foundation and lower walls of the former gas holder are located below grade in the central portion of the site. Within the holder, fill extends to bedrock.

A site location map is attached as Figure 1.

#### **SECTION 4: LAND USE AND PHYSICAL SETTING**

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives that restrict the use of the site to commercial use (which allows for industrial use) as described in Part 375-1.8(g) were/was evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the RI to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

#### **SECTION 5: ENFORCEMENT STATUS**

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include:

New York State Electric and GAS (NYSEG)

The NYSDEC and NYSEG entered into a Consent Order on March 30, 1994. The order obligates NYSEG to investigate and, if necessary, remediate 33 former MGP sites in their service area. The Auburn (Green Street) site is one of the sites included in the multi-site order.

## **SECTION 6: SITE CONTAMINATION**

### **6.1: Summary of the Remedial Investigation**

A Remedial Investigation (RI) has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the Site Characterization Report.

The following general activities are conducted during an RI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

The analytical data collected on this site includes data for:

- groundwater
- soil

#### **6.1.1: Standards, Criteria, and Guidance (SCGs)**

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: <http://www.dec.ny.gov/regulations/61794.html>

#### **6.1.2: RI Results**

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are

summarized in Exhibit A. Additionally, the Site Characterization Report contains a full discussion of the data. The contaminant(s) of concern identified at this site is/are:

acetone	benzo(a)pyrene
arsenic	benzo(b)fluoranthene
benzene	benzo(k)fluoranthene
ethylbenzene	chrysene
toluene	cyanide
xylene	dibenz[a,h]anthracene
styrene	indeno(1,2,3-CD)pyrene
2-Methylphenol	naphthalene
2-Methylnaphthalene	phenol
benzo(a)anthracene	

As illustrated in Exhibit A, the contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil

## **6.2: Interim Remedial Measures**

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

There were no IRMs performed at this site during the RI.

## **6.3: Summary of Environmental Assessment**

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

Based upon the resources and pathways identified and the toxicity of the contaminants of ecological concern at this site, a Fish and Wildlife Resources Impact Analysis (FWRIA) was deemed not necessary for OU 01.

**Nature and Extent of Contamination:** Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, and cyanide. Groundwater samples were also analyzed for per- and polyfluoroalkyl substances (PFAS), and 1,4-dioxane. Based upon investigations conducted to date the primary contaminants of concern include arsenic in surface soils, VOCs, SVOCs, and arsenic in subsurface soils, and VOCs, SVOCs, and cyanide in groundwater.

**Soil:** Several metals including arsenic, iron, calcium, lead, mercury and zinc are found in surface soils (0-2 inches) at the site exceeding unrestricted soil cleanup objectives (SCOs). Arsenic is the only metal found in surface soils at the site exceeding commercial use SCOs. Arsenic exceeding

commercial SCOs is located within a narrow strip of surface soil along the western boundary of the site. The maximum concentration of arsenic encountered in surface soil at the site was 24.9 parts per million (ppm). There is no indication that site-related surface soil contamination extends off-site. The area around the impacted surface soil area is covered with crushed stone or pavement.

Subsurface soil (2 to 20 feet) is impacted by several constituents associated with the historic use of the site for manufactured gas plant (MGP) operations at levels exceeding unrestricted SCOs and protection of groundwater SCOs including VOCs (benzene, ethylbenzene, toluene, and xylene (BTEX)), SVOCs (polycyclic aromatic hydrocarbons (PAHs)), and metals (arsenic). Elevated levels of acetone were also detected in several subsurface soil samples. Subsurface soil contamination at levels exceeding protection of groundwater SCOs is found primarily in the central portion of the site within the former MGP gas holder or just outside the former MGP gas holder. The maximum concentration of a VOC detected in subsurface soil is benzene at a concentration of 11 ppm and the maximum concentration of an SVOC detected in subsurface soil is benzo(a)anthracene at a concentration of 11 ppm. Arsenic was detected at a maximum concentration of 43 ppm in subsurface soil.

There is no indication that site-related subsurface soil contamination extends off-site.

Groundwater: VOCs, SVOCs, and cyanide are found in groundwater within the former MGP gas holder in overburden groundwater at levels exceeding groundwater standards. VOCs including styrene and BTEX; SVOCs including naphthalene, phenol, and 2-Methylphenol; and cyanide were encountered at levels above groundwater standards in the one monitoring well within the former MGP gas holder. In groundwater samples collected in May 2014, the maximum concentration of total BTEX encountered in overburden groundwater was 2,040 parts per billion (ppb), the maximum concentration of total SVOCs encountered in overburden groundwater was 127 ppb and the maximum concentration of total cyanide encountered in overburden groundwater was 1,300 ppb compared to a standard for cyanide of 200 ppb. Benzene was the only constituent found in overburden groundwater exceeding groundwater standards in monitoring wells outside the former MGP gas holder. Benzene concentrations in groundwater outside the former MGP gas holder ranged from non-detect to 22 ppb compared to a standard of 1 ppb.

Data indicates the SVOC and cyanide groundwater impacts are limited to within the former MGP gas holder and thus the site boundary. VOC groundwater impacts (benzene) may extend beyond the site boundary. Additional monitoring wells will be installed to further address this item. However, groundwater is much less impacted by site-related contaminants outside of the former MGP gas holder.

#### **6.4: Summary of Human Exposure Pathways**

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*.

People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. People will not come into contact with site related soil or groundwater contamination unless they dig below the surface. Volatile organic compounds in soil vapor (air spaces within the soil) may move into buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of the buildings, is referred to as soil vapor intrusion. The inhalation of site related contaminants due to soil vapor intrusion does not represent a current concern because the site is vacant. However, the potential exists for the inhalation of site contaminants due to soil vapor intrusion for any future onsite development. In addition, sampling indicates soil vapor intrusion is not a potential concern for offsite buildings.

## **6.5: Summary of the Remediation Objectives**

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

### **Groundwater**

#### **RAOs for Public Health Protection**

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

#### **RAOs for Environmental Protection**

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination.

### **Soil**

#### **RAOs for Public Health Protection**

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

#### **RAOs for Environmental Protection**

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

### **Soil Vapor**

#### **RAOs for Public Health Protection**

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

## **SECTION 7: SUMMARY OF THE SELECTED REMEDY**

To be selected the remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Section 6.5. Potential remedial alternatives for the Site were identified, screened and evaluated in the FS report.

A summary of the remedial alternatives that were considered for this site is presented in Exhibit B. Cost information is presented in the form of present worth, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit C.

The basis for the Department's remedy is set forth at Exhibit D.

The selected remedy is referred to as the Surface Soil Removal, Cover System, Enhanced Bioremediation, Monitored Natural Attenuation (MNA), Institutional Control (IC), and Site Management remedy.

The estimated present worth cost to implement the remedy is \$953,000. The cost to construct the remedy is estimated to be \$544,000 and the estimated average annual cost is \$20,000.

The elements of the selected remedy are as follows:

### **1. Remedial Design**

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

- A pilot scale studies will be conducted to more clearly define design parameters for enhanced bioremediation;
- A pre-design investigation of the upper foot of surface soils to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover;
- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;



- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green remediation principles and techniques to the extent feasible in the future development at this site, any future on-site buildings will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction.

## 2. Excavation

To accommodate the site cover described in remedy element 4, all soils in the upper foot which exceed the commercial SCOs as defined by 6 NYCRR Part 375-6.8 will be excavated and transported off-site for disposal. Approximately 27 cubic yards of contaminated soil will be removed from the site. A pre-design investigation of the upper foot of surface soils will be completed to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover.

## 3. Backfill

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

## 4. Cover System

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

## 5. Enhanced Bioremediation

In-situ enhanced biodegradation will be employed to treat VOCs in groundwater within and outside of the subsurface former MGP gas holder. The biological breakdown of contaminants through aerobic respiration will be enhanced by increasing the dissolved oxygen concentration in groundwater. Prior to the full implementation of this technology, on-site pilot scale studies will

be conducted to more clearly define design parameters. Between the pilot and the full-scale implementations, treatment wells will be installed. The screen depth of treatment wells be determined during the design.

Groundwater monitoring will be required within and downgradient of the treatment zone for contaminants of concern as well as dissolved oxygen and oxidation/reduction potential.

#### 6. Monitored Natural Attenuation (MNA)

Groundwater contamination (remaining after active remediation) will be addressed with MNA. Groundwater will be monitored for site related contamination and also for MNA indicators which will provide an understanding of the (biological activity) breaking down the contamination. MNA will require the installation of additional monitoring wells so that the full limits of groundwater contamination are contained within the monitoring well network. It is anticipated that contamination downgradient of the holder will decrease to levels below groundwater standards in a reasonable period of time (5 to 10 years). Reports of the attenuation will be provided every year.

#### 7. Institutional Controls

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

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

#### 8. Site Management Plan

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

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

Institutional Controls: The Environmental Easement discussed in Paragraph 7 above.

Engineering Controls: The soil cover discussed in Paragraph 4 above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- a provision for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible. The nature and extent of contamination in areas where access was previously limited or unavailable will be immediately and thoroughly investigated pursuant to a plan approved by the Department. Based on the investigation results and the Department determination of the need for a remedy, a Remedial Action Work Plan (RAWP) will be developed for the final remedy for the site, including removal and/or treatment of any source areas to the extent feasible. Citizen Participation Plan (CPP) activities will continue through this process. Any necessary remediation will be completed prior to, or in association with, redevelopment. This includes the area beneath the active electrical substation, in the event that the electrical substation is removed temporarily or permanently from the site;
- descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department; and
- monitoring for vapor intrusion for any buildings on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

## **Exhibit A**

### **Nature and Extent of Contamination**

This section describes the findings of the Remedial Investigation for all environmental media that were evaluated. As described in Section 6.1, samples were collected from various environmental media to characterize the nature and extent of contamination.

For each medium for which contamination was identified, a table summarizes the findings of the investigation. The tables present the range of contamination found at the site in the media and compares the data with the applicable SCGs for the site. The contaminants are arranged into three categories: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganics (metals and cyanide). For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use. For soil, if applicable, the Restricted Use SCGs identified in Section 4 and Section 6.1.1 are also presented.

#### **Groundwater**

Groundwater samples were collected from on-site overburden monitoring wells in May 2013, May 2014 and September 2019 as part of the Remedial Investigation (RI) for the site. Groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, and cyanide as part of May 2013 and May 2014 groundwater sampling and per- and polyfluoroalkyl substances (PFAS) as part of September 2019 groundwater sampling. The samples were collected to assess groundwater conditions on-site and determine if groundwater contamination may be migrating off-site. The results of groundwater sampling are summarized in Table 1 and Figure 2. The results of groundwater sampling indicate that contamination in groundwater at the site exceeds groundwater standards for VOCs, SVOCs, and cyanide. Table 1 presents the most recent groundwater monitoring results for VOCs, SVOCs and cyanide which were obtained during the May 2014 sampling event.

One monitoring well was installed within the former MGP gas holder foundation (MW-4). The groundwater sample collected from this monitoring well was the most impacted by site related contaminants. Groundwater exceeds standards in MW-4 for VOCs including styrene and benzene, toluene, ethylbenzene, and xylene (BTEX); SVOCs including naphthalene, phenol, and 2-methylphenol; and cyanide. In May 2014, the concentration of total BTEX at well MW-4 was 2,040 parts per billion (ppb), the concentration of total SVOCs was 127 ppb and the concentration of cyanide was 1,300 ppb compared to a standard of 200 ppb. However, groundwater is much less impacted by site related contaminants outside of the former MGP gas holder. Benzene was the only parameter which exceeded groundwater standards in a monitoring well installed outside the former MGP gas holder foundation. In May 2014, the concentration of benzene at well MW-7 was 22 ppb compared to a standard of 1 ppb. The RI determined that groundwater generally flows to the northeast at the site, thus, MW-7 is down gradient of MW-4. Groundwater exceeding the ambient quality standard for benzene may extend off-site. Additional monitoring wells will be installed to further address this item.

Figure 2 shows the nature and extent of the groundwater contamination including and relative to the former gas holder location.

**Table 1 – Groundwater (May 2014)**

Detected Constituents	Concentration Range Detected (ppb) <sup>a</sup>	SCG <sup>b</sup> (ppb)	Frequency Exceeding SCG
<b>VOCs</b>			
Benzene	ND – 1,400	1	2 of 8
Ethylbenzene	ND – 20	5	1 of 8
Styrene	ND – 33	5	1 of 8
Toluene	ND – 410	5	1 of 8
Xylene	ND - 220	5	1 of 8
<b>SVOCs</b>			
2-Methylphenol	ND – 2.5	1	1 of 8
Naphthalene	ND – 120	10	1 of 8
Phenol	ND – 4.9	1	1 of 8
<b>Inorganics</b>			
Barium	90 – 2,300	1,000	2 of 8
Iron	670 – 33,800	300	8 of 8
Magnesium	1,100 – 45,600	35,000	3 of 8
Manganese	5.7 – 2,100	300	3 of 8
Sodium	24,300 – 456,000	20,000	8 of 8
Cyanide (total)	ND – 1,300	200	1 of 8

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.

b - SCG: Standard Criteria or Guidance - 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).

ND - Not Detected

The primary groundwater contaminants are VOCs including BTEX, SVOCs, and cyanide associated with the use of the site as an MGP storage facility. As noted on Figure 2, groundwater is significantly impacted within the former MGP gas holder foundation by these contaminants, while impacted by benzene to a much lesser degree outside the former MGP gas holder foundation.

The remaining inorganic compounds (other than cyanide) found in overburden groundwater exceeding groundwater standards as shown in Table 1 were also found in upgradient monitoring wells and are considered to

represent site background conditions. Therefore, the metal compounds found in groundwater are not considered site specific contaminants of concern.

Based on the findings of the RI, the presence of VOCs, SVOCs and cyanide has resulted in the contamination of groundwater. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are: VOCs, SVOCs and cyanide.

## Soil

Surface and subsurface soil samples were collected at the site during the RI. Surface soil samples were collected from a depth of 0 to 2 inches to assess direct human exposure in November 1990 and May 2013. Subsurface soil samples were collected from a depth of 2 - 20 feet to assess soil contamination impacts to groundwater. The results indicate that surface soils at the site exceed the unrestricted and commercial soil cleanup objectives (SCOs) for metals and subsurface soil samples exceed unrestricted and protection of groundwater SCOs for VOCs, SVOCs, and metals. Table 2a and Figure 3 present a summary of surface soil sampling results. Table 2b and Figure 4 present a summary of subsurface soil sampling results.

Table 2a compares metals concentrations in surface soils to unrestricted SCOs as well as to applicable commercial use SCOs. The metals arsenic, calcium, iron, lead, mercury, and zinc were found to exceed unrestricted SCOs. However, only arsenic was found to exceed commercial SCOs in four of twelve surface soil samples collected at the site. Arsenic was present in soils in a narrow strip of grass covered ground along the western boundary of the site.

**Table 2a – Surface Soil (0-2 inches depth)**

Detected Constituents	Concentration Range Detected (ppm) <sup>a</sup>	Unrestricted SCG <sup>b</sup> (ppm)	Frequency Exceeding Unrestricted SCG	Restricted Use SCG <sup>c</sup> (ppm)	Frequency Exceeding Restricted SCG
<b>Metals</b>					
Arsenic	4 – 24.9	13	5 of 12	16	4 of 12
Calcium	7,360 – 110,000	10,000	11 of 12	N/A	N/A
Iron	9,510 – 17,400	2,000	12 of 12	N/A	N/A
Lead	16.3 – 171	63	5 of 12	1,000	0 of 12
Mercury	ND – 0.41	0.18	1 of 12	2.8	0 of 12
Zinc	41.1 - 229	109	5 of 12	10,000	0 of 12

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;

b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.

c - SCG: Part 375-6.8(b), Restricted Use Soil Cleanup Objectives for the Protection of Public Health for Commercial Use, unless otherwise noted.

N/A – Not Applicable (No Standard)

ND – Not Detected

Table 2b compares VOCs, SVOCs, and arsenic concentrations in subsurface soil to unrestricted SCOs as well as applicable protection of groundwater SCOs. Several constituents associated with the historic use of the site for MGP operations were encountered at elevated levels in subsurface soil samples. These constituents include VOCs (BTEX), SVOCs (polycyclic aromatic hydrocarbons (PAHs)), and arsenic. Elevated levels of acetone were also detected in several subsurface soil samples. These constituents exceeded both applicable unrestricted and protection of groundwater SCOs. The highest concentrations of MGP related constituents were encountered in subsurface soil samples collected from within the former gas holder foundation. The maximum concentration of a VOC detected in subsurface soil is benzene at a concentration of 11 ppm at soil boring location SB-4. The maximum concentration of an SVOC detected in subsurface soil is benzo(a)pyrene at a concentration of 11 ppm at soil boring SB-2.

Several other metals were present in subsurface soils samples above unrestricted SCOs including aluminum, barium, cadmium, calcium, iron, lead, mercury, nickel, and zinc. With the exception of barium, each of these metals was present at levels below protection of groundwater SCOs. These constituents are typically associated with historic fill and were present at concentrations below protection of groundwater SCOs and are therefore not expected to have an impact on groundwater. Barium was present in only one of 27 samples in exceedance of protection of groundwater SCOs and is also typically associated with historic fill.

**Table 2b – Subsurface Soil (2-20 feet depth)**

Detected Constituents	Concentration Range Detected (ppm) <sup>a</sup>	Unrestricted SCG <sup>b</sup> (ppm)	Frequency Exceeding Unrestricted SCG	Protection of Groundwater SCG <sup>c</sup> (ppm)	Frequency Exceeding Restricted SCG
<b>VOCs</b>					
Acetone	ND – 8.4	0.05	6 of 27	0.05	6 of 27
Benzene	ND – 11	0.06	6 of 27	0.06	6 of 27
Ethylbenzene	ND – 1.1	1	1 of 27	1	1 of 27
Toluene	ND – 1.1	0.7	1 of 27	0.7	1 of 27
Xylene	ND – 4.1	0.26	2 of 27	1.6	2 of 27
<b>SVOCs</b>					
2-Methylnaphthalene	ND – 1.9	0.41	1 of 27	36.4	0 of 27
Benzo(a)anthracene	ND – 11	1	4 of 27	1	4 of 27
Benzo(a)pyrene	ND – 8.1	1	4 of 27	22	0 of 27
Benzo(b)fluoranthene	ND – 10	1	5 of 27	1.7	2 of 27
Benzo(k)fluoranthene	ND – 3.9	0.8	3 of 27	1.7	2 of 27
Chrysene	ND – 9	1	4 of 27	1	4 of 27
Dibenzo(a,h)anthracene	ND – 4.1	0.33	2 of 27	1,000	0 of 27

Detected Constituents	Concentration Range Detected (ppm) <sup>a</sup>	Unrestricted SCG <sup>b</sup> (ppm)	Frequency Exceeding Unrestricted SCG	Protection of Groundwater SCG <sup>c</sup> (ppm)	Frequency Exceeding Restricted SCG
Indeno(1,2,3-cd)pyrene	ND – 6.3	0.5	4 of 27	8.2	0 of 27
<b>Metals</b>					
Aluminum	3,660 – 10,800	10,000	2 of 27	N/A	N/A
Arsenic	3 - 43	13	9 of 27	16	7 of 27
Barium	32.7 – 1,290	350	1 of 27	820	1 of 27
Cadmium	0.032 – 3.7	2.5	1 of 27	7.5	0 of 27
Calcium	3,190 – 121,000	10,000	1 of 27	N/A	N/A
Iron	6,300 – 42,100	2,000	25 of 27	N/A	N/A
Lead	6 – 272	63	27 of 27	450	0 of 27
Mercury	0.014 – 0.72	0.18	8 of 27	0.73	0 of 27
Nickel	7.9 – 40.5	30	7 of 27	130	0 of 27
Zinc	17.8 - 589	109	5 of 27	2,480	0 of 27

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;

b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives.

c - SCG: Part 375-6.8(b), Soil Cleanup Objectives for the Protection of Groundwater

N/A – Not Applicable (No Standard)

ND – Not Detected

The primary soil contaminants are VOCs (acetone and BTEX), SVOCs (polycyclic aromatic hydrocarbons (PAHs)) and arsenic and barium associated with historic use of the site for MGP operations (remote gas storage). As noted on Figure 4, the primary soil contamination is associated with the former MGP gas holder which is centrally located within the site boundary. Other metals encountered in surface and subsurface samples including aluminum, cadmium, calcium, iron, lead, mercury, nickel and zinc were present at levels below applicable SCOs for the site (commercial and protection of groundwater SCOs) and are typically associated with historic fill.

Based on the findings of the Remedial Investigation, the presence of VOCs, SVOCs and arsenic has resulted in the contamination of soil. The site contaminants identified in soil which are considered to be the primary contaminants of concern, to be addressed by the remedy selection process are VOCs, SVOCs and arsenic.



## Exhibit B

### Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (see Section 6.5) to address the contaminated media identified at the site as described in Exhibit A.

#### **Alternative 1: No Action**

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative leaves the site in its present condition and does not provide any additional protection to public health and the environment.

#### **Alternative 2: Surface Soil Removal, Cover System, Monitored Natural Attenuation (MNA), Institutional Controls (ICs) and Site Management**

This alternative includes a site cover over the entire site consisting of existing soils and crushed stone with excavation of soils in exceedance of commercial SCOs in the top one foot on the western portion of the site to accommodate the cover. The Alternative also includes an institutional control in the form of an environmental easement to limit development of the site to commercial or industrial use, restrict the use of groundwater from beneath the site as a source of a potable water without NYSDOH or Cayuga County Health Department approval, and require evaluation of soil vapor intrusion prior to development of the property with implementation of appropriate actions if deemed necessary. Long-term groundwater monitoring would be required pursuant to a Site Management Plan. The long-term groundwater monitoring plan must meet the requirements of monitored natural attenuation as established in DER-10 and continue until concentrations of contaminants in groundwater meet NYSDEC standards or asymptotic levels acceptable to the NYSDEC. Periodic certification of institutional and engineering controls would be required.

*Present Worth:* ..... \$301,000  
*Capital Cost:* ..... \$70,000  
*Annual Costs (years 1-30):* ..... \$15,000

#### **Alternative 3: Surface Soil Removal, Cover System, Enhanced Bioremediation, MNA, ICs and Site Management**

This alternative includes all of the elements in Alternative 2 (surface soil removal, cover system, MNA, institutional controls, site management) with the addition of in-situ treatment of groundwater by aerobic biodegradation. In-situ enhanced biodegradation employs a treatment additive to expedite the degradation of contaminants in groundwater within the former MGP gas holder foundation and downgradient of the subsurface holder.

*Present Worth:* ..... \$953,000  
*Capital Cost:* ..... \$544,000  
*Annual Costs (years 1-10):* ..... \$43,000  
*Annual Costs (years 11-20):* ..... \$15,000  
*Annual Costs (years 21-30):* ..... \$2,000

#### **Alternative 4: Restoration to Pre-Disposal or Unrestricted Conditions**

This alternative achieves all of the SCGs discussed in Section 6.1.1 and Exhibit A and soil meets the unrestricted soil clean objectives listed in Part 375-6.8 (a). This alternative includes the excavation and off-site disposal of all soil contamination above unrestricted SCO and backfilling with soil meeting unrestricted SCO. The excavation of all soils in exceedance of unrestricted SCO eliminates sources of groundwater contamination. Removal of the sub-station is required for this excavation. This Alternative would include confirmation groundwater sampling under the Site Management Plan to confirm groundwater meets standards both on and off-site. Groundwater monitoring under Alternative 4 is expected to be less extensive than under Alternatives 2 and 3 because the source of groundwater contamination is permanently removed. This Alternative does not rely on institutional controls to prevent future exposure.

<i>Present Worth:</i> .....	<i>\$11,565,000</i>
<i>Capital Cost:</i> .....	<i>\$11,500,000</i>
<i>Annual Costs (years 1-5):</i> .....	<i>\$15,000</i>

**Exhibit C****Remedial Alternative Costs**

<b>Remedial Alternative</b>	<b>Capital Cost (\$)</b>	<b>Annual Costs (\$)</b>	<b>Total Present Worth (\$)</b>
Alternative 1: No Action	0	0	0
Alternative 2: Surface Soil Excavation, Cover System, Monitored Natural Attenuation, Institutional Controls and Site Management	\$ 70,000	\$ 15,000 (1-30 years)	\$ 301,000
Alternative 3: Surface Soil Excavation, Cover System, Monitored Natural Attenuation, Enhanced Bioremediation, Institutional Controls and Site Management	\$ 544,000	\$ 43,000 (1-10 years) \$ 15,000 (11-20 years) \$ 2,000 (21-30 years)	\$ 953,000
Alternative 4: Restoration to Pre-Disposal or Unrestricted Conditions	\$ 11,500,000	\$ 15,000 (1-6 years)	\$ 11,565,000

## **Exhibit D**

### **SUMMARY OF THE SELECTED REMEDY**

The Department has selected Alternative 3, Surface Soil Excavation, Cover System, Enhanced Bioremediation, MNA, ICs and Site Management as the remedy for this site. Alternative 3 achieves the remediation goals for the site by establishing a site cover which allows for continued use of the site as an electrical substation and implementing groundwater treatment with the goal of meeting groundwater standard by treatment and MNA. The elements of this remedy are described in Section 7. The selected remedy is depicted in Figure 5.

### **Basis for Selection**

The selected remedy is based on the results of the RI and the evaluation of alternatives. The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

The selected remedy Alternative 3 satisfies this criterion by eliminating exposure to contaminants of concern by establishing a site cover, treating contaminated groundwater, and placing institutional controls (environmental easement and site management plan) on the site. Alternative 3 removes contamination exceeding commercial SCOs from surface soils (top one foot) and eliminates exposure to subsurface soils and groundwater through the implementation of institutional controls. In-situ groundwater treatment provides further protection of the environment by reducing the concentrations of contaminants in groundwater. Alternative 1 (No Further Action) does not provide sufficient protection to public health and the environment and will not be evaluated further. Alternative 2 satisfies this criterion, but not as effectively as Alternative 3 because Alternative 2 does not include in-situ treatment of groundwater contamination, therefore groundwater contamination may persist beneath the site for a longer period of time. Alternative 4 satisfies this criterion by the complete elimination of site contamination.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

Alternatives 2 through 4 each comply with this criterion. Alternatives 2 and 3 remove contaminated surface soil above soil cleanup objectives (SCOs) and treat contaminated groundwater in exceedance of groundwater standards with the goal of meeting groundwater standards. In-situ groundwater treatment combined with MNA under Alternative 3 is expected to decrease groundwater contaminant concentrations over time. Alternative 2 is expected to eventually comply with this Alternative however it is expected to take significantly longer to achieve groundwater standards without in-situ treatment. Alternative 4 removes all contamination from the site exceeding any SCGs, and thus satisfies this criterion.

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the

remedial strategies.

3. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Long-term effectiveness is accomplished by Alternatives 2, 3, and 4. The site cover and institutional controls (environmental easement and site management plan) under Alternatives 2 and 3 effectively eliminate the risk of direct contact exposure to contaminants over the long term. Full removal of contaminated site soils under Alternative 4 eliminates long-term risks without the use of institutional or engineering controls (site cover).

4. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternative 4 permanently removes the volume of subsurface soil contamination from the site. The full removal of contaminated subsurface soil results in a reduction in the volume of contaminated groundwater beneath the site within a short amount of time. Alternative 3 leaves the subsurface soil contamination in place beneath the site but reduces the volume of groundwater contamination at the site through treatment via enhanced biodegradation. Similar to Alternative 3, Alternative 2 leaves subsurface soil contamination in place, however under Alternative 2 groundwater contamination is reduced at a slower rate.

5. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternative 2 has the least short-term impacts as there is no intrusive remediation in the subsurface beneath the substation. Alternative 3 necessitates more short-term impacts than Alternative 2 due to the in-situ groundwater treatment. Enhanced biodegradation is a frequently used remedial technology and short-term impacts such as drilling operations can be effectively managed. Alternative 4 necessitates significant short-term impacts because it involves the relocation of the electrical substation and the excavation and off-site disposal of subsurface soil. Best management practices are needed under this alternative to protect the surrounding community during relocation of the electrical substation, excavation, and off-site disposal. Alternative 3 is more effective in the short-term than Alternative 2 because Alternative 3 is expected to achieve remedial objectives for groundwater more quickly than Alternative 2.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

Alternative 2 is the easiest alternative to implement. Alternative 2 includes only the removal and replacement of surface soil, the long-term maintenance of a site cover, and the long-term monitoring of groundwater. Each of these activities is easily implementable. Alternative 3 is also easily implementable. Alternative 3 includes the components of Alternative 2 described above and in-situ treatment of groundwater by enhanced biodegradation. Enhanced biodegradation is a common technology which is easily implementable. Alternative 4 is more difficult

to implement than Alternatives 2 and 3. Alternative 4 requires the relocation of the electrical substation currently at the site so that contaminated subsurface soil beneath the electrical substation can be removed. The electrical substation is critical infrastructure to the community; therefore, either temporary or permanent relocation of the electrical substation is needed to implement this alternative.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

The cost of remedial action at this site differs substantially between Alternative 4 and Alternatives 2 and 3. Alternative 4 removes all subsurface soil contamination from the site which requires the removal of the electrical substation at significant cost. The removal action under Alternative 4 includes excavation to a depth of 20 feet with a significant amount of removal beneath the groundwater table which is also costly. Alternative 4 reduces the length of time groundwater needs to be monitored thus reducing the monitoring cost, but this reduction does not off-set the difference in capital costs.

Alternative 2 has little capital costs because it only includes a small soil removal and placement of institutional controls (placement of an environmental easement and establishment of a site management plan). Alternative 3 is more costly than Alternative 2 because it includes the cost of in-situ groundwater treatment. Long-term costs for monitoring under Alternative 2 and 3 are approximately the same. Alternative 3 is expected to be cost effective because it will reduce contaminant concentrations at a significantly lower cost than Alternative 4.

8. Land Use. When cleanup to pre-disposal conditions is determined to be infeasible, the Department may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

The site is currently the location of an electrical substation operated by the site owner NYSEG. Site use is not expected to change in the foreseeable future. The electrical substation is important infrastructure to the local community and cannot be easily relocated. Alternatives 2 and 3 allow for the continued use of the site for this purpose. Alternative 4 requires the removal and relocation of the electrical substation during implementation of the remedial action so that all subsurface contamination can be removed.

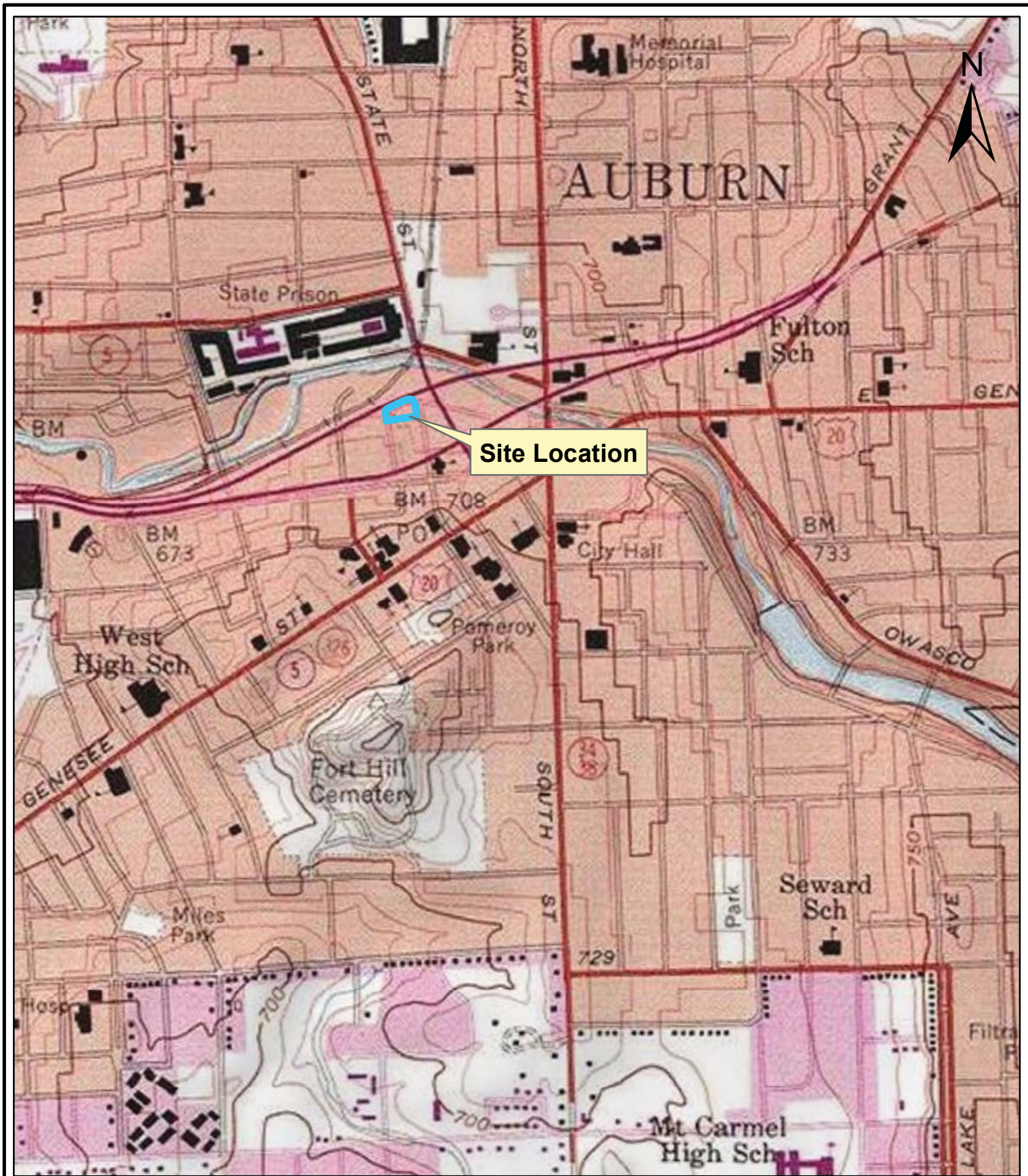
Alternatives 2 and 3 include a provision for evaluation of additional remedial actions should use of the site as an electrical substation be discontinued in the future allowing for better access to contaminated soil and groundwater beneath the site. However, a significant change of use of this site is not expected during the time over which Alternatives 3 is expected to effectively achieve remedial action objectives for groundwater.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluated. A responsiveness summary has been prepared that describes public comments received and the manner in which the Department will address the concerns raised.

Alternative 3 has been selected because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.





## Legend



Approximate Site Boundary

Former Auburn Green Street MGP Site  
Green Street  
Auburn, Cayuga County, New York

0 700 1,400 2,800 Feet



Figure 1

Site Location Map

AECOM

July 2013





MW-4	CRIT	05/13
VOCs:		
Benzene	1	2100
Toulene	5	750
Ethylbenzene	5	25
Xylenes (total)	5	260

MW-4	CRIT	05/14
VOCs:		
Benzene	1	1400
Ethylbenzene	5	20
Styrene	5	333
Toulene	5	410
Xylenes (total)	5	220

MW-7	CRIT	05/14
VOCs:		
Benzene	1	22

MW-2	CRIT	05/13
VOCs:		
Benzene	1	15

MW-4	CRIT	05/13
SVOCs:		
Napthalene	10	140
Phenol	1	5.3
2-Methylphenol(o-cresol)	1	2.93
4-Methylphenol(p-cresol)	1	2.83
Cyanide (total)	200	9103

MW-4	CRIT	05/14
SVOCs:		
Napthalene	10	120
Phenol	1	4.9
2-Methylphenol(o-cresol)	1	2.53
Cyanide (total)	200	13003

MW-1	CRIT	05/13
VOCs:		
Benzene	1	59









MW-5	CRIT	05/13
VOCs:		
Acetone	50	82
Benzene	1	14

MW-3	CRIT	05/13
VOCs:		
Benzene	1	10

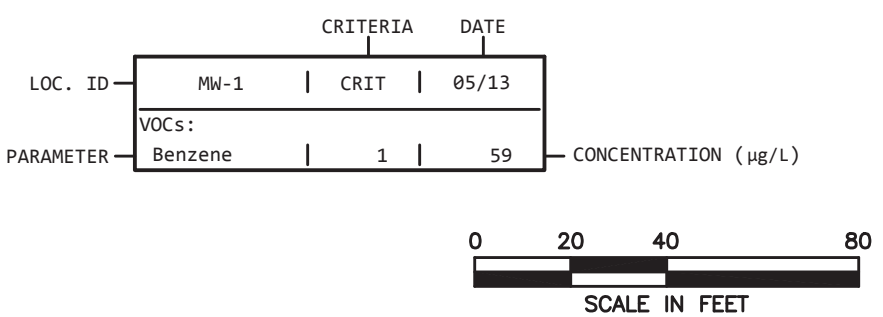
LOC. ID	MW-1	CRIT	05/13
VOCs:			
PARAMETER	Benzene	1	59

CONCENTRATION (µg/L)

LEGEND

-  MONITORING WELL LOCATION
-  SOIL BORING
-  BUILDING
-  PAVEMENT
-  BERM
-  APPROXIMATE PROPERTY BOUNDARY
-  FENCE
-  APPROXIMATE FORMER GAS HOLDER LOCATION

CRITERIA: NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations.  
SOURCE: BASEMAP CREATED USING T.G. MILLER P.C. ENGINEERS AND SURVEYORS TOPOGRAPHIC MAP; JUNE 20, 2013.



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Figure 2  
Groundwater Exceedances

Former Auburn Green Street MGP Site  
Green Street  
Auburn, Cayuga County, New York

June 2017

60543583





SS-12	CRIT 1	CRIT 2	CRIT 3	04/14
Metals:				
Calcium	10000	--	--	46,200
Iron	2000	--	--	10,000
Zinc	109	10000	2480	112

SS-7	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Calcium	10000	--	--	30,500
Iron	2000	--	--	13,900

SS-9	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Calcium	10000	--	--	42,600
Iron	2000	--	--	17,400

SS-3	CRIT 1	CRIT 2	CRIT 3	11/90
Metals:				
Calcium	10000	--	--	54,000
Iron	2000	--	--	10,000

SS-8	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Calcium	10000	--	--	49,800
Iron	2000	--	--	9,510

SS-5	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Iron	2000	--	--	13,300

SS-4	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Arsenic	13	16	16	17
Calcium	10000	--	--	107,000
Iron	2000	--	--	12,100
Lead	63	1000	450	85
Zinc	109	10000	2480	229

SS-2	CRIT 1	CRIT 2	CRIT 3	11/90
Metals:				
Calcium	10000	--	--	110,000
Iron	2000	--	--	10,000

SS-11	CRIT 1	CRIT 2	CRIT 3	04/14
Metals:				
Arsenic	13	16	16	15.9
Calcium	10000	--	--	14,900
Iron	2000	--	--	10,700
Lead	63	1000	450	120
Zinc	109	10000	2480	111

SS-6	CRIT 1	CRIT 2	CRIT 3	05/13
Metals:				
Arsenic	13	16	16	23.8
Calcium	10000	--	--	16,900
Iron	2000	--	--	15,500
Lead	63	1000	450	94.1
Zinc	109	10000	2480	150

SS-1	CRIT 1	CRIT 2	CRIT 3	11/90
Metals:				
Arsenic	13	--	--	19
Calcium	10000	--	--	57,000
Iron	2000	--	--	12,000
Lead	63	--	--	130

SS-10	CRIT 1	CRIT 2	CRIT 3	04/14
Metals:				
Arsenic	13	16	16	24.9
Calcium	10000	--	--	20,200
Iron	2000	--	--	12,600
Lead	63	1000	450	171
Mercury	0.18	2.8	0.73	0.41
Zinc	109	10000	2480	129

NEW YORK STATE ROUTE 5 & 20  
(WEST BOUND TRAFFIC)

WATER STREET

GREEN STREET

HULBERT STREET

ASPHALT PARKING LOT










EXCAVATION LIMITS  
SURFACE SOIL (0-1')  
VOL. = ±27 YD<sup>3</sup>

HIGH VOLTAGE TRANSFORMER AREA

SHED

BUILDING

LEGEND


-  SURFACE SOIL LOCATION
-  HISTORICAL SURFACE SOIL SAMPLE\*
-  BUILDING
-  PAVEMENT
-  AREAL EXTENT OF SURFACE SOIL  
REQUIRING REMEDIATION, (0-1')
-  BERM
-  APPROXIMATE PROPERTY BOUNDARY
-  FENCE
-  APPROXIMATE FORMER GAS HOLDER LOCATION

		CRITERIA	CRITERIA	CRITERIA	DATE
LOC. ID	SS-4	CRIT 1	CRIT 2	CRIT 3	05/13
PARAMETER	Metals:				
	Arsenic	16	16	16	17

CONCENTRATION (mg/kg)

A horizontal scale bar labeled "SCALE IN FEET" with markings at 0, 20, 40, and 80 feet. The bar is divided into four equal segments, each representing 20 feet.

uding CP-51 Table 1, Effective 12/2/10.



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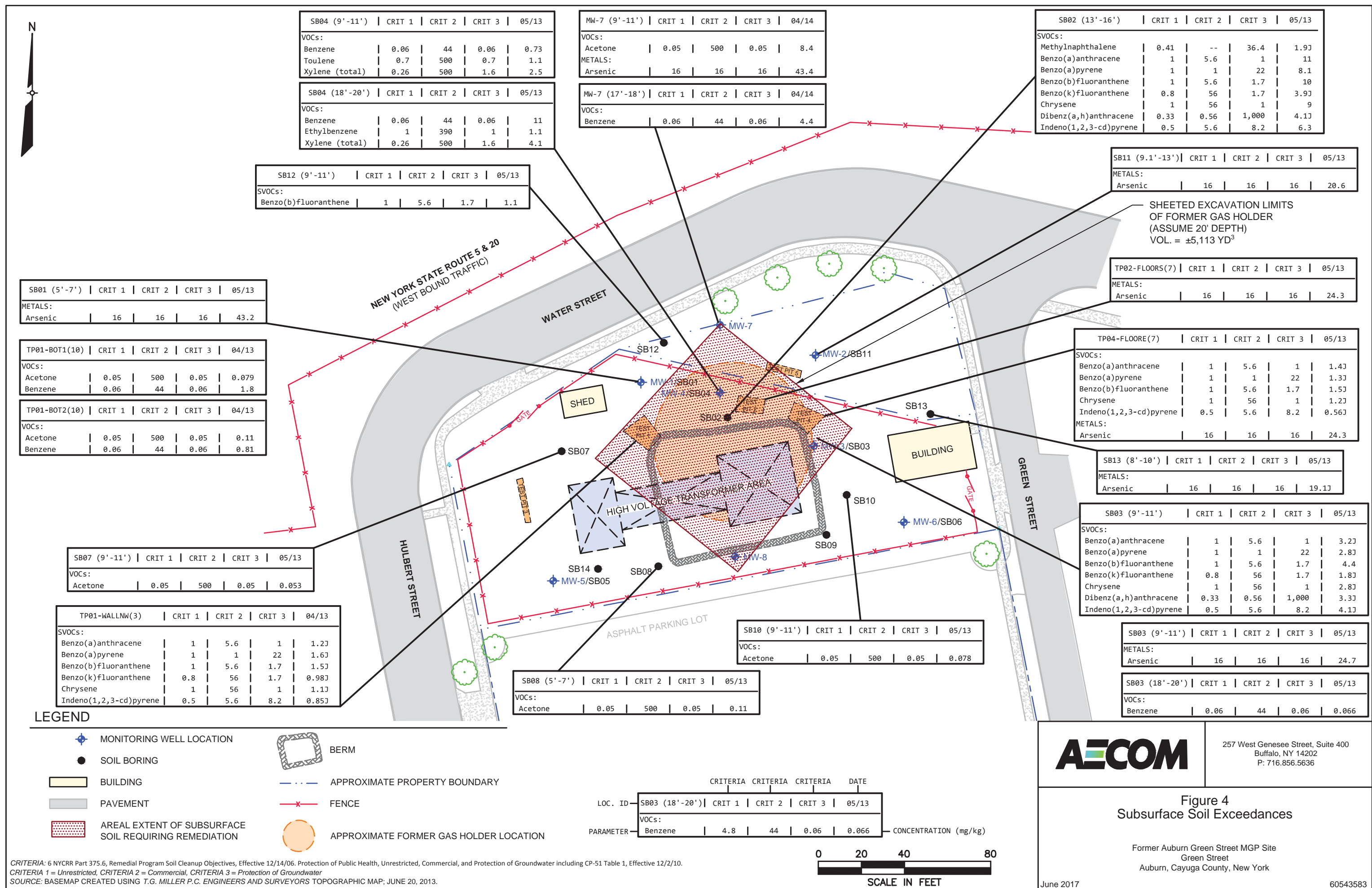
Figure 3  
Surface Soil Exceedances

Former Auburn Green Street MGP Site  
Green Street  
Auburn, Cayuga County, New York

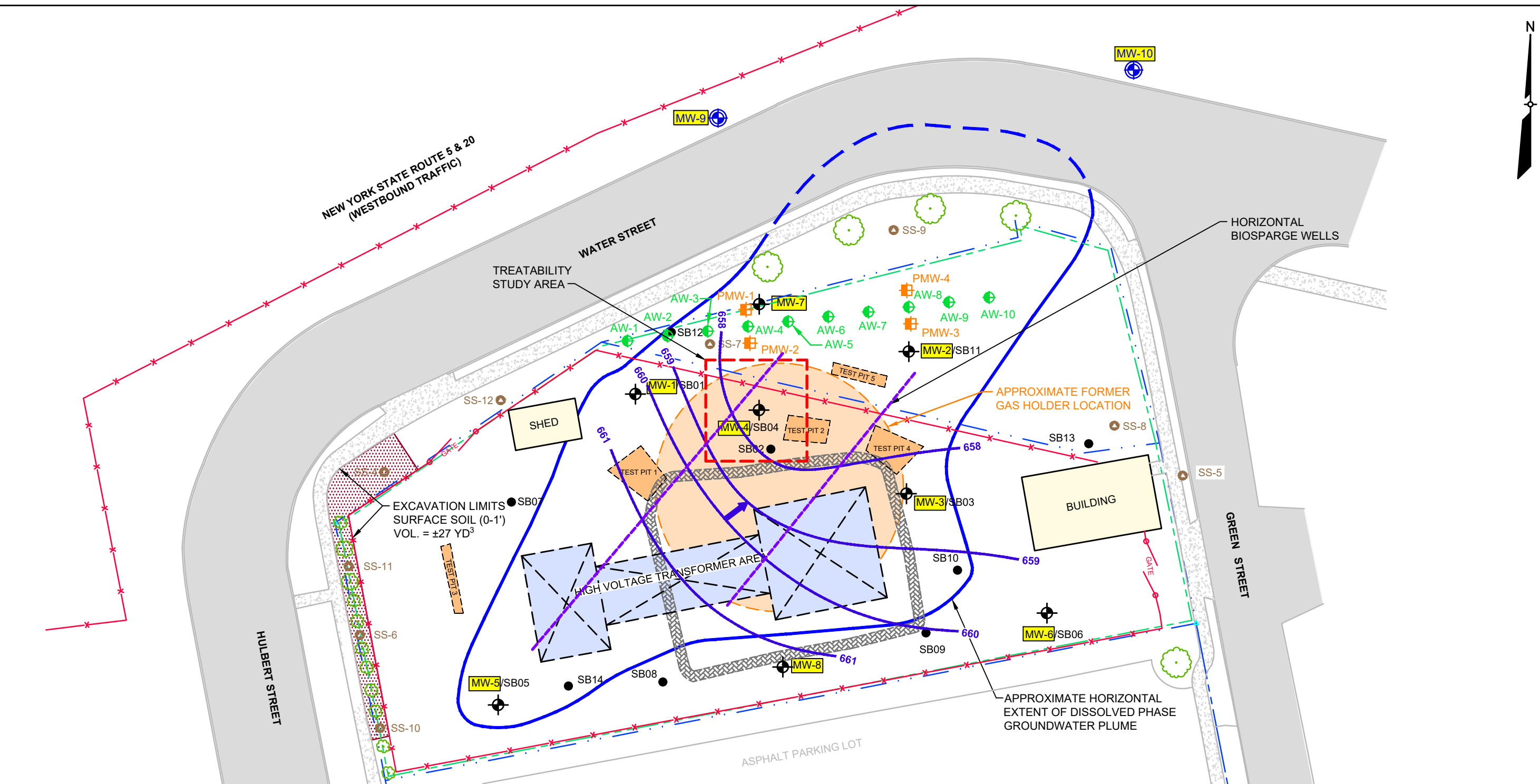
June 2017

60543583

CRITERIA: 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives, Effective 12/14/06. Protection of Public Health, Unrestricted, Commercial, and Protection of Groundwater including CP-51 Table 1, Effective 12/2/10.  
CRITERIA 1 = Unrestricted, CRITERIA 2 = Commercial, CRITERIA 3 = Protection of Groundwater  
SOURCE: BASEMAP CREATED USING T.G. MILLER P.C. ENGINEERS AND SURVEYORS TOPOGRAPHIC MAP; JUNE 20, 2013.  
\*ATLANTIC ENVIRONMENTAL SERVICES, INC, SEPTEMBER 1991. "MANUFACTURED GAS PLANT SITE SCREENING REPORT, GREEN STREET SITE, AUBURN, NY"



J:\Projects\60543583\_AuburnMGRFS\900-CAD-GIS\910-CAD\FIGURE 1-ALTERNATIVE 3.dwg, 2/20/20 -1-RAL



# LEGEND

- |                                   |  |   |
|-----------------------------------|--|---|
| EXISTING MONITORING WELL LOCATION | APPROXIMATE PROPERTY BOUNDARY  | PROPOSED MONITORING WELL                    |
| SURFACE SOIL SAMPLE LOCATION      | EXTENT OF SITE COVER SYSTEM  | EXCAVATION LIMITS SURFACE SOIL (0-1')       |
| SOIL BORING                       | CHAIN LINK FENCE   | O <sub>2</sub> PERFORMANCE MONITORING WELLS |
| BUILDING                          | APPROXIMATE FORMER GAS HOLDER LOCATION   | O <sub>2</sub> APPLICATION WELL             |
| ASPHALT PAVEMENT                  | MONITORING WELLS SAMPLED QUARTERLY YEAR 1; SEMI-ANNUALLY YEAR 2; ANNUALLY THEREAFTER |   |
| SIDEWALK                          |  |   |
| BERM                              |  |   |

SOURCE: BASEMAP CREATED USING T.G. MILLER P.C. ENGINEERS AND SURVEYORS TOPOGRAPHIC MAP; JUNE 20, 2013.



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Figure 5 - Supplement to Auburn Green Street FS  
Supplement to FS Alternative 3  
Enhanced In situ Aerobic Treatment Option

Former Auburn Green Street MGP Site  
Green Street  
Auburn, Cayuga County, New York

FEBRUARY 2020

60543583

# **APPENDIX A**

## **Responsiveness Summary**



# RESPONSIVENESS SUMMARY

**NYSEG – Auburn Green St. MGP  
Manufactured Gas Plant Program  
Auburn, Cayuga County, New York  
Site No. 706009**

The Proposed Remedial Action Plan (PRAP) for the NYSEG – Auburn Green St. MGP site was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on February 26, 2020. The PRAP outlined the remedial measure proposed for the contaminated groundwater and soil at the NYSEG – Auburn Green St. MGP site.

The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was scheduled for March 16, 2020 to present the remedial investigation /feasibility study (RI/FS) and the proposed remedy for the NYSEG – Auburn Green St. MGP site. The public meeting was canceled in accordance with Executive Order 202.15 which suspended in-person public meetings related to proposed site remedies in order to limit community spread of COVID-19. The public comment period was to have ended on March 27, 2020, however it was extended to May 22, 2020, to allow the public additional time to comment on the proposed remedy in the absence of a public meeting. Comments received during the comment period have become part of the Administrative Record for the site.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

Dominic Gambaiani, Cayuga Climate Action Member, submitted an e-mail dated April 24, 2020; A.T. Miller, Cayuga Climate Action Member, submitted an e-mail dated April 26, 2020; Dee Dee Dailey, Cayuga Climate Action Member, submitted an e-mail dated May 1, 2020; and Laurel Ullyette, Cayuga Climate Action Member, submitted an e-mail dated May 9, 2020, which included the following comments:

**COMMENT 1:** Our climate action group, Cayuga Climate Action, would first and foremost like to thank you and your department for your plans to clean up the contamination at the old Green Street NYSEG property located in Downtown Auburn, NY. It is critical to continue to fund these clean-up projects, even during this time of uncertainty as the state is on pause due to COVID-19. Now, more than ever, protecting the environment and funding those projects ensures clean water, clean soil, and clean air for all New York State citizens now and in the future. Please know that you have our full support as a citizen-led organization with this project.

**RESPONSE 1:** Comment noted.

Stephanie Nelson, Moravia, New York submitted an e-mail dated April 25, 2020 which included the following comment:

**COMMENT 2:** I support immediate clean-up of the Green Street electrical station due to contamination from a process last century to produce gas.

**RESPONSE 2:** Comment noted.

--

Therese Wilson, Cayuga Climate Action Member, submitted an e-mail dated April 26, 2020 which included the following comment:

**COMMENT 3:** Your plan for the Green Street property in downtown Auburn comes as such good news! At last our water soil and air will get the attention and protection they deserve and need. I am relieved and grateful and want to express my full support for this project.

**RESPONSE 3:** Comment noted.

--

Rebecca Ruggles, Aurora, New York submitted an e-mail dated May 3, 2020 and Anna Mack, Cayuga County Action Member, submitted an e-mail dated May 22, 2020 which included the following comment:

**COMMENT 4:** Thank you for the opportunity to comment on the proposal to remediate the substation at Green Street in Auburn. As a county resident, I strongly support spending public funds to conduct such remediation. Based on the article in the Auburn Citizen, I understand that the proposed plan is scaled back from a more extensive remediation which would have involved removal of soil and relocation of the substation.

It seems to me that the less intensive approach makes sense, since any removal of soil carries contamination risk and presumes that there is somewhere else that contaminated soils can be safely stored. I am not a scientist, but I think bioremediation is a good option.

Although the nature of the contamination and its impact on ground water is alarming to hear about, it is very important that state agencies be transparent with the public. We need to understand the toxic legacy of the past in order to invest in solutions and support regulations that prevent damage to our soils and waters in the present and future.

Thank you again for this opportunity to comment.

**RESPONSE 4:** Comment noted.

Davidd Levy, MD, Auburn Family Care, submitted an e-mail dated May 4, 2020 which included the following comments:

**COMMENT 5:** We are writing to comment about the remedy proposed for manufactured gas plant site at Green Street in Auburn, NY.

Our business is only about 100 yards from the site, address is 8 Hulbert Street.

We have looked through some of the publications available at the DEC website, though not all as some are thousands of pages long.

We have not seen any specifics as to how you are going to protect the businesses and community members in the immediate vicinity. Our business is a medical office that has two different medical practices with at least 12 employees present on a daily basis. As a medical office we also have dozens of patients coming to the office on a daily basis.

How does the DEC plan to protect our business, staff and patients from the contamination at the site. We are specifically concerned about arsenic, cyanide, volatile organic compounds and semivolatile organic compounds that are mentioned in the fact sheet dated April 2020.

Our other concern is that the only way we found out about this program was by chance viewing a post on facebook for The Citizen, the local newspaper. We would think that the DEC or DOH would have made sure to contact those who are direct neighbors well before this time to explain what was going to be done in their own backyard.

We hope to hear from you soon.

**RESPONSE 5:** With regard to notification, a fact sheet was sent to the property owner of your address upon the start of the remedial program in 2013. This fact sheet, and subsequent fact sheets, provide instructions on signing up for the NYSDEC list-serv to receive information fact sheets on remediation sites.

To protect the community during remediation, the remedial design document will contain specific information regarding the engineering controls to be employed to prevent contaminant migration including, but not limited to control of dust, odor and tracking of contaminated soil from the site. Other typical methods to minimize short-term impacts of remediation include identifying best truck routes, minimizing idling of heavy equipment and trucks, etc.

Further, during excavation and removal of soils, a Community Air Monitoring Plan (CAMP) will be implemented which measures volatile organic compounds (VOCs) and dust in real-time on a continuous basis. If ambient air concentrations of site contaminants exceed predetermined levels, field activities will cease until corrective actions are taken to abate emissions.

Before remedial actions begin, the community will again be notified of the project schedule, the work to be completed and what to expect.

Bruce Natale, Cayuga County Planning Department, submitted an e-mail dated May 22, 2020 which included the following comments:

**COMMENT 6:** I would like to offer the following comments on the Remedy Proposed for third Manufactured Gas Plant Site in Auburn, the Green Street gas holder site, also known as

NYSEG - Auburn Green St. MGP  
Manufactured Gas Plant (MGP) Green Street, Auburn, NY 13021  
Site No. 706009

I have been familiar with this site since compiling the County's abandoned waste site list in 1989-1992 and submitting sites for the State's Hazardous Material Site inventory about 1994.

I am an environmental/civil engineer with 40 years of experience in investigating and remediating environmental quality issues. I have experience with investigating petroleum and NAPL/DNAPL materials in fractured, creviced bedrock, such as underlays this site.

The proposed remedy does not adequately address the possibility of the MGP contaminants dropping into and traveling in the bedrock crevices. There is a high probability of SVOC contaminants being under the westbound Route 5 & 20 Arterial, Curley's parking lot and the Finger Lakes Railway bed (which Cayuga County, my employer, owns). The probability of contamination under these parcels is further elevated, because the Green Street gas holder was filled via piping from the McMaster Street MGP for decades. Any condensate leakage from the pipe or purging/spillage/dumping of condensate at the Green Street site could have easily move for decades along the outside of the pipe and in the pipe bedding materials back down-gradient towards McMaster Street and or the Owasco Lake Outlet.

A much more thorough evaluation of potential SVOC and/or NAPL/DNAPL materials migration through bedrock crevices needs to be conducted. Only then can a good removal and long-term remediation and monitoring plan be developed.

Also, an earlier phase of this site investigation and remediation in 2013 indicated that the gas holder was removed as early as 1930. The attached aerial photograph from 1938 clearly shows the Green Street gas holder, so it is possible that this gas holder was active until interstate gas pipelines evolved in the late 1940's.

Please let me know if you need additional information on these points, or if an opportunity to meet with state and consultant staff will be offered to discuss this in more detail.

**RESPONSE 6:** A review of the site files for the NYSEG – Auburn Green St. MGP site (7-06-009) and the NYSEG McMaster St. Auburn MGP site (Site No. 7-06-010) does not reveal any indications of potential impacts to bedrock groundwater from the Green St. site or impacts to groundwater from a possible connection between the Green St. site and the McMaster St. site.

During the remediation of the McMaster St. site, soil was removed to bedrock in areas of the site between former MGP operations and the Green St. MGP site. No connecting pipe between the



McMaster St. site and the Green St. site was found during this removal action. Tar condensate is typically found at MGP sites at the point of generation of manufactured gas where elevated temperatures were utilized. Manufactured gas was significantly cooled prior to distribution. Hence if a connecting pipe was present between the two sites, and if it did leak, a significant contaminant release would not be expected.

A pair of overburden and shallow bedrock monitoring wells were installed in between the westbound arterial and the Finger Lakes Railway bed as part of the remedial investigation of the McMaster St. site. Analytical sampling results from these monitoring wells did not exceed groundwater standards for volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs).

No evidence of a connecting pipe was found during the remedial investigation of the Green St. site. The investigation of the Green St. site did not uncover coal tar within the former distribution holder or elsewhere on the Green St. site. VOC and SVOC impacts to overburden soil and groundwater were generally limited to within or beneath the former distribution holder foundation, with benzene impacts in overburden groundwater extending outside the holder and possibly off-site.

Benzene impacts to overburden groundwater will be addressed under the proposed remedy. Given that no coal tar was encountered during the investigation of the Green St. site, the limited extent of contamination in overburden groundwater at the Green St site, and the lack of groundwater contamination between the Green St. and McMaster St. sites in overburden or shallow bedrock groundwater, it was determined that sampling bedrock groundwater beneath the Green St. site was not necessary.

A historical records search was performed for the Green St. site as part of the remedial investigation. This records search included the review of Sanborn flood insurance maps from 1890 until 1941. A 1941 Sanborn map does not include the distribution holder. It was thus determined that the distribution holder was decommissioned and partially demolished by 1941. The 1938 aerial photograph provided showing the distribution holder still in place is consistent with the distribution holder being decommissioned and partially demolished between 1930 and 1941. Based on this aerial photograph, it is presumed that the actual decommissioning and partial demolition of the holder fell between 1938 and 1941.”

--

Louise Rossmann, Cayuga County Action Member submitted an e-mail dated May 22, 2020 which included the following comment:

**COMMENT 7:** Thank you for the opportunity to comment on the proposal to remediate the soil at the NYSEG substation at Green Street in Auburn. As a county resident and member of the Cayuga County Climate Action group, I strongly support spending public funds to conduct such remediation.

Thank you again for this opportunity to comment.

**RESPONSE 7:** Comment noted. Please note, as a responsible party, NYSEG is under an Order on Consent to fund the implementation of the remedial action at this site, rather than New York State.

## **APPENDIX B**

### **Administrative Record**

# **Administrative Record**

**NYSEG – Auburn Green St. MGP  
Manufactured Gas Plant Program  
Auburn, Cayuga County, New York  
Site No. 706009**

1. *Proposed Remedial Action Plan for the NYSEG Auburn Green St. MGP site*, dated February 2020, prepared by the Department.
2. Order on Consent, Index No. D0-0002-9309, between the Department and New York State Electric & Gas Corporation, executed on March 30, 1994.
3. *Site Characterization Report – Auburn Green Street Former MGP Gas Holder Site*, dated August 2016, prepared by AECOM.
4. *Feasibility Study Report – NYSEG Auburn Green Street Former Manufactured Gas Plant Holder Site*, dated April 2019, prepared by AECOM.
5. *Final Feasibility Study Supplement – Evaluation of Anaerobic and Aerobic Technologies within Former Gas Holder*, dated February 10, 2020, prepared by AECOM.
6. E-mail dated April 24, 2020 from Dominic Gambaiani, Cayuga Climate Action Member.
7. E-mail dated April 25, 2020 from Stephanie Nelson, Moravia, New York.
8. E-mail dated April 26, 2020 from Therese Wilson, Cayuga Climate Action Member.
9. E-mail dated April 26, 2020 from A.T. Miller, Cayuga Climate Action Member.
10. E-mail dated May 1, 2020 from Dee Dee Dailey, Cayuga Climate Action Member.
11. E-mail dated May 3, 2020 from Rebecca Ruggles, Aurora, New York.
12. E-mail dated May 4, 2020 from Davidd Levy, MD, Auburn Family Care.
13. E-mail dated May 9, 2020 from Laurel Ullyette, Cayuga Climate Action Member.
14. E-mail dated May 22, 2020 from Anna Mack, Cayuga County Action Member.
15. E-mail dated May 22, 2020 from Bruce Natale, Cayuga County Planning Department.
16. E-mail dated May 22, 2020 from Louise Rossmann, Cayuga County Action Member.

## **Appendix B**

### **Pre-Design Investigation Work Plan**



Prepared for:  
New York State Electric & Gas Corp  
Binghamton, NY 13902

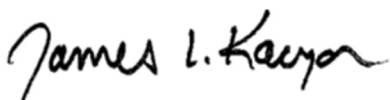
Prepared by:  
AECOM  
Amherst, NY  
Project 60652550  
July 2022

# Pre-Design Investigation Work Plan

**NYSEG - Auburn Green St. MGP Site**  
**Auburn, Cayuga County, New York**  
**NYSDEC Site # 7-06-009**

# Remedial Design Work Plan

**NYSEG - Auburn Green St. MGP Site  
Auburn, Cayuga County, New York  
NYSDEC Site # 7-06-009**




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Prepared By: James Kaczor, P.G.



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Prepared By: Randy Sillan, PhD.



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Reviewed By: Matthew Thorpe, P.E.

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## 1.0 Introduction

This Pre-Design Investigation Work Plan (PDIWP) presents the sampling locations, rationale, field methods, and laboratory methods to be used for the pre-design investigation (PDI) to support the remedial design of the remediation of impacted soils and groundwater planned at the Auburn Green Street Former Manufactured Gas Plant (MGP) Site (Site) located in Auburn, Cayuga County, New York (Site No. 7-06-009). Figure 1-1 shows the Site location. NYSDEC issued a Proposed Remedial Action Plan (PRAP) for the Site on April 22, 2020 and a Record of Decision (ROD) for the Site on July 8, 2020. This PDI is in support of a remedial design to be developed in accordance with the ROD and the Administrative Order on Consent (CO) (Index No. D0-0002-9309) between NYSDEC and NYSEG (NYSDEC, March 30, 1994) and subsequent the Amended and Restated Multi-Site Order on Consent (ARMSCO) (Index No. D0-0002-9309) between New York State Department of Environmental Conservation (NYSDEC) and New York State Electric & Gas Corporation (NYSEG) (NYSDEC, 2016).

The initial version of this PDIWP was submitted to NYSDEC on August 4, 2021. NYSDEC provided comments dated August 26, 2021. A response to comments was provided on September 22, 2021. A teleconference was held September 28, 2021 between NYSDEC, NYSEG and AECOM to discuss the response to comments. Due to commitments related to subcontractor availability and schedule, certain elements of the August 4, 2021 work plan were completed the week of August 24, 2021 (preliminary geophysical survey) and August 30, 2021 (installation of MW-10). Additional elements were completed the week of September 27, 2021 (collection of surface soil sample SS-13, installation and development of MW-9, development of MW-10, completion of soil boring SB-15, and groundwater sampling at MW-1, MW-3, MW-4, MW-5, and MW-6) and the week of October 4, 2021 (groundwater sampling at MW-2, MW-7, MW-8, MW-9, and MW-10, and slug testing at select wells).

Following initial data reduction in early October 2021, a follow-up teleconference with NYSDEC and NYSDOH was held on November 1, 2021. Following this teleconference, additional PDIWP elements were requested by NYSDEC (monitoring wells MW-11 (inside former holder) and MW-12 (downgradient of former holder near northeast property corner), and an additional round of groundwater sampling in spring 2022 to assess potential for seasonal variability). This updated version of the PDIWP presents the initial and updated elements of work.

As outlined in Section 3.3 of NYSDEC's Technical Guidance for Site Investigation and Remediation (DER-10), specific requirements for investigation work plans are provided in the following sections:

- Section 2 contains the worksite history and description.
- Section 3 describes the PDIWP objectives, scope, and rationale.
- Section 4 provides a quality assurance project plan (QAPP).
- Section 5 describes health and safety protocols.
- Section 6 presents the PDI schedule.

## 2.0 Site Description and History

### 2.1 Site Description

The Site is located in the City of Auburn, Cayuga County, New York. The location of the Site and the surrounding features are shown on Figure 2-1. The Site is surrounded by a mix of commercial and residential properties in the downtown section of Auburn. The Site is bounded by Hulbert Street to the west, Water Street to the north, Green Street to the east, and a parking lot to the south. Farther to the north is NY Route 5 and 20 West, a railroad right-of-way with rail tracks, the Owasco Outlet River, and the Auburn Correctional Facility. East of Green Street is a hotel followed by commercial properties. Commercial properties followed by residential properties are located to the west and south of the Site. The Site is approximately 500 feet southeast of the NYSEG Auburn McMaster St. MGP site (Site No. 706010).

The Site is comprised of two parcels of land. The parcels are summarized as follows:

- Parcel 115.52-1-37 – NYSEG substation - This parcel is currently used as an active substation for NYSEG. As shown on Figure 2-2, the majority of the former gas holder was located on this parcel. The parcel is covered with crushed stone fill and is surrounded by a chain-link fence with secure access.
- Parcel 115.52-1-38 – Adjacent northeast NYSEG parcel – This parcel is also owned by NYSEG and is located immediately adjacent to and northeast of the NYSEG substation parcel. This parcel is vacant and covered with grass and trees. There is no fence surrounding this parcel.

The Site and adjoining parcels fall within a “central commercial” zoning district identified by the City of Auburn.

The nearest residence to the former MGP gas holder is approximately 300 feet (ft) to the west. The City of Auburn receives its potable water supply from Owasco Lake, with its intake located approximately 3.5 miles upstream (south) of the Site (AES, 1991).

### 2.2 Site History

The gas holder was constructed in 1890 for gas produced by the nearby McMaster Street MGP and possibly the Clark Street MGP. The gas holder existed until sometime between 1931 and 1941. The gas holder was owned and used by the Auburn Gas Light Company from 1890 to 1911, the Empire Gas and Electric Company from 1911 to 1936, and NYSEG from 1936 until it was demolished between 1931 and 1941. The site was then used as an auto sales and service shop and from 1946 to 1950, a nearby lumber yard expanded into the Site. In 1950, NYSEG constructed the substation currently present at the Site. The Site is currently zoned for commercial use (C-2: Central Commercial) by the City of Auburn and is currently still a NYSEG electric substation.

The key features of the MGP are shown on Figure 2-2 and include:

- A 100,000-cubic foot capacity gas holder with a brick-and-mortar foundation in the center portion of the Site.
- A gas governor house located on the eastern side of the Site.
- A shed located along the southern side of the Site.

Several environmental investigations have been performed at the Site between 1981 and 2015. These investigations were documented in the Site Characterization (SC) Report (AECOM, 2016). Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, and cyanide. Groundwater samples were also analyzed for per- and polyfluoroalkyl substances (PFAS), and 1,4-dioxane in 2019. Based upon investigations conducted to date the primary contaminants of concern include arsenic in surface soils, VOCs (benzene, ethylbenzene, toluene, and xylene [BTEX]), SVOCs, and arsenic in subsurface soils, with VOCs (BTEX), SVOCs, and cyanide in groundwater.

## 3.0 Pre-Design Investigation Objectives, Scope, and Rationale

### 3.1 Objectives

During preparation of the FS and the Remedial Design Work Plan (RDWP) additional information was identified which will be needed in order to complete the remedial design. This PDI is intended to provide the additional information required to design the selected remedy for the Site as specified in the ROD. The objectives of this PDI are to:

- Confirm distribution of contaminants of concern and understand oxidation/reduction (“redox”) conditions in groundwater to support delineation of the treatment area in the remedial design;
- Evaluate groundwater flow direction and velocity to support remedial design;
- Perform a field-scale biosparging pilot study to determine physical parameters for the remedial design and confirm feasibility of biosparging to meet remedial action objectives;
- Refine horizontal delineation of surface soil arsenic impacts;
- Evaluate the current substation cover material; and,
- Update the survey.

### 3.2 Pre-Design Investigation Scope and Rationales

The scope of the PDI includes borings for new well installations, well sampling, slug testing, biosparging pilot study, surface soil evaluation, and survey of new investigation features. Elements of the investigation include the following:

Completed Fall 2021 (per August 2021 PDIWP):

- Installed two new monitoring wells (MW-9 and MW-10) to approximately 20 feet below ground surface (ft bgs) in the vicinity of MW-4 and within the former gas holder footprint.,
- Collected groundwater samples from eight existing wells (MW-1 to MW-8) and two new wells (MW-9, MW-10) to confirm distribution of groundwater contaminants of concern and redox potential conditions. The most recent prior groundwater monitoring event for MW-1 through MW-8 was May 2014.
- Perform slug testing at five wells in the vicinity of the biosparging pilot study area to estimate hydraulic conductivity. Hydraulic conductivity will be used to confirm feasibility of biosparging and estimate groundwater velocity in support of the design of the biosparging and ORC wells (if needed).
- Perform delineation sampling of the upper foot of surface soils in a limited area west of the substation fence to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover.
- Confirm the extent of the crushed stone fill inside the substation fence and ensure it is sufficient for a site cover.

To be completed Spring 2022 (additional elements pursuant to November 1, 2021 technical meeting):

- Install a minimum of two additional new monitoring wells: MW-11 within the former gas holder and MW-12 downgradient of the former gas holder near the northeast property boundary. Install both wells to approximately 20 ft bgs.
- Collect a spring 2022 round of groundwater samples from all wells (MW-1 through MW-12) to assess potential seasonal variations in groundwater quality.
- Measure depth to water and calculate groundwater elevations during the groundwater sampling event to determine the direction and magnitude of hydraulic gradients in the shallow aquifer.

Planned for fall 2021 (i.e., scope was included in August 2021 PDIWP) but rescheduled to spring 2022 pursuant to November 1, 2021 technical meeting:

- Implement a biosparging pilot-scale study to more clearly define design parameters for enhanced bioremediation.
- Collect a post-pilot study round of groundwater samples from nine wells in the vicinity of the biosparging pilot study area (MW-1, MW-2, MW-3, MW-4, MW-7, MW-9, MW-10, MW-11, and MW-12).
- Measure depth to water and calculate groundwater elevations during the groundwater sampling event to determine the direction and magnitude of hydraulic gradients in the shallow aquifer.

The four new wells (two installed fall 2021 (MW-9 and MW-10) and two to be installed spring 2022 (MW-11 and MW-12)) will support the field-scale biosparging pilot study and groundwater monitoring activities. The groundwater monitoring activities will provide baseline, seasonal, and post-pilot study groundwater quality data to be used in the assessment of the field-scale biosparging pilot study and assessment of potential oxygen-releasing compound (ORC) wells.

Soil borings will be continuously logged to verify the elevation of lithologic units, confirm placement of the well-screens, and revise lithology cross-section for the biosparging pilot study test area.

All new investigation locations will be surveyed for elevation and location.

### **3.3 Pre-Design Investigation Biosparging Pilot Study**

The PRAP and ROD identify in-situ enhanced biodegradation as the preferred remedial technology to treat VOCs and SVOCs in groundwater within and outside of the subsurface former MGP gas holder. The PDI biosparging pilot study will be performed to evaluate the ability of biosparging to distribute dissolved oxygen (DO) in the shallow aquifer. Results from the pilot study will be used to estimate the radius of influence (ROI) of injected air at various air flow rates, which is a critical parameter for the remedial design.

#### **3.3.1 Utility Clearance**

Intrusive activities that will be conducted during this PDI include soil borings and well drilling. Prior to the start of intrusive activities, a call will be placed to New York DIG SAFE CALL CENTER at Dig Safely New York, by dialing 811 or 1-800 272-4480 for utility mark outs to minimize the risk of encountering subsurface utilities. Site personnel will be contacted to determine if detailed utility plans are available for the Site. Soft dig technologies, such as an air knife, may also be used for utility

clearance. If the mark outs indicate that utilities are close to a proposed drilling location, the location will be moved to avoid utilities at the discretion of the field personnel and the drilling subcontractor. Locations of underground utilities and other objects (former MGP structures) will be identified prior to drilling and may require use of subsurface geophysical methods, and a third-party utility contractor.

### 3.3.2 Pre-Design Investigation Borings

A minimum total of three new borings are planned in the vicinity of MW-4 and in close proximity to (MW-9) or within the former gas-holder footprint (MW-10 and MW-11) and will be completed as a biosparging air injection well (MW-9) and observation wells (MW 10 and MW-11). The wells will be used to inject air and monitor groundwater during the biosparging pilot study. Figure 3-1 shows proposed locations. The proposed PDI well locations provide a range of lateral distance (10 to 30 feet) from the biosparging air injection well (MW-9) using the new MW-10 and MW-11, and existing wells MW-1, MW-4, and MW-7 to monitor during the pilot study.

A minimum of one new monitoring well (MW-12) is planned downgradient of the former gas holder, north of MW-2 and east of MW-7, near the northeast property corner. This well will provide additional groundwater quality data near the property boundary. Figure 3-1 shows the proposed location.

Soil borings will be completed using hollow-stem auger (HSA) drilling methods. Prior to below grade drilling activities, the boring locations will be hand cleared to five ft bgs. Soil samples will be continuously logged from the ground surface to the bottom of the boring using 2-foot long split-spoon samplers. Each location will be completed to refusal or bedrock, whichever is encountered first. Bedrock is anticipated to be encountered at approximately 20 ft bgs in the area of and within the footprint of the former gas holder.

Soil samples will be visually described and recorded by the field geologist including the presence of fill material or subsurface obstructions, the nature of each geologic unit encountered, and observations regarding moisture content. A photoionization detector (PID) with a 10.2 electron volt detector will be used to screen soil samples. In addition, visual and olfactory observations regarding the presence of hydrocarbon-like residuals will be recorded on the boring logs. During soil logging the field geologist will verify the elevation of lithologic units, confirm placement of the well-screens, and refine lithology cross section for the biosparging pilot study test areas. The descriptions will be in accordance with the Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), American Society for Testing and Materials (ASTM) D2487-11. Soil samples for analytical laboratory testing are not planned.

Downhole sampling equipment (i.e., split-spoon sampler) will be decontaminated between each boring and each sample interval using a detergent, rinsing with potable water, and air drying between sample locations. Larger downhole equipment (drill rods and HSAs) will be steam cleaned at a temporary decontamination pad prior to use onsite and between boring locations.

### 3.3.3 Pre-Design Investigation Well Installation

The default drilling method for advancing overburden borings for monitoring well installation will use 4¼-inch inside diameter (ID) HSAs. Following completion of the deepest split-spoon sample at each location, observations from the soil borings will be used to determine screen placement at the wells. The expected screen interval for the air injection well MW-9 is 18 to 20 ft bgs and may be adjusted in the field to install the screen in more permeable, sandy soil if silt and clay are observed immediately above the bedrock within the former holder footprint. The expected screened interval for pilot study observation wells MW-10 and MW-11 and downgradient observation well MW-12 is approximately 10



to 20 feet bgs, which is similar to nearby wells with bottom depths that range from 16 to 19 ft bgs. Upon review of the soil borings and consultation with the AECOM Project Manager, the final depth and screen interval for MW-9, MW-10, MW-11, and MW-12 will be chosen based on field observations and the depth of bedrock.

The air injection and observation monitoring wells will be constructed with 2-inch ID, schedule 40, flush-threaded, PVC casing and matching factory-slot 10-slot PVC well screen. An additional 1 foot of casing will be installed below the screen for MW-9 to provide a sump for accumulation of very fine soil that may occur during cycling of air sparge operation.

Upon completion of borehole advancement, the well screen and riser pipe will be inserted into the HSAs and set to the desired depth. A clean sand filter pack consisting of Morie sand (or equivalent), sized to match the screen and formation, will be placed into the annular space around the screen from approximately one foot below the screen to a minimum 2 feet above the top of the screen. A minimum one-foot thick bentonite (pellet or chip) seal will be placed above the filter pack and allowed to hydrate. If the bentonite seal is in a saturated zone, native groundwater will be allowed to hydrate the seal for 30 minutes. If the bentonite seal is in an unsaturated zone, potable water obtained from a certified source will be added slowly to the borehole for 30 minutes to promote hydration. The remaining borehole annulus will be grouted using non-shrink cement-bentonite grout (94 pounds cement, 5 pounds powdered bentonite, 6.5 gallons water; thoroughly mix cement and water prior to adding bentonite). Grout will be tremmied into the annular space extending from the bentonite seal to just below ground surface. Wells are anticipated to be completed in flush-mount well pads.

The air injection well design for MW-9 uses a short well screen (2 feet) to target delivery of air to a depth at the bottom or immediately below the targeted treatment interval in groundwater (approximated as the groundwater surface at 10 ft bgs to bedrock at 20 ft bgs). The injected air will migrate laterally in accordance with pressure gradients and permeability anisotropy and migrate vertically via buoyancy forces. As the injected air moves laterally and vertically, oxygen partitions from the air to groundwater to increase dissolved oxygen concentrations and create favorable conditions for aerobic biooxidation of the COCs. The anticipated installation of a 10-ft screen interval for MW-10 and MW-11 is similar to existing monitoring wells and provides an assessment of groundwater quality within the targeted treatment interval in groundwater.

### **3.3.4 New Monitoring Well Development**

Each new monitoring well will be developed to remove fine grained soil introduced during the drilling process and to improve hydraulic connection between the formation and the well screen. A suitable pump will be selected for development at each well (i.e., Watterra pump, peristaltic, or submersible). Pump selection will depend upon monitoring well casing diameter, depth to water, anticipated drawdown, volume of water required to be removed, and access well or electric power supply.

During development, the field personnel will record development information in a project notebook and/or on a well development form. Periodic readings (every 0.5 to 1 well volume) will include depth to water, pumping rate, temperature, pH, conductivity, and turbidity. The goal of development will be to remove a minimum of five casing volumes of water and achieve a turbidity reading of 50 nephelometric units (NTU) or less. If these development goals have not been achieved after two hours of development, the field personnel will notify the AECOM Project Manager for further instructions. Wells will be allowed to sit for a minimum of 72 hours after development prior to sampling.

### 3.3.5 Groundwater Sampling

Prior to this PDI, the Site wells were last sampled in May 2014. Several rounds of groundwater sampling will be performed as part of the PDI.

- October 2021: A baseline round of groundwater sampling was completed after the installation of MW-9 (August 2021) and MW-10 (September 2021), which were installed in the vicinity of MW-4 under a NYSDEC preliminary/conditional approval of the initial version of this RDWP (August 2021). All existing wells as of October 2021 (MW-1 through MW-10) were sampled.
- Summer 2022: A round of groundwater sampling will take place after the installation of MW-11 and MW-12. All wells will be sampled (MW-1 through MW-12). The purpose of this round is to assess potential seasonal variability of groundwater quality and provide additional data within and downgradient of the former gas holder.
- Summer/Fall 2022: A round of groundwater sampling will take place after the biosparging pilot study has been completed. Nine wells in the vicinity of the biosparging pilot study area will be sampled (MW-1, MW-2, MW-3, MW-4, MW-7, MW-9, MW-10, MW-11, and MW-12). The purpose of this round is to assess any changes in groundwater quality following the biosparging pilot study.

For each round, a groundwater level and well depth measurement will be taken as an initial task. At each well, the water level will be measured using an electronic water level meter and the water level will be recorded to the nearest 0.01 feet. Total well depth for each well will also be confirmed. Low-flow groundwater sampling methodology will be used. During purging, the field personnel will record development information in a project notebook and on a well development form

Laboratory analysis for each sample will be for site specific contaminants (as specified in Table 3-1) and MNA indicators as specified below:

- VOCs (BTEX, styrene, and acetone)
- SVOCs ( 2-methylphenol, 2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz[a,h]anthracene, indeno(1,2,3-CD)pyrene, naphthalene, and phenol)
- Dissolved Iron
- Total Cyanide
- Nitrate
- Sulfate

Field testing for additional natural attenuation parameters will be collected at each well location during groundwater sampling using a real-time water quality meter (i.e., YSI) to provide baseline groundwater quality for the biosparging pilot study. Field collected parameters will include DO, oxidation-reduction potential (ORP), pH, temperature, electrical conductivity, and turbidity at each location. A sample list summary including quantities and analytical methods for the PDI is presented in Table 3-1.

### 3.3.6 Aquifer Testing (Slug Testing)

Aquifer testing (slug testing) was completed during the fall 2021 phase of the PDI to determine aquifer properties. Slug tests were performed at five wells (MW-1, MW-2, MW-4, MW-7, and MW-10) in the vicinity of the pilot study to estimate hydraulic conductivity of the surrounding geologic material in the

area of the pilot study. Hydraulic conductivities determined from the slug tests will be used to confirm feasibility of biosparging and estimate groundwater velocity in support of the remedial design of the biosparging and ORC wells. Prior to the start of slug testing, a depth to water and depth of water to top of screen was determined. Testing was performed after groundwater sampling when the water level has returned to static conditions.

The slug test method involves lowering or raising the static water level in a well bore by the removal or insertion of a cylinder (slug) of known volume. The return of the water level to a pre-test static level is then measured over time. The change in the water level over time is plotted to determine hydraulic conductivity.

For shallow wells under unconfined conditions, as are present at this Site, a conventional stainless steel or PVC slug and the “slug in” or falling head test method and the “slug out” or rising head test method for partially penetrating unconfined aquifers will be used. Slug tests will be performed in a similar manner as described in ASTM D-4044. As all site wells are shallow wells under unconfined conditions, it is anticipated that the permeability test data will be interpreted based on the Bouwer and Rice Method (Bouwer and Rice, 1976; Bouwer, 1989).

The “slug-in” falling head test uses a stainless steel or PVC slug lowered into the water column to raise the water level in the well. The recovery of the water table will be measured using a water level meter or a pressure transducer. The water level was generally permitted to recover to at least 90 percent of the original static water level. Following recovery, a “slug out” or rising head test was completed where the slug was then quickly removed from the water column. The recovery of the water table was measured using a water level meter or a pressure transducer. The water level was generally permitted to recover to at least 90 percent of the original static water level.

The equipment (slug, water level meter, transducer) used in the test was decontaminated prior to use at the next well. A new length of nylon cord was used at each well to suspend the slug.

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

### **3.3.7 Biosparging Pilot Test and Follow-up Groundwater Sampling.**

Following completion of PDI well installation, aquifer testing, and fall baseline and summer seasonal groundwater sampling, the biosparging pilot study will be conducted. The pilot study will involve rental and installation of a biosparging remediation trailer to supply air to the air injection well (MW-9). The pilot test will consist of operation and monitoring of the biosparging system to complete a step injection test (approximate duration 4 days) and an extended injection test (approximate duration 7 days). The biosparging trailer will then be demobilized and a post-pilot study round of groundwater samples will be collected from nine wells in the vicinity of the biosparging pilot study area (MW-1, MW-2, MW-3, MW-4, MW-7, MW-9, MW-10, MW-11, and MW-12). Field data collection and laboratory analyses for the post-pilot study round of groundwater sampling will be for the same analyses and water quality parameters as the baseline. Follow-up groundwater sampling will be conducted in the same manner as described in Section 3.3.5 above.

### 3.3.7.1 Step Test

The initial phase of the pilot test will be a multi-day, intermittent biosparging air injection study at three or more flow rates ("steps"). The step tests will be used to evaluate the relationship between air flow rates, air injection pressure, and area of ROI. Planned air flow rates are 2, 5, and 10 standard cubic feet per minute (scfm). The flow rates at each step may be adjusted based on field observations of injection pressure and influence at nearby wells. To evaluate the ROI at each step, the following will be monitored during each flow step:

- Monitoring locations: MW-1, MW-2, MW-3, MW-4, MW-7, MW-10, MW-11 and MW-12.
- Groundwater elevation using manual measurement of depth to water.
- DO concentration using an appropriate handheld device.
- ORP using an appropriate handheld device.

Measurement of DO and ORP will occur within the well screen of the monitoring wells. Measurements will be collected prior to start of each flow step (baseline), every 30-minute intervals for the first 3 hours, and hourly through the end of the flow step. Each flow step will run for approximately 8 hours during the day. Groundwater will be allowed to equilibrate to baseline conditions overnight (~12 hours) prior to starting the next flow step. Immediately after stopping each step test, continuous monitoring of DO will occur at one location (most likely MW-4) to estimate oxygen utilization rates.

At the start of the first step test, the pressure to the injection well will be gradually increased over a 10-minute period until air flow is detected at the wellhead. The pressure at which air flow is detected (breakthrough pressure) will be recorded. After air flow is detected, the air flow rate will be adjusted to the specified flow rate. Air flow will be maintained at each flow step while in-field testing and documentation is conducted. The time for each flow step may be adjusted based on stability of dissolve oxygen concentrations that indicate steady state has been achieved.

An objective of the biosparge pilot study is to evaluate multiple flow rates to determine the optimal minimal flowrate that produces an aerobic treatment zone with sufficient ROI that can be used to design a biosparging remedy. Thus, air flowrates during step tests in the pilot study are varied to understand the relationship between air injection rate and ROI, which is site-specific. Although the remedial objective is to biooxidize VOCs in situ with biosparging, some phase transfer of VOCs may occur from groundwater to air that migrates to the vadose zone. If VOCs reach the vadose zone, biodegradation of VOCs, specifically benzene, in the vadose zone readily occurs within a few feet of the groundwater table and is not expected to reach the ground surface. To evaluate the potential for phase transfer of VOCs, soil vapor will be monitored during the pilot study at monitoring wells where the groundwater table is below the top of screen. Soil vapor will be monitored for VOCs with a PID.

### 3.3.7.2 Extended Test

After the step tests are completed, the relationships between the injection pressure, flow rate, and area of influence will be reviewed and used to select an operating flow rate for the extended test. In addition, results from the step test will be used to determine an appropriate cycle timing for air injection to minimize preferential air flow paths in the subsurface and optimize transfer of oxygen from injected air to groundwater.

The extended test is planned to run for seven days using a pulsed air injection process (cycling) at one or more flow rates. The extended test will be used to evaluate the ability of the selected flow rate to maintain elevated DO in the groundwater. The injection on-cycle timing will be determined from

observations of the time required to achieve steady DO concentration during the step tests. The off-cycle timing will be determined from analysis of the oxygen decay rate to minimize the time that DO concentrations decrease to less than 1 milligram per liter (mg/L). The system will be monitored per the monitoring plan for the step tests at least twice per day for the duration of the extended test.

### **3.4 Surface Soil Delineation Sampling**

Delineation of MGP impacts, primarily metals, of the upper foot of surface soils in a limited area west of the substation fence is required to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover.

The proposed excavation area is bounded on the west-northwest by a concrete sidewalk, on the east-southeast by the substation fence, and at the northeastern limit by a driveway entering a gate to the substation beyond which is historical sample SS-12 (compliant result for arsenic). The inside of the substation fence bounding the excavation is covered with crushed stone, providing a limit to the presence of surface soil. As such, only the southern limit of the proposed excavation area is not bounded by a physical feature or a compliant sample (see Figure 3-1).

The field personnel will verify these physical conditions visually and if confirmed, collect one surface soil sample (SS-13) approximately 10 feet south of the southern limit of the previously sampled area between the substation fence and the sidewalk.

### **3.5 Evaluation of Substation Cover Material**

During the PDI the extent of the crushed stone fill inside the substation fence will be confirmed to be sufficient for a site cover. Field personnel will use a trowel or shovel to remove a small area of crushed stone fill inside the fence line bordering the soil excavations and measure the depth of the crushed stone to soil or a demarcation layer if one is present.

### **3.6 Site Survey**

A field survey will be conducted by a New York licensed Land Surveyor to add the two new wells to the existing base map for the project design work. New topographic surveys will be prepared for the limits of ROD-required remediation. PDI boring locations will be surveyed for elevation and location. The horizontal coordinate system will be New York State Plane – Central (NAD83/2011) with vertical information which will use North America Vertical Datum (NAVD88-Geoid12B). Vertical elevations of well components will be measured to within one hundredth of a foot accuracy.

A site boundary survey already exists for the Site and will be used during design and establishment of environmental easements and a site management plan (SMP) when remedial construction is complete.

This information, as well as previous sample locations throughout the project area, will be incorporated into the site base map.

### **3.7 Investigation-derived Waste Management**

Investigation-derived waste (IDW) generated during the PDI will be collected in properly labeled 55-gallon drums. Drums of soil and groundwater will be labeled as “pending analysis – investigation-derived residual – soil/water from drill cuttings” and temporarily stored pending characterization and proper disposal. Containerized IDW soil and groundwater will be disposed of offsite at a facility permitted to accept such material.

Personal protective equipment (PPE) will be disposed of as municipal waste unless grossly contaminated, in which case PPE will be placed in 55-gallon drums for proper disposal.

It is anticipated one composite sample from the drummed soil cuttings and one composite sample from the drummed purge water will be collected for characterization for offsite disposal. The composite samples will be analyzed for parameters required by the selected waste disposal contractor. Potential IDW characterization analyses are provided on Table 3-2 for information.

### **3.8 Community Air Monitoring Plan (CAMP)**

Community air monitoring requires real-time monitoring for VOCs and particulates (i.e., dust), at the upwind and downwind perimeter of each designated PDI work area when intrusive activities are in progress at the Site. The community air monitoring is intended to provide 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 investigation work activities. For this PDIWP, intrusive activities are defined as soil boring and monitoring well installation activities. As the objective of biosparging is to create conditions for in situ biodegradation of VOCs and SVOCs, the transfer of VOCs and SVOCs to air above the ground surface is highly unlikely; however, perimeter air monitoring will be performed for the in situ biodegradation pilot study to determine requirements for longer-term remedial strategies.

Real time monitoring during the PDI will be performed at one upwind and one downwind station for VOCs and particulates during drilling activities in accordance with the guidance in DER-10 Appendix 1A, New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan and DER-10 Appendix 1B Fugitive Dust and Particulate Monitoring. These documents are provided in Appendix A.

VOC monitoring will be performed during the PDI using a field PID (RAE Systems MiniRAE™ or equivalent) located downwind of the work zone. If the concentration of total VOCs exceeds 5 parts per million (ppm) above background, then work activities will be temporarily halted. If the total VOC level then decreases below 5 ppm over background, work activities will resume. If the total VOC levels persist at levels in excess of 5 ppm, work activities will be halted, the source of the vapors identified, and corrective actions taken to abate the emissions until the concentrations drop below the action levels. PIDs will be calibrated daily.

Particulate monitoring will be performed during the PDI using real-time monitoring equipment capable of measuring particulate matter less than 10 microns in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate alert and action levels. The alert level is 100 micrograms per cubic meter [ $\text{mcg}/\text{m}^3$ ] and the action level is  $150 \text{ mcg}/\text{m}^3$ . If the particulate level is  $100 (\text{mcg}/\text{m}^3)$  greater than background for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. If the PM-10 particulate levels exceed  $150 \text{ mcg}/\text{m}^3$  above the background level work must be stopped and a re-evaluation of activities initiated. Work may continue if controls implemented are successful in reducing the PM-10 particulate levels below  $150 \text{ mcg}/\text{m}^3$ . Each particulate monitor's calibration will be checked daily with a filtered air sample.

### **3.9 PDI Summary Letter Report**

The results of the PDI including a description of field activities completed and data obtained will be presented in a PDI Summary Letter Report. The letter report will be prepared to meet the general requirements of DER-10. The analytical laboratory will supply Category B data deliverables within 15

days of sample receipt. A Data Usability Summary Report (DUSR) will be prepared as detailed in DER-10, Appendix 2B. The DUSR will be submitted with the PDI Summary Letter Report.

## 4.0 Quality Assurance Project Plan

This section describes the quality assurance (QA) requirements for the PDI as specified in DER-10.

### 4.1 Project Organization

This PDI will be performed by AECOM on behalf of NYSEG. AECOM will arrange for the drilling and analytical services and provide on-site field personnel to perform the soil characterization, soil sampling, and groundwater sampling. The consultant will also perform the data interpretation and reporting tasks. Key contacts for this project are as follows:

#### 4.1.1.1 NYSEG Project Manager:

John Ruspantini  
New York State Electric & Gas  
James A. Carrigg Center  
18 Link Drive  
P.O. Box 5224  
Binghamton, New York 13902-5224  
Telephone: (607) 762-8787  
Fax: (607) 762-8451

#### 4.1.1.2 AECOM Project Manager:

James Kaczor, P.G.  
AECOM  
1 John James Audubon Parkway, Ste 210  
Amherst, NY 14228  
Telephone: (716) 923-1300

#### 4.1.1.3 AECOM Field Team Manager:

Randy Sillan, Ph.D.

#### 4.1.1.4 AECOM Quality Assurance Officer:

Melissa Saunders

#### 4.1.1.5 Laboratory Representative (Eurofins TestAmerica):

John Schove (Amherst, NY)

### 4.2 Sampling and Testing Procedures

This section details the sampling and testing procedures which will be followed during this PDI. The chosen laboratory for the project (Eurofins TestAmerica) is certified, and maintains certification, under the NYSDOH Environmental Laboratory Approval Program (ELAP).

Sampling equipment will be properly decontaminated before being reused or disposed of accordingly. Samples will be collected in pre-cleaned sample containers provided by the laboratory performing analysis with any necessary preservations added to the sample containers at the laboratory prior to



sample collection. Coolers with ice will be used to store samples at 4 degrees Centigrade (°C) until delivered to and analyzed by the laboratory.

#### **4.2.1 Chemical Analysis**

Samples collected for the biosparging pilot study and drummed soil waste characterization analysis will be analyzed for the parameters specified in Table-3-1. Duplicate and matrix/matrix-spike duplicates are required at a frequency of 1 per 20 samples. In addition to the groundwater samples collected, one duplicate sample, one matrix spike/matrix spike duplicate (MS/MSD) per round of groundwater sampling and for the surface soil sample. A trip blank will be submitted to the lab with each shipment of aqueous VOC samples. Holding times for the samples are given in Table 3-2. Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling.

### **4.3 Sample Tracking and Custody**

This section presents sample custody procedures for both the field and laboratory. Implementation of proper custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the chain-of-custody and transfer of samples will be trained on the purpose of the chain-of-custody and specific procedures prior to implementation.

Evidence of sample traceability and integrity is developed by implementation of, and adherence to, the chain-of-custody procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. A sample is considered to be in a person's custody if the sample is:

- In a person's possession
- Maintained in view after possession is accepted and documented
- Locked and tagged with custody seals so that no one can tamper with it after having been in physical custody
- In a secured area which is restricted to authorized personnel

#### **4.3.1 Field Sample Custody**

A chain-of-custody record accompanies the sample containers from selection and preparation at the laboratory, during shipment to the field for sample containment and preservation, and during return to the laboratory. Triplicate copies of the chain-of-custody must be completed for each sample set collected.

The chain-of-custody lists the field personnel responsible for taking samples, the project name and number, the name of the analytical laboratory to which the samples are sent, and the method of sample shipment. The chain-of-custody also lists a unique description of every sample bottle in the set. If samples are split and sent to different laboratories, a copy of the chain-of-custody record will be sent with each sample.

The Remarks space on the chain-of-custody is used to indicate if the sample is an MS/MSD, or any other sample information for the laboratory. Since they are not specific to any one sample point, trip and equipment blanks are indicated on separate rows. Once all bottles are properly accounted for on the form, a sampler will write his or her signature and the date and time on the first Relinquished By space. The sampler will also write the method of shipment, the shipping cooler identification number,

and the shipper air bill number on the top of the chain-of-custody. Errors will be crossed out with a single line in ink and initialed and dated by the author.

One copy of the chain-of-custody is retained by sampling personnel and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler is wrapped tightly with clear packing tape. It is then relinquished by field personnel to personnel responsible for shipment, typically an overnight carrier. The packing tape must be broken to open the container. Breakage of the tape before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the AECOM Project Manager, and the sample(s) will not be analyzed.

#### **4.3.2 Laboratory Sample Custody**

The AECOM Project Manager or Field Team Manager will notify the laboratory of upcoming field sampling activities and the subsequent shipment of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The following laboratory sample custody procedures will be used:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check cooler temperature, and check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the chain-of-custody record and record the date and time received.
- Care will be exercised to annotate any labeling or description errors. In the event of discrepant documentation, the laboratory will immediately contact the AECOM Project Manager or Field Team Manager as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming chain-of-custody procedure.
- The samples will be stored in a secured area and, if required, stored at a temperature of  $4^{\circ}\pm 2^{\circ}\text{C}$ .
- A laboratory tracking record will accompany the sample or sample fraction through final analysis and final storage for control.

A copy of the tracking record will accompany the laboratory report and will become a permanent part of the project records.

#### **4.4 Reporting**

Data will be provided in electronic format, including the following specific requirements:

- All data generated will be submitted in an electronic data deliverable (EDD) that complies with the DEC's Electronic Data Warehouse standards (EDWS) or as otherwise directed by DER.
- Preliminary or final reports will be submitted to the DER in an electronic format that complies with DEC's Electronic Document Standards (EDS) or as otherwise directed.
- A DUSR will be prepared in accordance with NYSDEC procedures, included in Appendix D.

## 4.5 Data Quality Usability Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements to ensure that data of known and appropriate quality are obtained during sampling and analysis activities. Data developed during the PDI will be used to fulfill the overall objectives of the program.

The quality assurance and quality control (QA/QC) objectives for all measurement data include precision, accuracy, representativeness, completeness, and comparability. These objectives are defined in following subsections. They are formulated to meet the requirements of the USEPA SW-846, the analytical methods and their Contract Required Quantitation Limits (CRQLs), and Contract Required Detection Limits (CRDLs).

### 4.5.1 Precision

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement 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), relative range, and relative percent difference (RPD) are common.

For this project, field sampling precision will be determined by analyzing coded duplicate samples (labeled so that the laboratory does not recognize them as duplicates) for the same parameters, and then, during data validation, calculating the RPD for field duplicate sample results.

The data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, will be statistically calculated laboratory control limits based on historical data. Should there be insufficient data to calculate limits; the validation default RPD limits will be used: 20% for aqueous samples and 35% for soils.

### 4.5.2 Accuracy

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern, or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material and is expressed as the percent of the known quantity which is recovered or measured (percent recovery).

Sampling accuracy may be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. Additionally, initial and continuing calibrations must be established and be within method control limits. Instrument and method analytical accuracy can then be determined for any sample set.

The data quality objectives for analytical precision, calculated as the percent recovery, will be statistically calculated laboratory control limits based on historical data. Should there be insufficient data to calculate limits, the validation default percent recovery limits will be used: 70-130% for organic analyses, and 75-125% (matrix spike recovery) and 80-120% (laboratory control spike (LCS) recovery) for inorganic analyses.

### 4.5.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program. Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure that chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of sampling devices and digging equipment will be performed between samples. Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness also must consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling.

### 4.5.4 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid. The QC objective for completeness is generation of valid data for at least 90% of the analyses requested

### 4.5.5 Comparability

Comparability expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project.
- Requiring traceability of all analytical standards and/or source materials to the USEPA or National Institute of Standards and Technology (NIST).
- Requiring that all calibrations be verified with an independently traceable standard from a source other than that used for calibration.
- Using standard reporting units and reporting formats including the reporting of QC data.
- Performing a complete data validation on all of the analytical results, including the use of data qualifiers in all cases where appropriate.
- Requiring that all validation qualifiers be considered any time an analytical result is used for any purpose.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

#### **4.5.6 Sensitivity**

Soil, water, and waste samples will be analyzed according to the USEPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition and subsequent updates. The methods to be used for the laboratory analysis of groundwater and surface soil samples are presented in Table 3-2.

#### **4.6 Equipment Decontamination Procedures**

The following decontamination procedure will be followed for all non-disposal sampling equipment before being reused. Equipment will be washed thoroughly with a non-phosphate detergent.

- The equipment will then be rinsed with analyte-free water for removal of gross contamination.
- The equipment will be washed in a solution of phosphate free detergent and water.
- The equipment will be rinsed again with analyte-free water.

Decontamination water will be collected and managed as described in Section 3.7. After decontamination, equipment will be carefully stored to avoid contamination between sampling events.

## 5.0 Health and Safety Protocols

### 5.1 Site Hazards

There are physical hazards which may be present at the Site associated with existing conditions and with investigation activities. Potential physical hazards include the following:

- Traffic – Requires care when entering and leaving the Site.
- Overhead and underground utilities - Overhead power lines near recreation trail/site boundary. Potential underground utilities during drilling and test pitting.
- Mechanical equipment including drill rigs and excavations.
- Slips, trips, and falls – General site hazards. Debris inside and outside of buildings.
- Exposure to hazardous wildlife and plants.

Several environmental investigations have been performed at the Site between 1981 and 2015. These investigations were documented in the Site Characterization (SC) Report (AECOM, 2016). Soil and groundwater samples were analyzed for VOCs, SVOCs, PCBs, metals, and cyanide. Groundwater samples were also analyzed for per- and polyfluoroalkyl substances (PFAS), and 1,4-dioxane in 2019. Based upon investigations conducted to date the primary contaminants of concern include arsenic in surface soils, VOCs (BTEX), SVOCs, and arsenic in subsurface soils, and VOCs (BTEX), SVOCs, and cyanide in groundwater.

All staff will be bound by the provisions of the attached HASP (Appendix B) and are required to participate in a preliminary project safety meeting to familiarize them with the anticipated hazards and respective onsite controls. The discussion will cover the entire HASP subject matter, putting emphasis on critical elements of the plan; such as the emergency response procedures, personal protective equipment, site control strategies, and monitoring requirements. In addition, daily tailgate safety meetings will be held to discuss: the anticipated scope of work, required controls, identify new hazards and controls, incident reporting, review the results of inspections, any lessons learned or concerns from the previous day.

Further detail on Health and Safety protocols for the Site are presented in the Site-Specific HASP included as Appendix B.

## 6.0 Schedule

Certain baseline PDI activities were conducted under a NYSDEC preliminary/conditional approval of the initial version of this RDWP (August 2021). Baseline activities performed during August, September, and October 2021 included:

- performance of a geophysical survey in the area of new wells MW-9 and MW-10
- installation and development of MW-9 and MW-10
- baseline groundwater monitoring at MW-1 through MW-10
- performance of slug testing at MW-1, MW-2, MW-4, MW-7, and MW-10
- collection of soil samples at sample location SS-13

Pre-planning and coordination for the remainder of the PDI (installation and sampling of MW-11 and MW-12, seasonal groundwater sampling, and performance of the biosparging pilot study and post-study groundwater sampling) will begin upon NYSDEC approval of this PDIWP. The field portion of the work is expected to require three to four weeks of onsite activities. Summer 2022 well installations and seasonal groundwater sampling will be scheduled for early August 2022. The biosparging pilot study and follow-up groundwater sampling will be scheduled for late August to early September 2022. NYSEG will inform NYSDEC in writing at least 10 working days prior to conducting the work.

The results of the PDI will be summarized in a PDI Summary Letter Report. The letter report will be prepared to meet the general requirements of DER-10, Section 3.13. The results will also be incorporated into the 50% remedial design and into the 100% design package to NYSDEC. The PDI data package will be submitted to NYSDEC approximately 60 days after the completion of the post-biosparging study groundwater sampling field work.

## Tables



Table 3-1

Sampling Matrix for PDI Parameters  
Pre-Design Investigation  
NYSEG - Auburn Green St. MGP Site  
Auburn, Cayuga County, New York

Location <sup>(1)</sup>	Parameters															
	Groundwater							Surface Soil	Waste Characterization (potential as may be required by disposal facility) <sup>(8)</sup>							
	VOCs <sup>(2)</sup> (8260C)	SVOCs <sup>(3)</sup> (8270D)	Dissolved Metals <sup>(4)</sup> (6010C)	Nitrate (EPA353.2)	Sulfate (300.0)	Total Cyanide (9012A)	Field Parameters <sup>(5)</sup>	Metals (Arsenic) (6010C)	TCLP Benzene (5035A/ 5030C/ 8260B)	Total Benzene (5030C/ 8260B)	TCLP SVOCs (1311/ 8270D)	TCLP Metals (6010C/ 7470A)	Ignitability (1030)	Corrosivity (9045)	Reactivity (Sect. 7.3)	Flashpoint <sup>(9)</sup> (1010A)
MW-1	3	3	3	3	3	3	3	<sup>(10)</sup>								
MW-2	3	3	3	3	3	3	3									
MW-3	3	3	3	3	3	3	3									
MW-4	3	3	3	3	3	3	3									
MW-5	2	2	2	2	2	2	2									
MW-6	2	2	2	2	2	2	2									
MW-7	3	3	3	3	3	3	3									
MW-8	2	2	2	2	2	2	2									
MW-9	3	3	3	3	3	3	3									
MW-10	3	3	3	3	3	3	3									
MW-11	2	2	2	2	2	2	2									
MW-12	2	2	2	2	2	2	2									
SS-13 (0-6" and 6-12")								2								
Monitoring Subtotal	31	31	31	31	31	31	31	2								
Waste Char - Soil									TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Waste Char - Water									TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Waste Characterization Subtotal									TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
QA/QC																
Duplicate <sup>(6)</sup>	3	3	3	3	3	3		1								
Matrix Spike <sup>(6)</sup>	3	3	3	3	3	3		1								
Matrix Spike Duplicate <sup>(6)</sup>	3	3	3	3	3	3		1								
Trip Blank	3															
Rinse Blank <sup>(7)</sup>	3	3	3	3	3	3		1								
Total Per Sampling Event	46	43	43	43	43	43	31	6	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

## Notes:

- (1) Listed wells will be sampled during the PDI. Some wells will be sampled for baseline and seasonal events only. Other wells will be sampled for baseline, seasonal and post-pilot study events.  
 (2) Benzene, toluene, ethylbenzene, xylene (BTEX), and styrene  
 (3) 2-methylphenol, 2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz[a,h]anthracene, indeno(1,2,3-CD)pyrene, naphthalene, and phenol  
 (4) Dissolved Iron Only  
 (5) Field collected parameters will include dissolved oxygen, electrical conductivity, oxidation-reduction potential, pH, temperature, and turbidity.  
 (6) Duplicates, Matrix Spike, and Matrix Spike Duplicate samples will be collected at a rate of 1 per 20 samples per event.  
 (7) Rinse Blanks will be collected at a rate of 1 per sampling event.  
 (8) It is presumed herbicides, pesticides, and PCBs will not be required for IDW characterization based on absence in Site Characterization data.  
 (9) If visible floating layer, only.  
 (10) Shaded cells are not applicable for the location and/or analyses.

TCLP - Toxicity Characteristic Leachate Procedure  
 MW - monitoring well  
 SS - surface soil sample

QA/QC - quality assurance/quality control  
 VOC - volatile organic compound  
 SVOC - semi-volatile organic compound  
 PCB - polychlorinated biphenyls

Table 3-2

Analytical Specifications - Sample Bottle, Volume, Preservation, and Holding Time Summary  
Pre-Design Investigation  
NYSEG Auburn Green St. MGP Site  
Auburn, Cayuga County, New York

Matrix/Analysis	Sample Prep Method <sup>(1)</sup>	Analytical Method <sup>(1)</sup>	Sample Bottles <sup>(2)</sup>				Minimum Vol Rqd	Preservation <sup>(3)</sup>	Holding Time <sup>(4)</sup>		Comment
			Mat'l	Size	Qty	Source			Extraction	Analysis	
Aqueous Samples											
Volatile Organics	SW-846 5030C	SW-846 8260C	Glass	40 mL	3	Lab	40 mL	HCl to pH ≤ 2	NA	14 days	7 days if not preserved.
Semivolatile Organics	SW-846 3510C	SW-846 8270D	Glass	250 mL	2	Lab	250 mL	None	7 days	40 days	
Dissolved Iron	SW-846 3005A	SW-846 6010C	Plastic	250 mL	1	Lab	200 mL	HNO <sub>3</sub> to pH ≤ 2	NA	180 days	
Nitrate	EPA 353.2	EPA 353.2	HDPE	125 mL	1	Lab	50 mL	None	NA	48 hours	
Sulfate	EPA 300.0	EPA 300.0	HDPE	125 mL	1	Lab	50 mL	None	NA	28 days	
Total Cyanide	SW-846 9012A	SW-846 335.4/9012B	Plastic	500 ml	1	Lab	500 ml	NaOH to pH >12	NA	14 days	
Surface Soil Samples											
Metals (Arsenic)	SW 846 3050B/3051/3052	SW-846 6010C	Glass	8 oz.	1	Lab	10 g	None	NA	180 days	
Waste Characterization Non-Aqueous Samples (Potential as may be required by Disposal Facility)											
TCLP Benzene	SW-846 5035A	SW-846 8260C	Glass	2 oz.	1	Lab	5 g	None	NA	14 days	
TCLP SVOCs	SW-846 1311	SW-846 8270D	Glass	8 oz <sup>(5)</sup>	1	Lab	30 g	None	14 days	40 days	
TCLP Metals	SW-846 1311	SW-846 6010C/7470A							14 days	365 days	
Reactivity	NA	Section 7.3	Glass	8 oz.	1	Lab	30 g		NA	14 days	
Ignitability	NA	SW-846 1030							NA	14 days	
Corrosivity	NA	SW-846 9045							NA	14 days	
Percent Solids	NA	SM2540							NA	14 days	
Waste Characterization Aqueous Samples (Potential as may be required by Disposal Facility)											
Total Benzene	SW-846 5030C	SW-846 8260C	Glass	40 mL	3	Lab	40 mL	HCl to pH ≤ 2	NA	14 days	7 days if not preserved.
TCLP SVOCs	SW-846 1311	SW-846 8270D	Glass	250 mL	2		250 mL	None	7 days	40 days	
TCLP Metals	SW-846 1311	SW-846 6010C/7471A	Plastic	250 mL	1		250 mL		14 days	365 days	
Reactivity	NA	Section 7.3	Glass	1L	1		1L			14 days	
Ignitability/Flashpoint	NA	SW 1010A								14 days	
Corrosivity	NA	SW9045						14 days			

## Notes:

(1) More recent versions of SW-846, EPA, and SM methods may be used subject to AECOM approval.

(2) Bottles typical. Terracore samplers for VOCs in soil will be provided by laboratory or AECOM on a case-by-case basis.

(3) All samples for chemical analysis will be held at 4 degrees C in addition to any chemical preservation required.

(4) 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.

(5) A single 8-oz sample is sufficient for SVOCs, pesticides, PCBs, and metals.

SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IV, March 2009.

EPA - Compendium of Methods for the Determination of Toxic Organics in Air, Second Edition (EPA/625/R-96/010b; 1999).

SM - Standard Methods for the Examination of Water and Wastewater. AWWA. 20th Edition, 1998.

BTEX - benzene, toluene, ethylbenzene, xylene

PAHs - polynuclear aromatic hydrocarbons

HDPE - high-density polyethylene

NA - not applicable

HCL - hydrochloric acid

HNO<sub>3</sub> - nitric acid

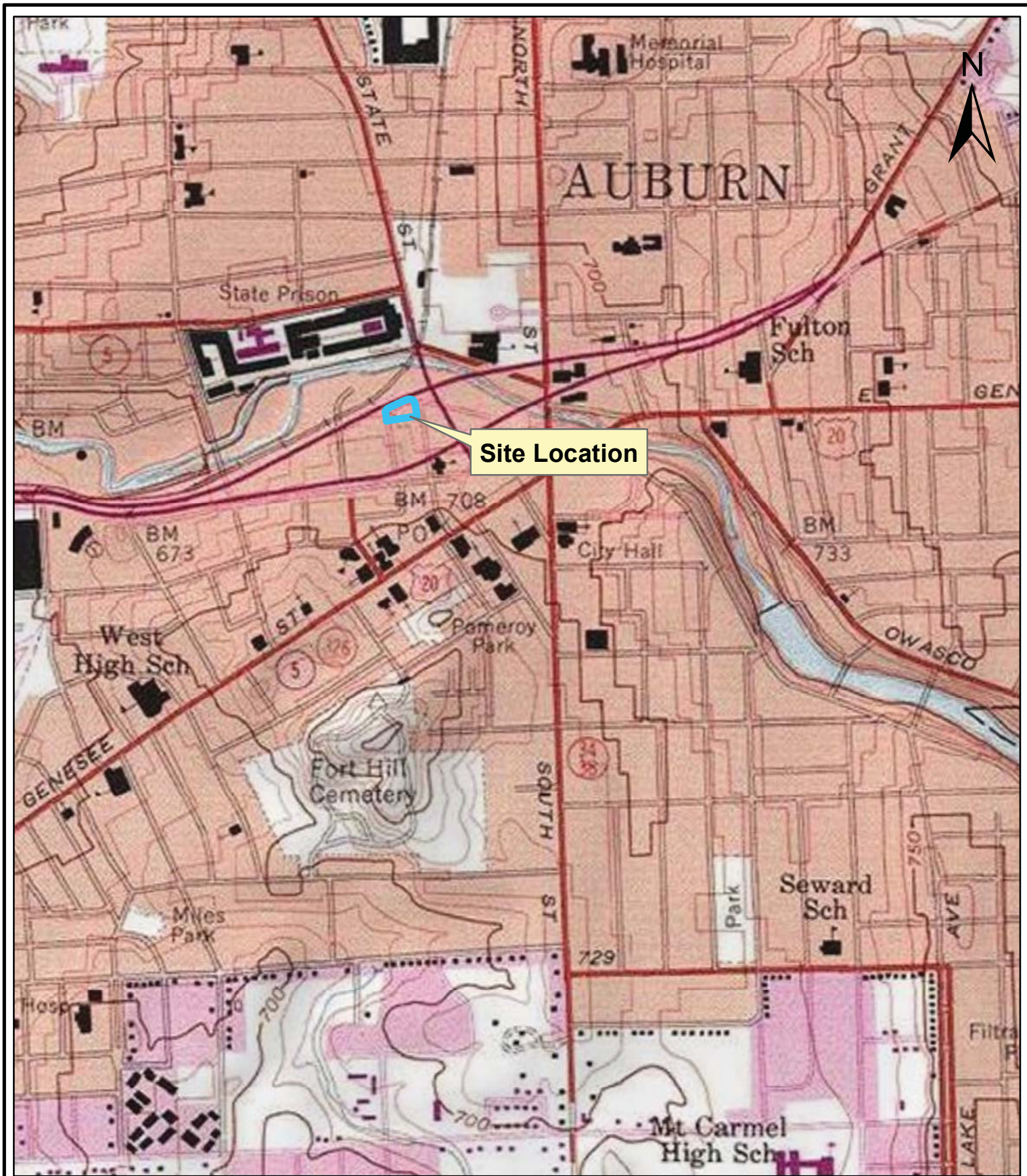
mL - milliliter

L - liter

g - gram

oz - ounce

## Figures



## Legend



Approximate Site Boundary

0 700 1,400 2,800 Feet



NYSEG - Auburn Green St. MGP Site  
Green Street  
Auburn, Cayuga County, New York

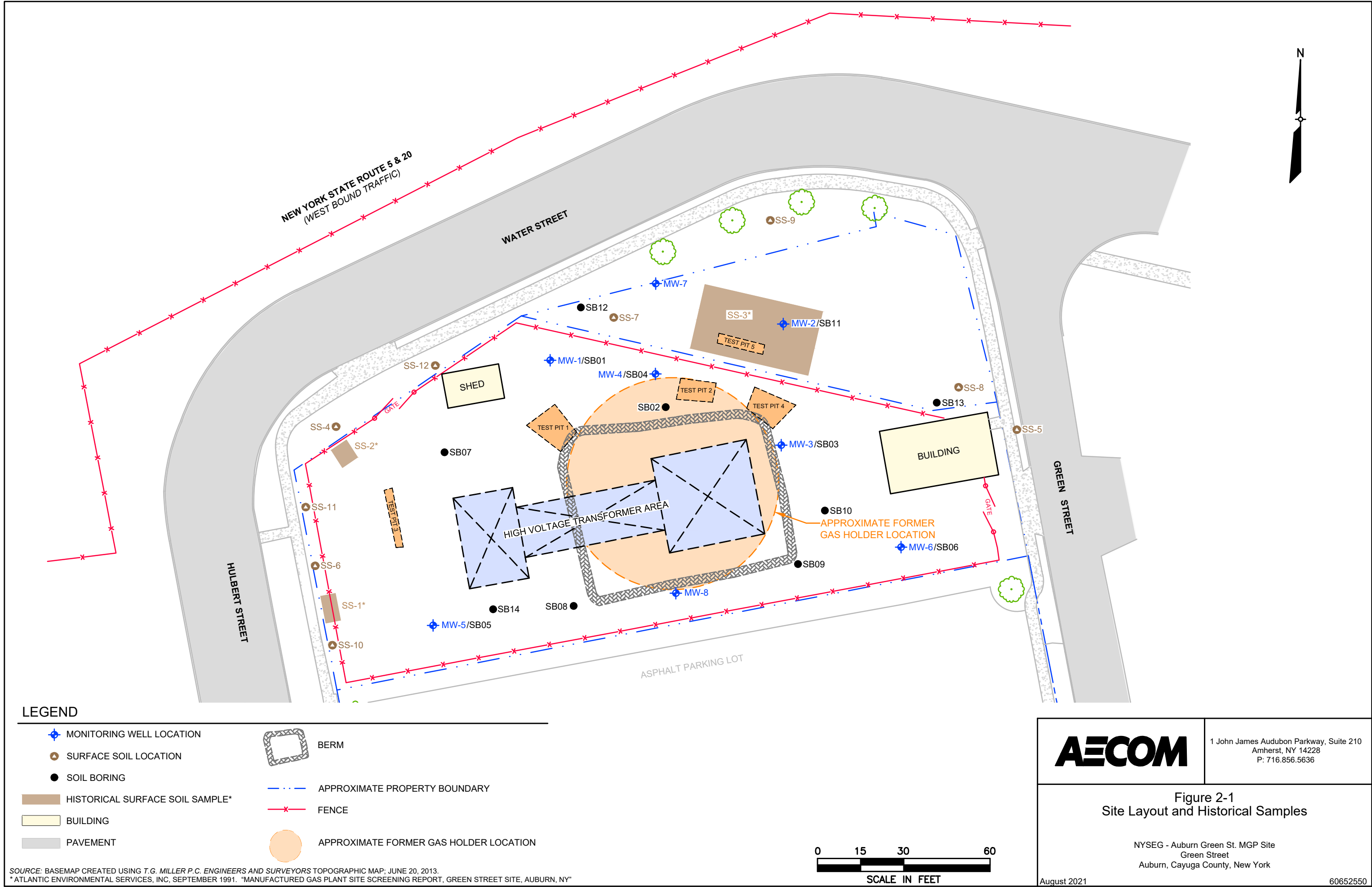
Figure 1-1

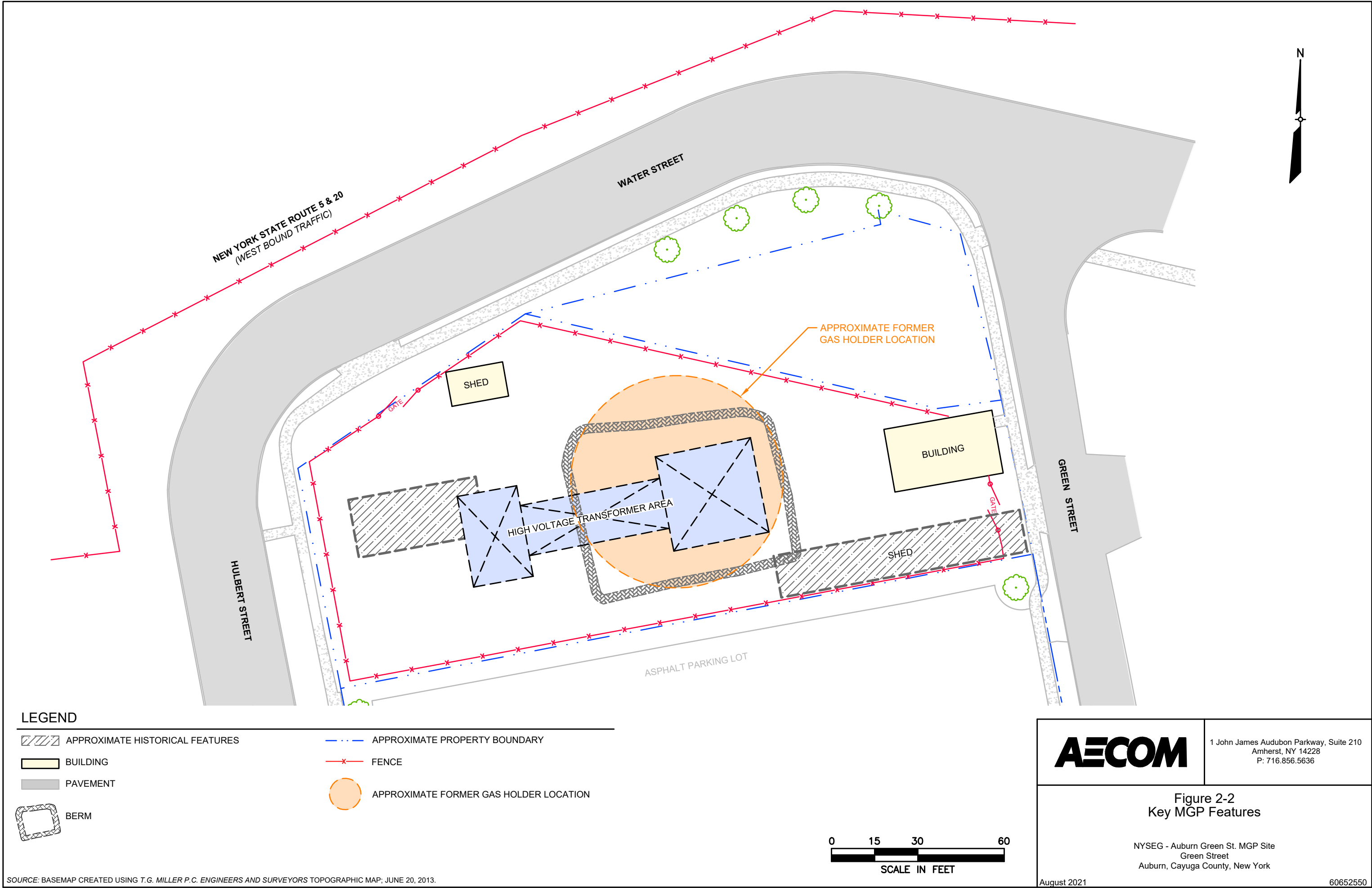
Site Location Map

**AECOM**

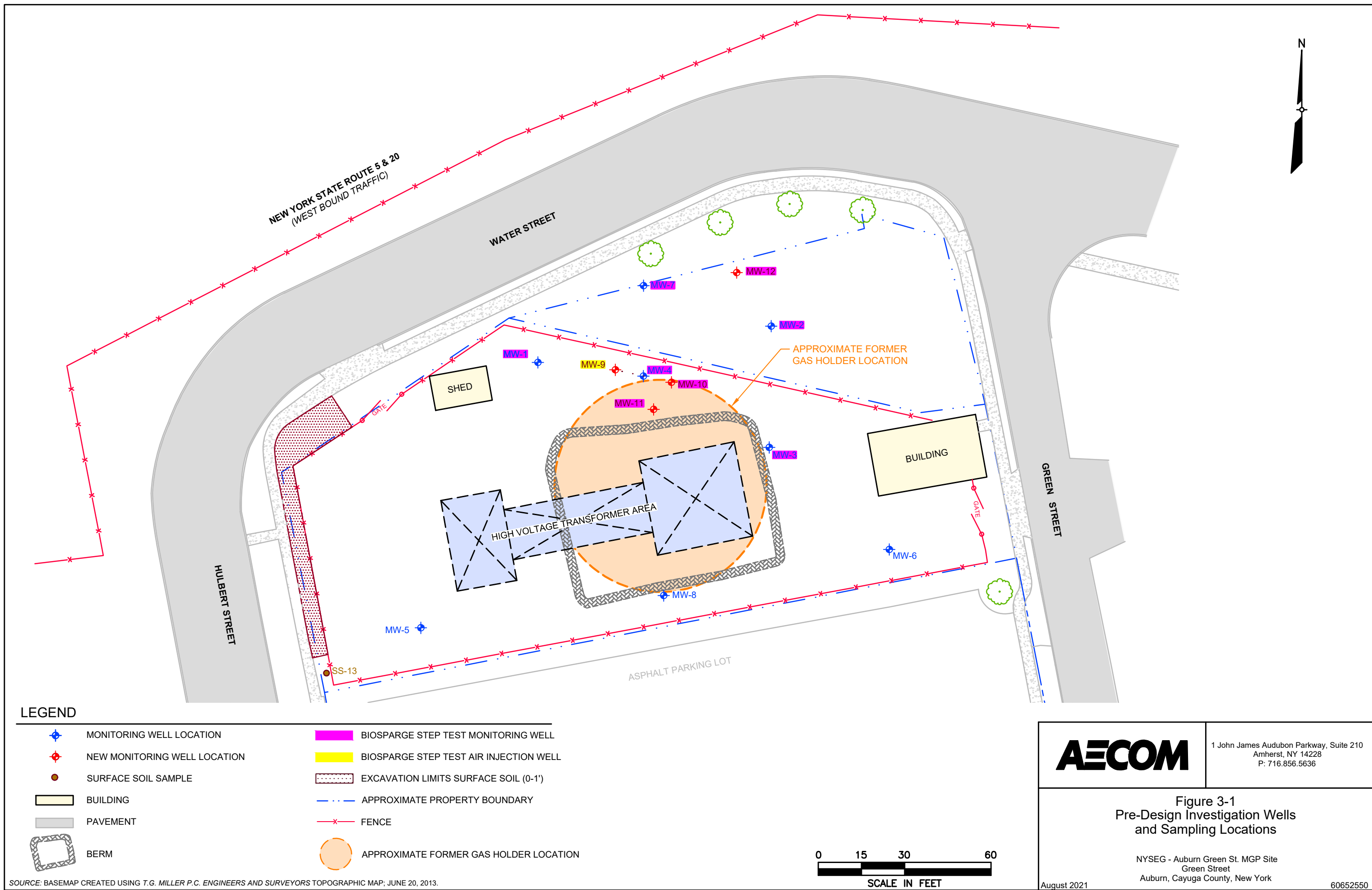
April 2022







SOURCE: BASEMAP CREATED USING T.G. MILLER P.C. ENGINEERS AND SURVEYORS TOPOGRAPHIC MAP; JUNE 20, 2013.



## **Appendix A**

**DER-10 Appendix 1A, New York  
State Department of Health  
Generic Community Air Monitoring  
Plan & DER-10 Appendix 1B  
Fugitive Dust and Particulate  
Monitoring.**



## 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 ( $\text{mcg}/\text{m}^3$ ) 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  $150 \text{ mcg}/\text{m}^3$  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  $150 \text{ mcg}/\text{m}^3$  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  $150 \text{ mcg}/\text{m}^3$  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 (PM<sub>10</sub>) with the following minimum performance standards:
  - (a) Objects to be measured: Dust, mists or aerosols;
  - (b) Measurement Ranges: 0.001 to 400 mg/m<sup>3</sup> (1 to 400,000 :ug/m<sup>3</sup>);
  - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m<sup>3</sup> for one second averaging; and +/- 1.5 g/m<sup>3</sup> 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/m<sup>3</sup>, 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° C (14 to 122° 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/m<sup>3</sup> (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/m<sup>3</sup>, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m<sup>3</sup> 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/m<sup>3</sup> 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 PM<sub>10</sub> 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/m<sup>3</sup> 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 B**

### **Site Specific Health and Safety Plan**

# Universal Health and Safety Plan

For use on all high-risk, industrial and HAZWOPER projects  
Includes control measures for the Coronavirus Pandemic



## Auburn Green Street Former MGP Site

17 N. Green Street  
Auburn, NY 13021  
U.S.A.

42.93301107, -76.57072949

**60652550**

Pre-Design Investigation

Prepared for

**NYSEG**

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Binghamton, NY 13902  
U.S.A.

Prepared by

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Prepared By:

Kevin J. McGovern, PG, CHMM  
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Signature

4/16/2021

Date Prepared

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Dale "Pete" Wray, CSP, CHMM, STS  
Safety, Health & Environment  
Manager

Signature

7/21/2021

Date Reviewed

Approved By:

James L. Kaczor, PG  
AVP/Project Director

Signature

7/8/2021

Date Approved

Expiration: **7/21/2022**

Valid for one (1) year maximum or until the scope of work, subcontractor(s), methods and/or equipment change.

# HASP SUMMARY

Note: This Summary is intended to provide key information only and cannot be substituted for reading, understanding, and complying with the full HASP, including the Emergency response section. This summary may be continually updated as tasks and personnel change. Use Continuation Sheets if necessary.

<b>Project Name:</b>	Auburn Green St. Former MGP Site, PDI	<b>Project Number:</b>	60652550
<b>Client Name:</b>	New York State Electric and Gas Corp		
<b>SH&amp;E INCIDENT REPORTING</b>			
<b>DCS Americas Incident Hotline 1-800-348-5046</b>			
TOLL-FREE   24 HOURS PER DAY   7 DAYS PER WEEK			
Immediately report injuries, illnesses, property damage, security issues, regulatory inspections, environmental impacts/spills, and any potentially work-related injury, illness, discomfort/pain or damage.			
<b>MEDICAL TREATMENT RESOURCES</b>			
Identify the nearest Occupational Clinic and Hospital to the site that accepts AECOM Workers Compensation Insurance (see <b>Attachment A</b> for instructions). If the they are an unreasonable distance from the site, identify nearer hospitals or clinics. Attach maps and directions to the clinics and hospitals in <b>Attachment A</b> .			
<b>AECOM Occupational Nurse</b>			
<b>1-512-419-5016</b> 24 HOURS PER DAY   7 DAYS PER WEEK			
<b>Nearest Occupational Clinic</b>			
<b>Name:</b>	Finger Lakes Medical Care Center	<b>Phone Number:</b>	(315) 258-7100
<b>Address:</b>	303 Grant Ave, Auburn, NY 13021		
<b>Hours of Operation:</b>	8AM-5PM		
<b>Nearest Hospital</b>			
<b>Name:</b>	Auburn Community Hospital	<b>Phone Number:</b>	(315) 255-7011
<b>Address:</b>	17 Lansing St, Auburn, NY 13021		
<b>KEY PERSONNEL</b>			
<b>Project Manager (PM):</b>	James L. Kaczor, PG	<b>Contact No.:</b>	(716) 866-0522
<b>Site Supervisor (SS):</b>	Sean Connelly	<b>Contact No.:</b>	(716) 393-0870
<b>Safety Officer (SSO):</b>	Sean Connelly	<b>Contact No.:</b>	(716) 393-0870
<b>Regional SH&amp;E Manager</b>	Candice Johnson (Environment)	<b>Contact No.:</b>	416-407-9661
<b>Area SH&amp;E Manager:</b>	Pete Wray (EBL EH&S East/REM-IAP NE)	<b>Contact No.:</b>	302-781-5872
<b>Account SH&amp;E Manager Environment BL:</b>	Not Applicable		
<b>Client PM:</b>	John Ruspantini	<b>Contact No.:</b>	(585) 484-6787



KEY PERSONNEL
NOTES: D – Direct Office Number   O – General Office Number   M – Mobile Device Number   R – Radio Channel

Short Service Employees (AECOM and Subcontractors) < 6 months with Company in Current Job Description	<input type="checkbox"/> Yes, see table below for details <input checked="" type="checkbox"/> None, not applicable		
Name	Company	Mentor	Mentor's Phone Number
NOTES: D – Direct Office Number   O – General Office Number   M – Mobile Device Number   R – Radio Channel			

Subcontractors (List All)				<input checked="" type="checkbox"/> Yes, see table below for details <input type="checkbox"/> None, not applicable
Company Name	Task(s)	Site Safety Officer	SSO's Phone Number	
Nothnagle Drilling	Well Installation	TBD	TBD	
TBD	Biosparging	TBD	TBD	
TBD	Investigation   Derived   Waste Management	TBD	TBD	
NOTES: D – Direct Office Number   O – General Office Number   M – Mobile Device Number   R – Radio Channel				

PM must positively verify subcontractors are approved in Subport (or by an equivalent evaluation process) for the work described. If there were any limitations/ conditions of approval, describe them below and how they are being met including the following (where applicable):

<input type="checkbox"/> Copy of their Corporate Safety Management Manual		
<input type="checkbox"/> Copy of their Project/Site-specific health and safety plan		
<input type="checkbox"/> Copy of task specific THAs/JHAs and daily inspection/tailgate forms		
<input type="checkbox"/> Copy of their Pre-Qualification form		
<input type="checkbox"/> Copy of their latest Workers Compensation Board (WCB) documents		
<input type="checkbox"/> Copy of the signed contract		
<input type="checkbox"/> Copy of their business license and training certificates (task specific)		
<input type="checkbox"/> Other (Describe)		
<input checked="" type="checkbox"/> I have verified that all subcontractors are approved in Subport (or equivalent), and that all conditions of approval are met.  <div style="text-align: center; margin-top: 10px;">James L. Kaczor</div>		
Project Manager Name	Project Manager Signature	Date

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## Attachments

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- Attachment B: THA Forms, and Tailgate Safety Meeting Form
- Attachment C: AECOM SHE Procedures
- Attachment D: Stretch/Flex Poster
- Attachment E: Site Orientation
- Attachment F: Safety Data Sheets
- Attachment G: NYSDOH Generic Community Air Monitoring Plan

# REVISION LOG

Template Revisions			
Version	Revised By	Date	Details of Revision
1.0	Alberto Munuera, Patrick Walz, & Gregg Ferris	14 FEB 2020	Initial Version, merging and replacing previous template documents (HAZWOPER HASP and Industrial/Project HASP)
1.1	Patrick Walz & Alberto Munuera	26 MAR 2020	Modified to add Coronavirus prevention and response guidelines
1.2	Tim Gilles, Kelly Dwyer, Scott Dietz, Lisa Rygiel, & Maria Hunt	28 MAY 2020	Formatting and grammar correction. Customized for universal use on high risk, Industrial and HAZWOPER projects

Project-Specific Revisions			
Version	Revised By	Date	Details of Revision
0	Kevin J. McGovern	4/16/2021	None – Original Site Health and Safety Plan
1			
2			
3			
4			

# 1. INTRODUCTION

This written Health and Safety Plan (HASP) is designed to identify, evaluate, and control safety and health hazards, and to outline emergency response actions for AECOM-managed activities. This HASP must be kept on site during work activities and made available to all workers including subcontractors and other site occupants for informational purposes. AECOM subcontractors are expected to independently characterize, assess, and control site hazards created by their specific scope of work.

This section of the HASP summarizes important AECOM SH&E Procedures that apply to all Design and Consulting Services (DCS) Americas jobs. See **Attachment B** for the Project Task Hazard Assessment (THA) forms and **Attachment C** for complete copies of applicable field SH&E Procedures.

## 1.1 Applicable References

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Federal Occupational Safety and Health Administration (OSHA) Code of Federal Regulation Title 29, Part 1910 (29 CFR Part 1910), Safety and Health Regulations for General Industry and 29 CFR 1926, Safety and Health Regulations for Construction.
- National Institute for Occupational Safety and Health/Occupational Safety and Hazards Administration/U.S. Coast Guard/U.S. Environmental Protection Agency, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Publication No. 85-115, 1985.
- The requirements in this HASP also conform to AECOM's Safety for Life Program requirements as specified in the AECOM Safety, Health and Environment (SH&E) Manual.
- Auburn Green Street Former MGP Site, Pre-Design Investigation Work Plan

## 1.2 Project Assumptions

- This is a Client-controlled site and AECOM is responsible for control of our immediate work area(s) only.
- Site management will assist in locating subsurface utilities, vessels, and structures located on the property and outside the scope of the utility locator service.
- No confined spaces will be entered on this project.
- No excavations will be entered.
- No work at heights (with fall protection) will be performed
- Work will be performed during daylight hours.



## 2. SITE DESCRIPTION

The Site is located in the City of Auburn, Cayuga County, New York (Figure 2-1). The location of the Site and the surrounding features are shown on Figure 2-2. The Site is surrounded by a mix of commercial and residential properties in the downtown section of Auburn. The Site is bounded by Hulbert Street to the west, Water Street to the north, Green Street to the east, and a parking lot to the south. Farther to the north is NY Route 5 and 20 West, a railroad right-of-way with rail tracks, the Owasco Outlet River, and the Auburn Correctional Facility. East of Green Street is a hotel followed by commercial properties. Commercial properties followed by residential properties are located to the west and south of the Site. The site is approximately 500 feet southeast of the NYSEG Auburn McMaster St. MGP site (Site No. 706010).

The Site is comprised of two parcels of land. The parcels are summarized as follows:

- Parcel 115.52-1-37 – NYSEG substation - This parcel is currently used as an active substation for NYSEG. As shown on Figure 2-3, the majority of the former gas holder was located on this parcel. The parcel is covered with gravel and is surrounded by a chain-link fence with secure access.
- Parcel 115.52-1-38 – Adjacent northeast NYSEG parcel – This parcel is also owned by NYSEG and is located immediately adjacent to and northeast of the NYSEG substation parcel. This parcel is vacant and covered with grass and trees. There is no fence surrounding this parcel.

The Site and adjoining parcels fall within a “central commercial” zoning district identified by the City of Auburn.

The nearest residence to the former MGP gas holder is approximately 300 feet (ft) to the west.

### 2.1 Site Background/History

The gas holder was constructed in 1890 for gas produced by the nearby McMaster Street MGP and possibly the Clark Street MGP. The gas holder existed until sometime between 1931 and 1941. The gas holder was owned and used by the Auburn Gas Light Company from 1890 to 1911, the Empire Gas and Electric Company from 1911 to 1936, and NYSEG from 1936 until it was demolished between 1931 and 1941. The site was then used as an auto sales and service shop and from 1946 to 1950, a nearby lumber yard expanded into the Site. In 1950, NYSEG constructed the substation currently present at the Site. The site is currently zoned for commercial use (C-2: Central Commercial) by the City of Auburn and is currently still a NYSEG electric substation.

The key features of the MGP are shown on Figure 2-3 and include:

- A 100,000-cubic foot capacity gas holder with a brick-and-mortar foundation in the center portion of the Site.
- A gas governor house located on the eastern side of the Site.
- A shed located along the southern side of the Site.

Several environmental investigations have been performed at the Site between 1981 and 2015. These investigations were documented in the Site Characterization (SC) Report (AECOM, 2016). Soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), metals, and cyanide. Groundwater samples were also analyzed for per- and polyfluoroalkyl substances (PFAS), and 1,4-dioxane in 2019. Based upon investigations conducted to date the

primary contaminants of concern include arsenic in surface soils, VOCs (primarily BTEX), SVOCs, and arsenic in subsurface soils, and VOCs (primarily BTEX), SVOCs, and cyanide in groundwater.

## 2.2 Client and/or Third-Party Operations at Site

The client currently operates an electrical substation at the Site.

## 2.3 Scope of Work

### 2.3.1 Project Scope and Objective(s)

This work is intended to provide the additional information required to design the selected remedy for the Site as specified in the ROD. The objectives of this PDI are:

- Install two new PDI wells in the vicinity of MW-4 and within the former gas holder footprint.
- Complete an elevation and location survey of the two new wells.
- Collect groundwater samples from eight existing wells (MW-1 to MW-8) and two new PDI wells to establish current groundwater quality (last sampled in May 2014) and provide baseline groundwater quality for the biosparging pilot study.
- Perform slug testing at four wells in the vicinity of the pilot study area to estimate hydraulic conductivity. Implement a biosparging pilot scale study to define design parameters more clearly for enhanced bioremediation.
- Implement a biosparging pilot scale study to define design parameters more clearly for enhanced bioremediation.
- Perform PDI of the upper foot of surface soils in a limited area west of the substation fence to confirm excavation limits and the suitability of existing surface and near surface soil as a site cover.
- Confirm the extent of the crushed stone fill inside the substation fence and ensure it is sufficient for a site cover.

### 2.3.2 Risk Register

The following tasks will be performed to achieve the project objective(s). A Task Hazard Assessment (THA) for each operation being performed by AECOM must be included in **Appendix B**, while those performed by the managed subcontractors must be prepared by the subcontractor. Oversight of managed subcontractor activities is considered a discrete AECOM task and shall also be listed below.

Task Name	Permit(s) Required		Task Performed By		
			AECOM	SUB	Third-Party
<a href="#">Coronavirus Precautions THA</a>	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Investigation Borings	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Monitoring Well Installation	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Monitoring Well Development	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slug Testing	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low-Flow Groundwater Sampling	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Task Name	Permit(s) Required		Task Performed By		
			AECOM	SUB	Third-Party
Biosparging Pilot Test	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Surface Soil Sampling	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site Survey	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Investigation-derived Waste Management	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Community Air Monitoring	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### 2.3.3 Scope of Work Risk Assessment

- |  |   |
|--|---|
| <input type="checkbox"/> <b>Low Risk</b>             | Examples: Non-intrusive work, occasional exposure and/or low risk hazards                   |
| <input type="checkbox"/> <b>Medium Risk</b>          | Examples: Intrusive work, heavy equipment use, frequent exposure and/or moderate hazards    |
| <input checked="" type="checkbox"/> <b>High Risk</b> | Examples: Complicated scope, large/multiple work crews, and/or constant exposure to hazards |

In general, the following tasks are considered High Potential (HiPo), as identified in S3AM-209-PR, Risk Assessment, based on the factors contributing to the severity and probability of credible outcomes resulting from ineffective mitigation of their hazards. Additional tasks or activities could be added to the list below based on a similar assessment their hazards and associate control measures. The following HiPo tasks will be required to complete the approved scope of work.

<input type="checkbox"/> Working at heights > 4 ft (including aerial lifts, snooper trucks, scaffolds)	<input type="checkbox"/> Working in a controlled area
<input type="checkbox"/> Working in a confined space	<input type="checkbox"/> Extreme heat or cold stress environments
<input type="checkbox"/> Working in a trench or excavation	<input checked="" type="checkbox"/> Working with power tools/equipment (drill, chain saw, grinder, etc.)
<input type="checkbox"/> Performing tasks requiring lock out/tag out	<input checked="" type="checkbox"/> Working with/operating heavy equipment or machinery, including drill rigs
<input type="checkbox"/> Work on energized equipment	<input type="checkbox"/> Working in isolation from first aid services or immediate/emergency assistance
<input type="checkbox"/> Working with electricity	<input checked="" type="checkbox"/> Working around mobile equipment
<input checked="" type="checkbox"/> Working with hazardous substances or materials (including all HAZWOPER projects)	<input checked="" type="checkbox"/> Exposure to vehicular traffic (highways, roads, parking lots)
<input type="checkbox"/> Working with material under pressure	<input type="checkbox"/> All-Terrain Vehicle Work
<input type="checkbox"/> Working where there is a possible threat of violence, including civil unrest	<input type="checkbox"/> Working on Railroads or within 25 Feet of Tracks
<input type="checkbox"/> Working in avalanche areas	<input type="checkbox"/> Any activity/task involving <u>non-voluntary</u> use of respiratory protection, including for site access
<input type="checkbox"/> Working on or over water or ice	<input checked="" type="checkbox"/> Working with people diagnosed with coronavirus or other pandemic diseases
<input type="checkbox"/> Working in remote or wilderness isolation	<input type="checkbox"/> Other HiPo Task(s) <b>[specify]:</b>

The following AECOM procedures provide task specific permit requirements and shall be consulted if applicable to the scope of work ([S3AM-218-PR](#)):

<input type="checkbox"/> <a href="#">S3AM-120-PR</a> , Radiation	<input type="checkbox"/> <a href="#">S3AM-304-PR</a> , Fall Protection
<input checked="" type="checkbox"/> <a href="#">S3AM-209-PR</a> , Risk Assessment & Management	<input type="checkbox"/> <a href="#">S3AM-310-PR</a> , Cranes & Lifting Devices
<input type="checkbox"/> <a href="#">S3AM-301-PR</a> , Confined Spaces	<input type="checkbox"/> <a href="#">S3AM-325-PR</a> , Lockout Tagout
<input checked="" type="checkbox"/> <a href="#">S3AM-302-PR</a> , Electrical Safety	<input type="checkbox"/> <a href="#">S3AM-330-PR</a> , Underground Work
<input type="checkbox"/> <a href="#">S3AM-303-PR</a> , Excavation	<input type="checkbox"/> <a href="#">S3AM-332-PR</a> , Hot Work

## 2.4 Cleaning/Disinfecting, Housekeeping and Personal Hygiene

During the Pandemic, AECOM has identified three basic levels of cleaning that are described in our [AECOM Pandemic Procedure](#). AECOM also requires that each location develop a Touch Point Cleaning program. Each project site shall implement a touch point cleaning program to minimize the transmission of the virus through environmental sources, specifically hard surfaces or "touch points." It is recommended that each site develop a checklist to identify the touch points specific to the site. The checklist can be initialed, dated, and signed for each touch point item to document the cleaning process. This cleaning should be conducted daily or more often as needed/desired. Contract a service or designate a person(s) and/or develop a schedule for cleaning responsibilities. Common touch points are listed below:

- Light Switches
- Equipment controls
- Cabinet and file drawer knobs/handles.
- Vending machines
- Chair arms
- Copier/printer/fax control buttons
- Shared desks and keyboards
- Shared tools and equipment
- Garage access buttons
- Handrails
- Doorknobs/handles
- Elevator buttons
- Sinks and Faucets
- Counter tops
- Tabletops
- Coffee pots
- Refrigerator
- Microwave
- Water dispensers
- Windowsills
- Portable toilet commonly touched areas
- Personal protective equipment (PPE) items

Basic housekeeping requirements for offices and work sites, as well as personal hygiene and sanitation standards can be found in [S3AM-013-PR](#) Housekeeping. Inspections will be performed at the regular interval specified below. The housekeeping inspection form [S3AM-013-FM1](#) is available for use. Complete the table below regarding site-specific Housekeeping and Personal Hygiene requirements:

<b>Cleaning/ Disinfecting</b>	<b>Frequency:</b>	Daily
	<b>Responsible Party:</b>	SS/SSO
<b>Housekeeping:</b>	<b>Inspection Frequency:</b>	Daily
	<b>Inspector:</b>	SS/SSO

<b>Eating, Drinking, Smoking:</b>	Permitted only in designated area(s) located in the support zone.
<b>Handwashing:</b>	Water, soap, and paper towels or equivalent supplies are located off site in neighboring gas stations, convenient stores, etc. Site staff will wash hands and face after completing work activities and prior to breaks or meals.
<b>Toilets:</b>	<p><b>Toilets</b> are located off site in neighboring gas stations, convenient stores, etc..</p> <p><i>NOTE: A minimum of one toilet must be provided for every 20 personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities, on-site facilities are <b>NOT</b> required.</i></p>
<b>Water:</b>	<p><b>Water</b> is located off site in neighboring gas stations, convenient stores, etc.</p> <p>A water supply meeting the following requirements will be used:</p> <p><i>Potable Water:</i> An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Disposable drinking cups for single use and a waste receptacle will be provided as needed. Water containers will be refilled daily and disinfected regularly. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.</p> <p><i>Non-Potable Water:</i> Outlets for non-potable water shall be posted or otherwise marked in a manner that will indicate clearly that the water is unsafe and is <b>NOT</b> to be used for drinking, washing of the person, cooking, washing of food, washing of cooking or eating utensils, washing of food preparation or processing premises, or personal service rooms, or for washing clothes. <b>Non-potable water is water that does not meet OSHA's Sanitation standard for potable water.</b> All containers of non-potable water will be marked with a label stating "<b>Non-Potable Water, Not Intended for Drinking Water Consumption</b>"</p>
<b>Illumination:</b>	<b>Artificial illumination</b> will <u>not</u> be provided. If natural light or installed lighting fixtures are not sufficient in the work area, toilet, and/or break area, then work activities will cease until adequate lighting is available.

## 3. AECOM SAFETY, HEALTH, AND ENVIRONMENT PROGRAM

### 3.1 AECOM Policy

AECOM's Safety, Health and Environment Policy, which establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance in the interest of benefitting AECOM's employees and stakeholder in the global marketplace, is available on AECOM's Ecosystem (intranet).

### 3.2 Safety for Life



"Safety for Life" is a comprehensive integrated AECOM Safety Management System that drives our nearly 100,000 employees toward AECOM's commitment to achieving zero work-related injuries and/or illnesses; preventing damage to property and the environment; and maintaining an environmentally friendly and sustainable workplace. Our Safety for Life program is supported by nine Life Preserving Principles that apply to all AECOM activities.

### 3.3 Life Preserving Principles

AECOM has adopted these "Life-Preserving Principles" to help demonstrate the commitment of our Safety for Life program. We firmly believe these "Life-Preserving Principles" will enable AECOM to achieve its goal of zero employee injuries, property damage and an environmentally friendly and sustainable workplace. The nine Life-Preserving Principles, along with their descriptions, can be found on AECOM's Ecosystem (intranet).

 <p><b>Commitment:</b> Managers will lead on safety, continuously demonstrating commitment to the highest standards.</p>	 <p><b>Recognition and Rewards:</b> Employees are rewarded for safety excellence and we share best practices..</p>
 <p><b>Participation:</b> All employees are encouraged to engage in helping to control the risks we face.</p>	 <p><b>Orientation and Training:</b> Our employees will be provided with effective safety training in order to identify and mitigate hazards in the workplace to prevent injuries to themselves and others who may be affected by their actions.</p>
 <p><b>Budgeting and Staffing for Safety:</b> The costs of managing SH&amp;E are budgeted into every project. Our safety staff are fully trained to provide expert guidance.</p>	 <p><b>Incident Investigation:</b> We investigate recordable incidents and serious near misses to understand the causes and take action to prevent recurrence.</p>
 <p><b>Pre-planning:</b> We assess risks and produce detailed plans to control them during design, planning, and execution of work.</p>	 <p><b>Fit for Duty:</b> All staff come to work each day fit and well, so they do not pose a hazard to themselves or others.</p>
 <p><b>Contractor Management:</b> We carefully select and collaborate with all our partners to create a safe working environment.</p>	

## 3.4 Driving and Vehicle Safety

The proper operation of vehicles is critical to protecting the safety of AECOM employees and subcontractors. Drivers face numerous hazards while operating vehicles. Some of the hazards include collision with another vehicle, collision with a fixed object, vehicle break down or failure, or falling asleep or becoming otherwise incapacitated while driving. All employees will adhere to Driving procedure [S3AM-005-PR](#), which includes the following key practices:

### 1. Authorized Drivers

Managers must authorize drivers following evaluation of driver criteria to drive and maintain an AECOM-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting AECOM business.

### 2. Electronic Devices Prohibited

AECOM prohibits use of all portable electronic devices while operating a motor vehicle/ equipment, which includes being stopped at a traffic light or stop sign. Electronic devices include, but are not limited to, all mobile phones, two-way radios, pagers, iPods, MP3s, GPS, DVD players, tablets laptops, and other portable electronic devices that can cause driver distraction. Hands-free device use is **NOT** allowed.

- GPS units and devices used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Electronic devices shall be setup for operation prior to commencing driving activities and shall **NOT** be changed by the driver while driving.

### 3. Vehicle Inspections

The driver shall conduct pre-trip vehicle inspections prior to each trip. A vehicle inspection checklist, [S3AM-005-FM2](#), can be used to guide and document the inspection process. Vehicle inspection is to include a 360-degree walk around and visual inspection under the vehicle for leaks and obstructions prior to moving the vehicle.

### 4. Training

All drivers shall complete defensive driver training. Additional training (i.e., hands-on defensive driver training) may apply for medium and high-risk drivers; see Driving procedure [S3AM-005-PR](#) and SHE Training procedure [S3AM-003-PR](#) for more details.

### 5. Journey Management Plan

Drivers who undertake trips in excess of 250 miles (400 kilometers) one way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan using [S3AM-005-FM1](#) or equivalent.

### 6. Secure Loads

Cargo is only to be carried within the passenger compartment of a vehicle when segregated and restrained to prevent objects from becoming distractions, obstructions, or projectiles to occupants should emergency vehicle maneuvers be required (e.g., harsh braking or crash). All

goods transported on flatbed trucks or in pickup beds must be securely fastened to prevent them from becoming hazards. All applicable laws and regulations regarding securing of loads must be met. It is prudent to check the load after a few miles to ensure that load has not shifted or loosened prior to completing the remainder of the trip.

## 7. Backing Up

Reversing the vehicle is to be avoided if at all possible. If backing up is necessary, use the following guidelines:

- ✓ Pre-plan all vehicle movements.
- ✓ If the pull-through method of parking is not possible, drivers will scan parking spot/area for hazards and back in; thereby, facilitating departure where the first move is forward.
- ✓ A light tap of the horn should be used to alert others of your intention to back up.
- ✓ Avoid tight spaces.

Vehicles rated over 10,001 pounds (4,536 kilograms) gross vehicular weight are required to have a competent spotter in place when backing. A competent spotter is one that has received spotter training. (For additional requirements pertaining to vehicles in this weight rating, see Commercial Motor Vehicles procedure [S3AM-320-PR](#)).

All vehicles shall have a competent spotter in place when backing in an active work zone. Parking and public access areas are recommended but not required to have a spotter.

## 3.5 Fitness for Duty

One of AECOM's nine Life-Preserving Principles is Fitness for Duty (see Fitness for Duty procedure [S3AM-008-PR](#)). Fitness for Duty means that individuals are in a state (physical, mental, and emotional) that enables them to perform assignments competently and in a manner that does not threaten the health and safety of themselves or others. On certain projects or for specific tasks, fit for duty certifications may be requested of medical providers by SH&E Managers or Human Resources (HR). Employees should ensure they are fit for duty prior to leaving home and unimpaired by substances or fatigue, and if necessary, contact your supervisor rather than attempting to report to work in unfit condition. Supervisors must observe their employees and work with the employee, SH&E staff, and HR to address deficiencies. AECOM will **NOT** tolerate retaliation against any employee for filing a complaint or concern regarding their fitness for duty or participating in any way in an investigation.

### 3.5.1 Medical Surveillance

AECOM's [S3AM-128-PR Medical Screening and Surveillance](#) details the requirements to participate in a medical monitoring program. Medical Surveillance provides a streamlined process to determine if employees meet the physical requirements to perform assigned duties as defined by applicable regulations. It is also designed to provide a means to collect data relevant to exposure to chemical and physical agents for the protection of the workers and to confirm the effectiveness of health and safety programs. The scope of work outlined in Section 2.3 involves the following types of medical surveillance:



Task or Exposure	Type of Screening or Surveillance
Working in an exclusion zone and the regulatory required exposure limit is anticipated to be exceeded.	HAZWOPER Baseline (Initial), Annual, and Exit Physicals

### 3.5.2 Proactive Health

AECOM is committed to promoting proactive health activities in addition to the planning for prevention of safety and environmental incidents. Proactive health activities will be completed on an on-going basis at AECOM on a corporate-wide basis (i.e., the wellness program associated with employee benefits), at offices, and at this project site. Management will be actively involved in providing and encouraging opportunities for health and wellness education and improvement. Health initiatives and education will be discussed periodically during office-based meetings as the safety moment or during the daily tailgate meeting as a toolbox talk. Topics may be related to, but are not limited to, the following:

- ✓ Heart health
- ✓ Stress management
- ✓ Smoking cessation
- ✓ Diabetes prevention
- ✓ Diet
- ✓ Exercise benefits

Topics and educational materials can be located on the AECOM Wellness page, National Institutes of Health website, Centers for Disease Control and Prevention website, and other reputable sources online.

In addition, the field team will be encouraged to participate in a daily stretch and flex routine (a standardized way to avoid soft tissue damage from work activities) to the best of their abilities, given their own personal limits. It is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The Stretch and Flex manual and poster (**Attachment D**) serve as guidance for the leader to follow.

### 3.5.3 Fatigue

One aspect of fit for duty is fatigue management. AECOM has developed procedures that limit work periods or requires additional rest under certain circumstances, including during long-distance travel or when working at high altitudes. These procedures also set limits on extended work periods of 14 hours per day or 60 hours per week. A fatigue management plan is required if longer working hours are necessary (see Fatigue Management Procedure [S3AM-009-PR](#)).

### 3.5.4 Fatigue and Driving Safety

The effect of fatigue is both physiological and psychological and can severely impair a driver's judgement. Fatigue can cause lapses in concentration which could prove fatal. Fatigue is not just a problem for drivers on long trips, as drivers can also suffer from fatigue on short trips.

- ✓ After strenuous fieldwork, consider overnight accommodation or vehicle sharing for staff who are not acclimatized to the type of work.
- ✓ Microsleep can occur with a limited warning, and may be linked to several factors, for example:

- Microsleep is most likely to occur during times when the circadian rhythm dictates the body should be asleep, such as at dawn, late at night, or in the mid-afternoon (e.g., 1 and 4 am and 1 and 4 pm.).
- Potential to feel drowsy after a meal.
- Driving long distances (considered potentially monotonous) even with sufficient sleep.
- Prolonged sitting and warm ambient temperature may also increase the feeling of sleepiness.
- ✓ If safe to do so, consider undertaking actions to disrupt the microsleep event while identifying a safe place to stop, e.g., open a vehicle window, listen to upbeat music/change music source or ask the passenger (if present) to engage in conversation.
- ✓ Ensure field staff are familiar with the signs of fatigue and mitigation factors.

The most common visible signs of microsleep include the following:

- Eyelid drooping
- Head nodding
- Wandering thoughts
- Eyelid closure
- Brief periods of snoring

If any of the above become apparent, immediately pull over to a safe location and contact your PM or SH&E representative.

### 3.5.5 Substance Abuse

Drug and alcohol abuse pose a serious threat to the health and safety of employees, clients, and the general public as well as the security of our job sites, equipment and facilities. AECOM is committed to the elimination of illegal drug use and alcohol abuse in its workplace and regards any misuse of drugs or alcohol by employees to be unacceptable. AECOM Substance Abuse Prevention Procedure ([S3AM-019-PR](#)) prohibits the use, possession, presence in the body, manufacture, concealment, transportation, promotion or sale of the following items or substances on company premises. Company premises refer to all property, offices, facilities, land, buildings, structures, fixtures, installations, aircraft, automobiles, vessels, trucks and all other vehicles and equipment - whether owned, leased, or used.

- Illegal drugs (or their metabolites), designer and synthetic drugs, mood or mind altering substances, and drug use related paraphernalia unless authorized for administering currently prescribed medication;
- Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances; and
- Alcoholic beverages while at work or while on any customer- or AECOM-controlled property.

This policy does not prohibit lawful use and possession of current medication prescribed in the employee's name or over-the-counter medications. Employees must consult with their health care provider about any prescribed medication's effect on their ability to perform work safely and disclose any restrictions to their supervisor.

Although some states may pass laws legalizing medical or recreational marijuana use, the use, sale, distribution and possession of marijuana are violations of federal law and AECOM policy, and will subject an employee to disciplinary action up to and including termination in accordance with controlling law. In Canada, where medical

and recreational marijuana use is legal, employees must still follow Federal and Provincial laws, and AECOM policy with regards to use and possession. Employees found to be in contravention of legal requirements or AECOM policy will be subject to disciplinary action up to and including termination.

## 3.6 Rewards and Recognition

One of AECOM's Life Preserving Principles is Recognition and Rewards for proactive safety, health and environmentally focused behaviors. All projects are expected to participate in the rewards and recognition programs available on the Corporate and DCS Americas SH&E ecosystem pages. Large, long term projects are encouraged to establish a project specific rewards and recognition program which incorporates project specific goals and activities ([template available S3AM-020-FM1](#)). **All rewards and recognition programs must emphasize the 9 Life Preserving Principles and proactive SH&E activities NOT solely the achievement of lagging metrics ("injury/incident-free" hours, etc.) as those may discourage incident reporting.**

There are several possible appropriate methods of rewarding and recognizing employees and contractors:

1. **Informal** – recognition via verbal acknowledgement, email, spot awards, luncheons, etc.
2. **Formal** – recognition via DCS Americas Programs:
  - AECOM Safety Star Recognition Program
  - AECOM Making a Difference (MAD) Award
  - Executive Challenge Coins



## 3.7 Hand Safety

The hands are exposed to hazards more than any body part. SH&E Hand Safety Procedure [S3AM-317-PR](#) describes requirements and best practices including these notable practices:

- **All personnel shall have gloves in their immediate possession 100%** of the time when in a shop or on a work site. Gloves that address the hazard shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc. Use the Gloves Needs Assessment ([S3AM-317-FM1](#)) to help determine the appropriate glove for the hazard(s).
- **Fixed open-blade knives are prohibited** from use during the course of AECOM work. Examples of fixed open-blade knives include pocket-knives, multi-tools, hunting knives, and standard utility knives. For more information about cutting tools, see [S3AM-317-ATT1](#) Safe Alternative Tools.

## 3.8 Safety Observations

Safety observations are observations made by employees or subcontractors of a condition or behavior which could contribute to an incident, prior to the incident occurring. Observations can also identify positive behaviors or interventions which contribute to the prevention of incidents. Large, long-term projects may benefit from the use of LifeGuard™ to track and trend observations on a site level. All other projects should log their observations using

IndustrySafe™. Both reporting systems can be accessed on any safety page of Ecosystem or by using the QR codes below from a smartphone/device while off the AECOM network.



### 3.9 Newly Hired or Transferred Employees

All newly hired or transferred employees with fewer than 6 months experience working on field projects or an employee who has not completed the required training or received required certifications are considered "Short Service Employees", or "SSEs" (see the Newly Hired or Transferred Employees procedure, [S3AM-015-PR](#)). The Project Manager will identify all SSEs working on the project, and each SSE will be assigned to an experienced team member so all activities may be monitored. All SSEs working or visiting a field environment are required to wear a green hard hat for safety and identification purposes. In the event a client has an existing SSEs program, AECOM will defer to the identification system required by the client. Any new employee shall wear the designated SSE identifier until the Project Manager determines the employee has the knowledge, skills, and ability related to the specific hazard on the project.

The project scope of work does **NOT** currently involve SSEs. If it becomes necessary to use one or more SSEs to complete the project scope of work, then they will be evaluated and approved in advance by the AECOM Project Manager prior to mobilizing to site and listed in this HASP.

### 3.10 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (see Stop Work Authority Procedure [S3AM-002-PR](#)) if an incident appears imminent, or when hazardous behaviors or conditions are observed. A stop work request can be informal if the situation can be easily corrected or may require shutting down operations if revised procedures are necessary to mitigate the hazard. If an AECOM employee observes an imminently hazardous situation on a site controlled by others (i.e., a client-managed contractor), the employee can always stop work for themselves by removing themselves from the situation. Employees also may attempt to stop work to avoid allowing the contractor to come to harm by immediately notifying the contractor foreman or site engineer, or if necessary, the client or party managing the contractor.



No employee should object to the issuance of a stop-work request, nor can any disciplinary action be levied against the employee. All employees must agree that the situation has been mitigated before resuming work. No employee will be disciplined for refusing to work if they feel it is unsafe.

## 3.11 Lone Worker Management

AECOM discourages employees from working alone (i.e., where AECOM personnel are out of visual and audio range of others) when performing field tasks (see SH&E Procedure [S3AM-314-PR, Working Alone](#)). Note that under no circumstances should Newly Hired or Transferred Employees be permitted to work alone, and lone workers are **NOT** permitted to perform high risk tasks. If lone work is to be performed, a communications/check-in plan must be developed. The scope of work outlined in section 2.3 does **NOT** involve the lone worker operations.

## 4. ROLES AND RESPONSIBILITIES

Roles and responsibilities for the project team are defined below. The Project Manager (PM) is ultimately responsible for the development of this HASP and establishing a budget to implement the controls and training required. The PM is also responsible for ensuring that the plan is implemented, that appropriate documentation is generated, and that records are maintained. The SH&E Manager is responsible for reviewing and approving this HASP and assisting with other SH&E matters upon request. A Site Safety Officer may be appointed to oversee implementation of the HASP in the field. All project team members are responsible for reviewing and abiding by this HASP, performing daily (or more frequent) task hazard assessments, stopping work when necessary to correct unsafe behaviors or conditions, and reporting incidents promptly to the PM and AECOM Incident Reporting Hotline.

**DCS Americas Incident Hotline: 1-800-348-5046**

### 4.1 Project Manager

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The PM will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations. Some of the PM's specific responsibilities include:

- 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 project risk registers /task hazard assessments shall be incorporated into the Project's HASP.
- Verifying that personnel, to whom this HASP applies, including AECOM subcontractors, have received a copy of it, with ample opportunity to review the document and to ask questions.
- Providing the concurring SH&E Manager with updated information regarding conditions at the site and the scope of site work if changes occur that will affect the accuracy of this HASP.
- Providing adequate authority and resources to the Site Supervisor or Site Safety Officer to allow for the successful implementation of all necessary SH&E Procedures.
- Maintaining regular communications with the Site Supervisor or Site Safety Officer and, when necessary, the AECOM Client SH&E Program Manager.
- Coordinating the activities of AECOM subcontractors and ensuring that they are aware of the pertinent health and safety requirements for these projects, when applicable.
- Conducting Safety System Auditing by way of Management Site Visits and/or Project Manager Self-Assessments on a regular basis.
- Approving amendments to the HASP (in conjunction with the Site Supervisor or Site Safety Officer).
- Coordinating activities with the client as needed to ensure the safe implementation of this HASP.

## 4.2 Site Supervisor

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans and HASP. The Project Manager may act as the Site Supervisor while on site. The Site Supervisor's responsibilities include:

- Discussing deviations or drift from the work plan with the Site Safety Officer and Project Manager.
- Discussing safety issues with the Project Manager, Site Safety Officer, and field personnel.
- Assisting the Site Safety Officer with the development and implementation of corrective actions for site safety deficiencies.
- Assisting the Site Safety Officer with the implementation of this HASP and ensuring compliance.
- Assisting the Site Safety Officer with inspections of the site for compliance with this HASP and applicable SH&E Procedures.
- Reviewing Project Risk Register/ Task Hazard Assessments and Task Hazard Assessments (THAs) with the work crew.
- Reporting incidents and ensuring incidents and observations are logged into Lifeguard or IndustrySafe.
- Verifying that all operations follow the requirements of this HASP and halting any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the Site Safety Officer, the SH&E Manager, and the Project Manager.

## 4.3 Site Safety Officer

The Site Safety Officer supports the Site Supervisor in providing a safe work environment. Not all sites will have a designated Site Safety Officer; the decision should be made by the Project Manager and SH&E Manager taking into consideration the complexity and risks of the scope of work. The Site Supervisor may act as the Site Safety Officer on sites without one. The Site Safety Officer's responsibilities include:

- Updating the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the SH&E Manager.
- Inspecting the site for compliance with this HASP and the SH&E Procedures using the appropriate field audit inspection checklist found in IndustrySafe.
- Coordinating with Site Supervisor to review THAs with the work crew.
- Assisting as needed to report incidents and verify that incidents and observations are logged into Lifeguard or IndustrySafe.

- Working with the Site Supervisor and Project Manager to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contacting the SH&E Manager for technical advice regarding safety issues.
- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Checking that all site personnel and visitors have received the proper training, orientation and medical clearance prior to entering the site.
- Establishing controlled work areas (as designated in this HASP or other safety documentation).
- Facilitating or co-leading daily tailgate meetings and maintaining attendance logs and records.
- Discussing potential SH&E hazards with the Site Supervisor, the SH&E Manager and the Project Manager.
- Selecting an alternate Site Safety Officer by name and informing him/her of their duties, in the event that the Site Safety Officer must leave or is absent from the site.
- Verifying that all operations follow the requirements of this HASP.
- Issuing a "Stop Work Order" under the conditions set forth in this HASP.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the SH&E Manager and the Project Manager.

## 4.4 Employees

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the SH&E Procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.
- Providing feedback to SH&E management for continuous improvement relating to omissions and modifications in the HASP or other safety policies and procedures.
- Notifying the Site Supervisor or Site Safety Officer of unsafe conditions and acts.
- Stopping work if there is doubt about how to safely perform a task or if unsafe acts or conditions are observed (including subcontractors or team contractors).
- Speaking up and refusing to work on any site or operation where the SH&E procedures specified in this HASP or other safety policies are not being followed.
- Contacting the Site Supervisor or Site Safety Officer or the SH&E Manager at any time to discuss potential concerns and update the THA in the field to reflect the modifications. Provide THA feedback to the supervisor for continuous improvement



- Calling the AECOM Hotline if an SH&E incident happens (+1-800-348-5046)
- Provide THA feedback to the supervisor for continuous improvement.

## 4.5 Subcontractors

Performance of the project scope of work **does** involve the use of subcontractors, which are listed in the subcontractor section of the [HASP Summary](#). The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in AECOM Procedure [S3AM-213-PR Subcontractor Management](#). The Project Manager is responsible for determining that the subcontractors being selected have been prequalified to work through the use of Subport or alternately stringent process as specified in the procedure. Each AECOM subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE) and all required training.

Each subcontractor that will be contracting any portion of their scope of work is required to obtain authorization to use those subcontractors that were not directly hired by AECOM prior to their mobilization to site. In addition, AECOM direct subcontractor is required to communicate both AECOM and client requirements and expectations to their subcontractors. The AECOM PM is required to confirm that all subcontractors used on the project meet both AECOM and client Safety, Health and Environment (SH&E) Evaluation Criteria, requirements and expectations. This includes confirming that individuals are competent to perform their assigned tasks and duties, obtaining authorization to use one or more short-service employees, and confirming that verification of competency can be provided upon request. In addition, the Project Manager must approve the use of all subcontractors (no matter the level) prior to their mobilization to site.

AECOM considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services as well as all other requirements applicable to their work. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures applicable to work that is exclusive to their activities on the site, and for which they may have superior knowledge. All subcontractor procedures must at a minimum comply with client and AECOM requirements in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior mobilization to the site.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the AECOM Project Manager or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

## 4.6 Visitors

Authorized visitors (e.g., client representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the Project Manager, Site Supervisor, or Site Safety Officer on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for

compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

If the site visitor requires entry to any exclusion zone (EZ), but does not comply with the above requirements, the visitor will be denied access to the EZ. If the visitor disregards instructions to remain outside the EZ, work activities will be immediately suspended, and the situation reported and documented.

Unauthorized visitors, and visitors not meeting the specified qualifications, will **NOT** be permitted within established controlled work areas. If unauthorized visitors and/or visitors not meeting the specified qualifications enter a controlled work area and/or EZ, work activities will be immediately suspended, and the situation reported and documented.

## 5. TRAINING AND DOCUMENTATION

The following sections describe the standard practices or programs that AECOM will establish to prepare employees to perform work safely and consistent with AECOM policy and Procedures.

### 5.1 HASP/Site Orientation

The Project Manager shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, Site Safety Officer, or Site Supervisor. This meeting will involve representatives from all organizations with a direct contractual relationship with AECOM on the job site. Minimum items to be covered are listed in **Attachment E**. Participants will then sign the HASP Personnel Acknowledgement register at the end of the HASP.

### 5.2 Daily Tailgate Meetings and THA Reviews

The Site Supervisor, Site Safety Officer or designee shall facilitate a tailgate meeting to discuss the specific requirements of this HASP and review the applicable THAs prior to the commencement of daily project activities. Attendance at the daily tailgate meeting is mandatory for all employees and subcontractors at the site contracted to AECOM. Simultaneous operations are encouraged to attend each other's tailgate meetings or at the very least the supervisors shall discuss the coordination of activities and associated hazards of each other's tasks. The supervisor will then convey the information to the work crew. The Tailgate Meeting must be documented by the Site Supervisor or Site Safety Officer on a Daily Tailgate Meeting form, a blank copy of which is included in **Attachment B**.

As part of the daily tailgate meeting, employees and subcontractors will be encouraged to voluntarily warm up and stretch select muscle groups to the best of their ability and within each person's individual limitations. Stretching is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The exercises included in Attachment D may be used to facilitate these efforts.

### 5.3 Worker Training and Qualifications

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure [S3AM-003-PR](#) establishes the general training requirements for AECOM employees.

Check all required training on the table below. Verify training records of employees and subcontractors.

#### Site Specific Training Requirements

Training	Applies to
<input checked="" type="checkbox"/> ERP/HASP and Site Orientation	All Employees and Subcontractors
<input checked="" type="checkbox"/> Vehicle/Driver Safety & Defensive Driving	All Employees who drive on behalf of AECOM
<input checked="" type="checkbox"/> Field Safety	Employees visiting the field that does not require HAZWOPER

### Site Specific Training Requirements

Training	Applies to
<input checked="" type="checkbox"/> Speak Up/Listen Up (SULU)	All AECOM field employees and supervisors
<input checked="" type="checkbox"/> First Aid / CPR	Designated employees or employees performing high risk activities and medical attention is more than 4 minutes away
<input checked="" type="checkbox"/> Respiratory Protection & Fit Test	Employees needing to wear respirators
<input type="checkbox"/> OSHA 10-Hr. Construction Safety (or CSTS 2020 in Canada)	Refer to Section 5.3.1 for guidance
<input type="checkbox"/> OSHA 30-Hr. Construction Safety	Refer to Section 5.3.1 for guidance
<input checked="" type="checkbox"/> HAZWOPER 40-Hour and 8-Hr. Annual Refresher	On HAZWOPER sites, in EZ, exposed to hazardous contamination
<input checked="" type="checkbox"/> HAZWOPER Supervisor	Employees managing others in HAZWOPER activities or at HAZWOPER Sites
<input type="checkbox"/> Hazardous Materials Shipping (U.S.)	Employee responsible for shipping HZM/HZW/DG and/or signing manifests
<input type="checkbox"/> Transportation of Dangerous Goods (CAN)	Employees responsible for shipping/transporting regulated hazardous materials that exceed regulatory requirements
<input checked="" type="checkbox"/> Annual Medical Surveillance / Clearance	Employees working in an exclusion zone and the regulatory required exposure limit <b>is</b> exceeded for 30 or more days a year
<input type="checkbox"/> Biennial Medical Surveillance / Clearance	Working in an exclusion zone more than 30 days a year and the regulatory required exposure limit is <b>NOT</b> exceeded
<input type="checkbox"/> Under Bridge Inspection Unit (UBIU) AECOM University module	Employees working in a UBIU
<input checked="" type="checkbox"/> All-Hands Coronavirus Training:	All Employees performing work during the COVID-19 Pandemic
<input type="checkbox"/> Local and/or Client Requirements:	[If applicable, specify]

### 5.3.1 OSHA 10-Hr. (or CSTS 2020)/OSHA 30-Hr. Training

OSHA 10 (or CSTS 2020 in Canada) and OSHA 30 training is required for projects with construction, demolition or construction/industrial-like hazards. "Construction//industrial-like hazards" occur on sites where the focus is **not** construction/industrial activities, but where our scope includes work activities involving work at heights, confined space, hot work, and/or lifting/hoisting loads or work around heavy construction equipment or "yellow iron." Examples of heavy construction equipment include excavators, bull dozers, graders, articulated dump trucks, pile drivers, and large air or mud rotary drill rigs. Smaller equipment like bobcats, road worthy commercial trucks, and hollow-stem auger drill rigs would not be considered heavy construction equipment.

This training is needed if this type of work is being performed within our work area or if it may impact our work area. It is not applicable if our work area is separated from the construction/demolition/industrial area with enough distance or physical barriers that fully prevent exposure of our team to those hazards. This includes projects where we serve as Inspectors, or any work where our employees are exposed to construction/industrial site hazards.

OSHA 30 hr. training is required for supervisors in the United States. The term "supervisor" has many different

meanings. The requirement to complete the OSHA 30 hr. course will be based on field supervisory roles and responsibilities, not administrative supervision roles. Field supervisors required to take the OSHA 30 course are defined as those individuals who provide work direction and leadership directly to AECOM field personnel and/or our subcontractors for construction/demolition activities or tasks that have construction/industrial-like hazards. These supervisors must be knowledgeable of construction hazards and controls because they are responsible for:

- Field implementation of a construction/demolition scope of work;
- Controlling performance on the job site;
- Evaluating and controlling hazards & preventing site safety risks; and
- Intervening to prevent unsafe actions or conditions of employees, clients, and subcontractors related to construction/demolition hazards.

## 5.4 Competent Person

A competent person is an employee who, through education, training, and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

AECOM's Competent Person Designation Procedure, [S3AM-202-PR](#), explains the roles, responsibilities and procedures of naming a competent person. Complete the table below and include an [S3AM-202-FM1](#) Competent Person Designation Form for each AECOM competent person (subcontractors to use an equivalent process). The following activities require and have been assigned a competent person:

### Competent Person Log

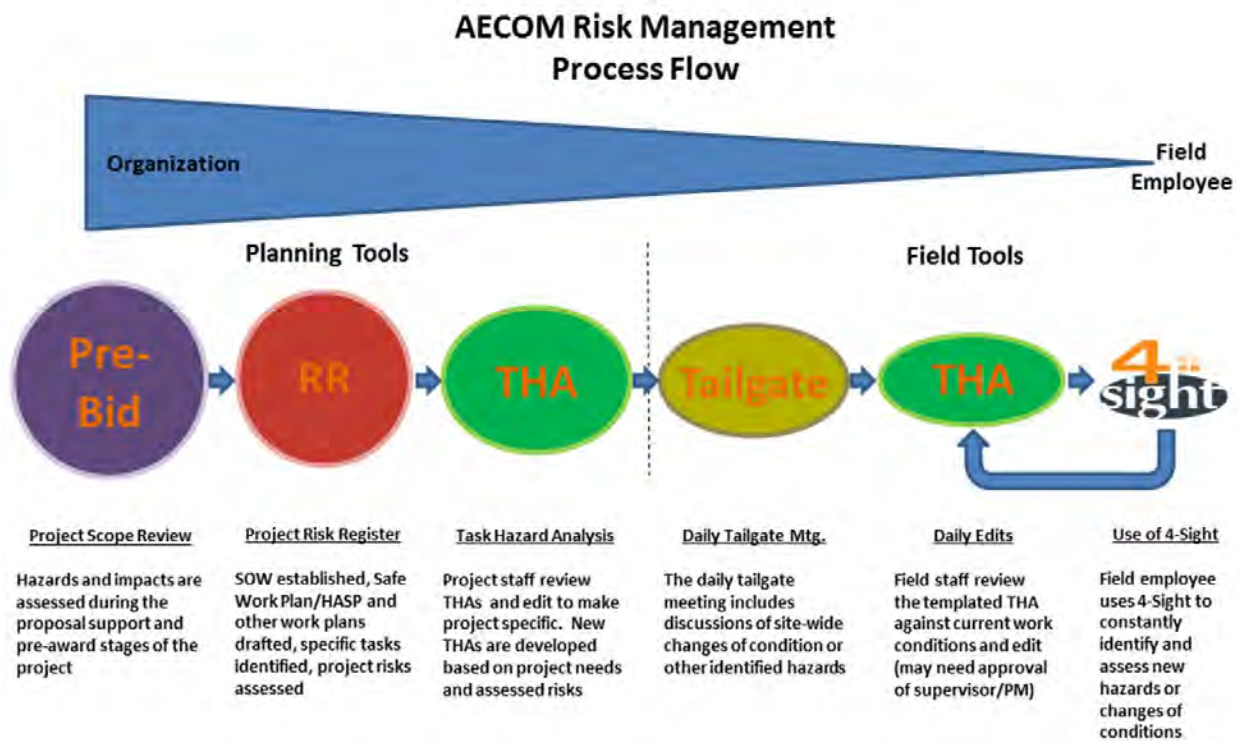
Activity / Area of Competency		Name of Person (Affiliation) Note: Subcontractor may provide this person
<input type="checkbox"/>	Asbestos	
<input type="checkbox"/>	Assured Equipment Grounding Conductor	
<input type="checkbox"/>	Blasting & Explosives	
<input type="checkbox"/>	Concrete & Masonry Construction	
<input type="checkbox"/>	Confined Spaces	
<input checked="" type="checkbox"/>	Control of Hazardous Energy (Lockout-Tagout)	On-Site Client Representative
<input type="checkbox"/>	Crane Assembly / Disassembly	
<input type="checkbox"/>	Cranes & Derricks	
<input type="checkbox"/>	Demolition	
<input type="checkbox"/>	Electrical Wiring Design & Protections	
<input type="checkbox"/>	Elevated Work Platforms & Aerial Lifts	
<input type="checkbox"/>	Fall Protection	
<input type="checkbox"/>	Hearing Protection	
<input checked="" type="checkbox"/>	Heavy Equipment	Subcontractor Representative (TBD)

### Competent Person Log

Activity / Area of Competency		Name of Person (Affiliation) Note: Subcontractor may provide this person
<input type="checkbox"/>	Ionizing Radiation	
<input type="checkbox"/>	Lead	
<input type="checkbox"/>	Material Hoists & Personnel Hoists	
<input type="checkbox"/>	Respiratory Protection	
<input type="checkbox"/>	Rigging Equipment	
<input type="checkbox"/>	Scaffolds	
<input type="checkbox"/>	Stairways & Ladders	
<input type="checkbox"/>	Steel Erection	
<input type="checkbox"/>	Trench & Excavations	
<input type="checkbox"/>	Underground Construction	
<input type="checkbox"/>	Welding & Cutting	

## 6. HAZARD ASSESSMENT AND CONTROL

AECOM has adopted an approach to hazard assessment and control that incorporates both qualitative and quantitative methods to identify hazards and the degree to which they may impact employees and AECOM operations. See [S3AM-209-PR](#), Risk Assessment and Management, for details regarding AECOM's process. This approach is illustrated below and described in the following section.



### 6.1 SH&E Procedures

All AECOM SH&E procedures, in their controlled copy version, are available on the [internal SH&E Policy and Procedures ecosystem page](#). Programmatic procedures referenced in this document (for example SH&E Training) do not need to be printed for inclusion in this HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment C**.

### 6.2 Task Hazard Assessments (THAs) and Daily Tailgate Meeting Form

THA forms (a blank version is located in [S3AM-209-PR](#)) shall be prepared for each task to be performed as part of the scope of work. This includes driving to the site, parking, and walking as well as the hazards, associated risk, and appropriate controls for all other work activities. The [DCS Americas Templated THA Library](#) may also be used to find

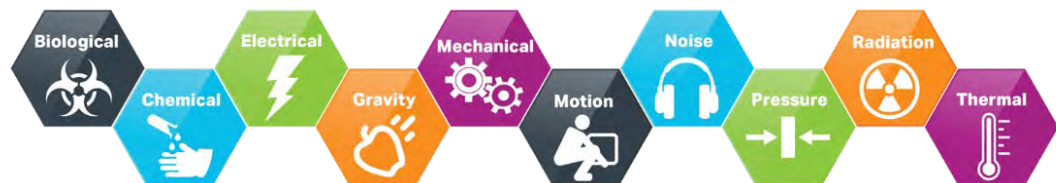
previously approved THAs, though these should be modified to be project and site-specific. The preparer shall have one THA form for each task in the Scope of Work found in this work plan (**Attachment B**) and shall also include blank copies.

In the field, all employees and visitors shall review the daily the THAs and complete and sign the Daily Tailgate Meeting Form [S3AM-209-FM5](#). Many times, when employees arrive in the field, situations are different than originally planned for or additional job steps are required. The THA asks workers update or 'dirty up' the THA in the 'On-Site Edits' rows to assess the risks presented by the changed condition and requires the worker to describe steps to reduce the risk. If the hazard(s) cannot be successfully mitigated, the work is **NOT** allowed to proceed.

## 6.2.1 Hazard Categories

THAs should include consideration of the following hazard categories when identifying hazards and task specific controls:

- Biological
- Chemical
- Electrical
- Gravity
- Mechanical
- Motion
- Pressure
- Noise
- Radiation
- Thermal



## 6.3 4 Sight

When preparing hazard assessments and throughout the day workers should use 4-Sight. This is a mental process through which workers ask themselves (and each other) four questions designed to effectively assess hazards. Using these questions during each task, especially those without established THAs, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.



- **What am I about to do?**
- **What could go wrong?**
- **What could be done to make it safer?**
- **What have I done to communicate the hazard?**

## 6.4 Speak Up/Listen Up

All AECOM employees have a responsibility to help create the environment where the expectation is Safety for Life. Speak Up/Listen Up (SULU) is a technique to steward jobsite safety by utilizing 4-Sight as a basis for safety feedback conversations. SULU has two main parts:



- **Speak Up** where employees use three simple steps when providing feedback to others about unsafe acts:
  - Ask to discuss their hazard assessment or 4-Sight for the task;
  - Get a commitment from the employee to apply the hazard controls and perform the task according to the accepted procedures; and
  - Follow up to ensure the employee is working safely
  
- **Listen Up** where employees use two simple steps when responding to safety feedback:
  - Listen – Focus on the message, not the messenger; and
  - Commit to performing the task the safer way

SULU conversations should happen consistently throughout the workday to create clear expectations of how work should be performed. All employees should recognize safe work behaviors in order to reinforce them and keep them going. An occasional correction is much more effective when employees are frequently encouraged and positively recognized for their safe actions. Managers and supervisors should be having SULU conversations during site visits and ensure peer to peer and site supervisor to crew SULU conversations are being held.

## 7. PHYSICAL AND BIOLOGICAL HAZARD ASSESSMENT

A physical hazard is a hazard that threatens the physical safety of an individual; contact with the hazard typically results in an injury. The following table summarizes the physical hazards or activities containing physical hazards present at the site and the associated procedures that address protection and prevention of harm.

All checked procedures **MUST** be included in **Attachment C** for implementation and reference. The following hazards and their site specific description are anticipated based on the scope of work and project site:

Hazard/ Activity (Note: Text in this column links to procedure)	Site Specific Description (Where, What Phase of Work, Frequency, Etc.)	Applicable Procedure
<input type="checkbox"/> <a href="#">Abrasive Blasting</a>		S3AM-335-PR
<input type="checkbox"/> <a href="#">Aerial Work Platforms</a>		S3AM-323-PR
<input type="checkbox"/> <a href="#">All-Terrain Vehicles</a>		S3AM-319-PR
<input type="checkbox"/> <a href="#">Blasting and Explosives</a>		S3AM-336-PR
<input checked="" type="checkbox"/> <a href="#">Bloodborne Pathogens</a>	First Aid Providers	S3AM-111-PR
<input type="checkbox"/> <a href="#">Cofferdams</a>		S3AM-344-PR
<input checked="" type="checkbox"/> <a href="#">Cold Stress</a>	Continuous exposure when ambient air temperature is below 32 °F (0 °C) or when ambient air temperature is below 50 °F (10 °C) with wet/damp conditions.	S3AM-112-PR
<input checked="" type="checkbox"/> <a href="#">Compressed Air Systems and Testing</a>	Biosparge Injections	S3AM-337-PR
<input checked="" type="checkbox"/> <a href="#">Compressed Gases</a>	Calibrating Field Instruments (i.e., PID, etc.)	S3AM-114-PR
<input type="checkbox"/> <a href="#">Concrete Work</a>		S3AM-338-PR
<input type="checkbox"/> <a href="#">Confined Spaces</a>		S3AM-301-PR
<input checked="" type="checkbox"/> <a href="#">Corrosive Reactive Materials</a>	Handling pre-preserved bottles for split sampling	S3AM-125-PR
<input type="checkbox"/> <a href="#">Cranes and Lifting Devices</a>		S3AM-310-PR
<input type="checkbox"/> <a href="#">Demolition</a>		S3AM-339-PR
<input type="checkbox"/> <a href="#">Diving (scientific and commercial)</a>		S3AM-334-PR
<input checked="" type="checkbox"/> <a href="#">Drilling, Boring &amp; Direct Push Probing</a>	Working with/alongside direct push rig	S3AM-321-PR
<input checked="" type="checkbox"/> <a href="#">Electrical Safety</a>	Working along an electrical substation.	S3AM-302-PR
<input type="checkbox"/> <a href="#">Excavation &amp; Trenches</a>		S3AM-303-PR
<input type="checkbox"/> <a href="#">Fall Protection</a>		S3AM-304-PR
<input type="checkbox"/> <a href="#">Flammable and Combustible Liquids</a>		S3AM-126-PR
<input type="checkbox"/> <a href="#">Gauge Source Radiation</a>		S3AM-122-PR
<input checked="" type="checkbox"/> <a href="#">Hand and Power Tools</a>	Collecting soil, sediment samples	S3AM-305-PR
<input type="checkbox"/> <a href="#">Hazardous Waste Operations</a>		S3AM-117-PR

Hazard/ Activity (Note: Text in this column links to procedure)	Site Specific Description (Where, What Phase of Work, Frequency, Etc.)	Applicable Procedure
<input checked="" type="checkbox"/> <a href="#">Heat Stress</a>	Continuous exposure when ambient air temperature is above 80 °F (26.6 °C) <u>and</u> a standard work uniform is worn <b>or</b> when ambient air temperature is above 70 °F (21.1 °C) <u>and</u> impermeable chemical protective clothing is worn.	S3AM-113-PR
<input checked="" type="checkbox"/> <a href="#">Heavy Equipment</a>	Oversight activity observing operations where excavators/ construction equipment are working	S3AM-309-PR
<input type="checkbox"/> <a href="#">High Altitude</a>		S3AM-124-PR
<input type="checkbox"/> <a href="#">Highway and Road Work</a>		S3AM-306-PR
<input type="checkbox"/> <a href="#">Hoists Elevators and Conveyors</a>		S3AM-343-PR
<input type="checkbox"/> <a href="#">Hot Work</a>		S3AM-332-PR
<input type="checkbox"/> <a href="#">Ladders</a>		S3AM-312-PR
<input type="checkbox"/> <a href="#">Lockout Tagout</a>		S3AM-325-PR
<input type="checkbox"/> <a href="#">Machine Guarding Safe Work Practice</a>		S3AM-326-PR
<input type="checkbox"/> <a href="#">Marine Safety and Vessel Operations</a>		S3AM-333-PR
<input type="checkbox"/> <a href="#">Material Storage</a>		S3AM-316-PR
<input type="checkbox"/> <a href="#">Mine Site Activities</a>		S3AM-341-PR
<input type="checkbox"/> <a href="#">Mining Operations</a>		S3AM-345-PR
<input checked="" type="checkbox"/> <a href="#">Noise</a>	Working with/alongside direct push/ drill rig	S3AM-118-PR
<input checked="" type="checkbox"/> <a href="#">Non-Ionizing Radiation</a>	Frequent exposure to sunlight during daylight hours	S3AM-121-PR
<input checked="" type="checkbox"/> <a href="#">Overhead Lines</a>	Working with/alongside drill rig	S3AM-322-PR
<input checked="" type="checkbox"/> <a href="#">Pandemic Virus</a>	Potential exposure during travel and field task(s)	SR1-003-PR2
<input type="checkbox"/> <a href="#">Powder-Actuated Tools</a>		S3AM-327-PR
<input type="checkbox"/> <a href="#">Powered Industrial Trucks</a>		S3AM-324-PR
<input type="checkbox"/> <a href="#">Radiation</a>		S3AM-120-PR
<input type="checkbox"/> <a href="#">Railroad Safety</a>		S3AM-329-PR
<input checked="" type="checkbox"/> <a href="#">Respiratory Protection</a>	Potential Exposure to Hazardous Chemicals	S3AM-123-PR
<input type="checkbox"/> <a href="#">Scaffolding</a>		S3AM-311-PR
<input type="checkbox"/> <a href="#">Steel Erection</a>		S3AM-340-PR
<input type="checkbox"/> <a href="#">Temp. Floors, Stairs, Railings, Toe-boards</a>		S3AM-342-PR
<input checked="" type="checkbox"/> <a href="#">Underground Utilities</a>	Installing borings.	S3AM-331-PR
<input type="checkbox"/> <a href="#">Underground Work</a>		S3AM-330-PR
<input checked="" type="checkbox"/> <a href="#">Wildlife, Plants and Insects</a>	Potential exposure during field activities.	S3AM-313-PR
<input type="checkbox"/> <a href="#">Working Alone</a>		S3AM-314-PR
<input type="checkbox"/> <a href="#">Working on and Near Water</a>		S3AM-315-PR

## 7.1 Pandemic Virus

COVID-19 is a disease that results from infection of the virus identified as SARS-CoV-2. SARS-CoV-2 is a Coronavirus, one of a large family of viruses found in both animals and humans. Some infect people and are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) with symptoms such as fever, cough, and shortness of breath. There currently is no human vaccine available for this virus.

Key AECOM resources can be found at the AECOM Ecosystem Coronavirus Information Center on the Ecosystem homepage or [at this link](#), the [Coronavirus Smart Card](#), and the AECOM Pandemic Procedure: [SR1-003-PR2](#). Additional resources can be found at the following non-AECOM websites:

- [Center for Disease Control and Prevention \(CDC\)](#).
- [World Health Organization \(WHO\)](#).

## 8. CHEMICAL HAZARD ASSESSMENT

A chemical hazard is a type of occupational hazard caused by exposure to chemicals in the workplace. Exposure to chemicals in the workplace can cause acute or long-term detrimental health effects. Potential exposure to chemical hazards on AECOM projects can come from several sources including materials brought on site to perform work, constituents of concern found in environmental media under investigation, and simultaneous operations being performed at the site by the property owner/third parties.

### 8.1 Potential Exposure Pathways

Occupational exposure to chemical hazards associated with the work activities could potentially occur by two primary routes (inhalation and skin contact) and one indirect route (incidental ingestion). These exposure pathways are discussed below.

#### 8.1.1 Inhalation

The primary risks associated with AECOM's scope of work pertain to potential exposure to airborne contaminants and explosion hazards. Constituents that potentially pose an occupational concern to employees by the inhalation route are carbon monoxide, hydrogen sulfide, methane, and volatile organic compounds. Air monitoring may be performed in the work area and within the employee's breathing zone to assess the need to implement appropriate control measures or stop work. In addition, air monitoring will be performed at the source to assess potential explosion hazards. See Section 9, Air Monitoring for additional information regarding the air monitoring requirements for this project.

#### 8.1.2 Skin Contact (Absorption)

Personnel handling residual product or waste and associated equipment may be exposed to chemical hazards by skin contact or adsorption. However, exposure is expected to be limited since workers will be required to wear appropriate PPE (i.e., appropriate work gloves, body clothing, and/or face shield).

#### 8.1.3 Ingestion

Personnel handling residual product or waste and associated equipment, including project hazardous materials, may be exposed by incidental ingestion. Typically, this exposure occurs if proper PPE was not used or personal hygiene was not practiced. Personal protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas as well as using the correct PPE.

## 8.1.4 Sources of Potential Chemical Exposures

Depending on the source of potential chemical hazard and the likelihood of exposure, certain measures will be taken to protect AECOM employees as specified below.

<input checked="" type="checkbox"/>	Exposure to chemical hazards is <b>NOT</b> anticipated
<input checked="" type="checkbox"/>	Hazardous chemicals will be used to perform the work (see Section 8.2)
<input checked="" type="checkbox"/>	Exposure to constituents of concern found in environmental media is likely (See Section 8.3)
<input type="checkbox"/>	Exposure to chemical hazards is possible due to activities of the site owner or other parties (see Section 8.4)

## 8.2 Hazardous Materials Communication

Hazardous materials that will be used on the site to perform the work can include a variety of products including sample preservatives, grout, concrete, paints, adhesives, decontamination solutions, etc. Safety data sheets (SDSs) must be available for all hazardous products that will be stored or used on the site that exceed usual household quantities.

Their properties, hazards, and associated required controls will be communicated to all affected staff and subcontractors in accordance with the requirements of AECOM Procedure [S3AM-115-PR](#) Hazardous Materials Communication including these key elements:

- All personnel shall be briefed on the hazards of any chemical product they use and shall be aware of and have access to the Safety Data Sheets (SDS).
- All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

In addition, any employee or organization (contractor or subcontractor) intending to bring any hazardous material onto this AECOM-controlled work site must first provide a copy of the item's SDS to the Site Supervisor or Site Safety Officer for review and filing. The Site Supervisor or Site Safety Officer will maintain copies of all SDS on site and in **Attachment F**. SDS may not be available for locally obtained products, in which case an alternate form of product hazard documentation will be acceptable.

See [S3AM-110-PR](#), Toxic and Hazardous Substances, for information on planning, training, monitoring, and details on several specific chemicals (Benzene, Cadmium, Chromium, Hydrogen Sulfide, Lead, and Silica).

## 8.3 Constituents of Concern

Based on information obtained from historical investigations and other sources, the chemicals in the table below are known or suspected to be present at the site.

### Summary of Hazardous Properties of Contaminant Exposure Hazards

Notes: PEL.....Permissible Exposure Limit TLV.....Threshold Limit Value		IP.....Ionization Potential eV.....Electron Volt			
Chemical Name	Media	Primary Routes of Exposure	PEL	TLV	IP (eV)
<b>Metals</b>					
Arsenic	Soil, GW	Dermal	0.5 mg/m <sup>3</sup>	0.2 mg/m <sup>3</sup>	n/a
<b>Other Common Site COCs</b>					
Benzene	Soil, GW, Vapor, etc.	Inhalation	1 ppm	0.5 ppm	9.25
Toluene	Soil, GW, Vapor, etc.	Inhalation	200 ppm	20 ppm	8.82
Ethylbenzene	Soil, GW, Vapor, etc.	Inhalation	100 ppm	20 ppm	8.77
Xylene	Soil, GW, Vapor, etc.	Inhalation	100 ppm	100 ppm	8.45, 8.56
Coal tar pitch hydrocarbons PAH	Soil, GW, Vapor, etc.	Inhalation	0.2 mg/m <sup>3</sup>	0.2 mg/m <sup>3</sup>	n/a
Naphthalene	Soil, GW, Vapor, etc.	Inhalation	10 ppm	10 ppm	8.12
Styrene	Soil, GW, Vapor, etc.	Inhalation	100 ppm	50 ppm	8.40
Phenol	Soil, GW, Vapor, etc.	Inhalation	5 ppm	5 ppm	8.5

## 8.3.1 Decontamination

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities. Decontamination steps are outlined in Section 4.7 of the Hazardous Waste Operations procedure [S3AM-117-PR](#). Some key elements are as follows:

- All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to exiting to clean areas of the site.
- Avoid reactions between the solutions and contaminated materials. Review the applicable SDS.
- All contaminated PPE and decontamination materials shall be contained, stored and disposed of in accordance with site-specific requirements determined by site management.
- Use caution while working around decontamination stations, including the decontamination pad, which may be a slip or trip hazard.
- Use disposable equipment when possible and practical.
- All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors.

All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ).

### Decontamination Procedures & Equipment

Procedure	Equipment Needed
Remove all equipment, sample containers, and notes to the CRZ. Obtain decontamination solutions and decontaminate the tools (shovels, auger flights, etc.) by brushing them under a water rinse. A high-pressure steam cleaner also may be used for decontamination. All waste and spent decontamination solutions will be properly contained.	Alconox solution  Deionized water  Brushes  Plastic sheeting

## Decontamination Procedures & Equipment

Procedure	Equipment Needed
<p>Remove disposable booties, or scrub boots with a stiff bristle brush and water, when necessary. Washtubs and chairs will be provided.</p> <p>Remove outer gloves (and boot covers, if used).</p> <p>Remove Tyvek® coveralls (if used); discard in provided container.</p> <p>Remove hardhat and eye protection.</p> <p>Remove respirator (if used).</p> <p>Remove inner gloves.</p> <p>Wash hands and face.</p> <p>The decontamination area will be covered with plastic sheeting that will be replaced when torn or heavily soiled and at the end of each shift.</p>	

## Equipment Decontamination Procedures

Type Equipment	Decontamination Solution	Procedure
Respirator (if used)	Alconox solution and deionized water	<p><b>Washing:</b> Disassemble and wash with an Alconox solution in deionized water. A stiff bristle (not wire) brush may be used.</p> <p><b>Rinsing:</b> Rinse in deionized water to remove all traces of detergent. This is important to prevent dermatitis.</p> <p><b>Disinfecting:</b> Thoroughly rinse or immerse in a sanitizer provided by the manufacturer.</p> <p><b>Final Rinsing:</b> Rinse thoroughly in clean water to remove all traces of disinfectant.</p> <p><b>Drying:</b> Drain and dry by hanging by the straps from racks or by towel drying with clean, soft cloths or paper towels.</p>
Water quality meter, oil/water interface probe, reusable sampling tools/ equipment		<p><b>Washing:</b> Disassemble and wash with an Alconox solution in deionized water.</p> <p><b>Rinsing:</b> Rinse in deionized water to remove all traces of detergent.</p>
Drilling Equipment/ Tools	High-pressure steam cleaner	Apply steam cleaner to used equipment/ tools

## Waste Handling for Decontamination

Waste Streams/Products	Disposal Procedures
Wash water	Containerize in 55-gallon DOT drums, and stage drums in temporary location pending shipment off site for treatment/ disposal.
Used PPE	
Spent plastic sheets/ consumables from decontamination procedures	



## 8.4 Site Chemical Hazards Outside AECOM Control

AECOM frequently performs work at Client sites that are engaged in chemical manufacturing or use chemicals as part of the manufacturing process. These types of operations can potentially expose AECOM and AECOM subcontractors to chemicals. The following mitigation measures should be applied to all work performed on these sites.

- Be familiar with the facility emergency alarms/alerts
- Know where the assembly areas are for each area of proposed site activity (note that assembly areas may be dependent on the direction of the prevailing wind)
- Be familiar with the products used on site and the appropriate response measures (may differ based on location on site)
- Discuss the above as part of daily tailgate meetings.

The client or host facility/site does not engage in chemical manufacturing or use chemicals as part of their manufacturing process. Therefore, a potential exposure to site chemical hazards outside of AECOM's control is not anticipated.

## 9. AIR MONITORING

Depending on the contaminants of concern, the products used to perform the work, or third-party operations, sampling or monitoring may be required within the work area on site to detect the presence and relative levels of chemical or particulate hazards. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be in accordance with Exposure Monitoring Procedure [S3AM-127-PR](#) and specified in the work permit and/or THA for the tasks. Key elements of the procedure include:

- Calibration of monitoring equipment and/or daily bump tests to verify calibrations and confirm alarm function.
- Documenting the results of calibration and/or daily bump tests.
- Documenting the results of monitoring activities.
- Personal monitoring and result evaluation must be directed by a Certified Industrial Hygienist or Certified Safety Professional.

Potential exposure to chemical hazards from sources including materials brought on site to perform work, constituents of concern found in environmental media under investigation, and/or simultaneous operations being performed at the site by the property owner/third parties are reasonably anticipated to have the potential to result in vapors, fumes, aerosols, mists, and/or airborne particulates/dusts at or near permissible exposure limits. Therefore, air monitoring that will be implemented is described below.

All monitoring data, including background readings, will be logged in a field logbook and incorporated into the project files. See the New York State Department of Health's (NYSDOH's) Generic Community Air Monitoring Plan (Attachment G) for additional information.

### 9.1 Real-Time Exposure Measurements/Equipment

Monitoring shall be performed within the work area on site in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in the work permit and THA as work is performed. All instrumentation needs to be rated intrinsically safe to prevent fire or explosion.

Instrument	Manufacturer/Model	Substances Detected
<input checked="" type="checkbox"/> Photo Ionization Detector (PID)	RAE Systems mini-RAE (min. 10.6 eV bulb)	<ul style="list-style-type: none"> <li>• Petroleum hydrocarbons</li> <li>• Organic Solvents</li> </ul>
<input checked="" type="checkbox"/> Particulate Monitor	MIE Model PDM-3 mini-RAM	<ul style="list-style-type: none"> <li>• Aerosols, mist, dust, and fumes</li> </ul>

### 9.2 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the

PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigation actions to limit, etc.) must be implemented prior to commencing activities at the specific work area.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of Site Supervisor or Site Safety Officer or the Safety Manager.

- |                              |   |
|------------------------------|---|
| <b>Reasons to Upgrade:</b>   | <ul style="list-style-type: none"> <li>▪ Known or suspected presence of dermal hazards;</li> <li>▪ Occurrence or likely occurrence of gas, vapor, or dust emission; or</li> <li>▪ Change in work task that will increase the exposure or potential exposure to hazardous materials.</li> </ul>                  |
| <b>Reasons to Downgrade:</b> | <ul style="list-style-type: none"> <li>▪ New information indicating that the situation is less hazardous than was originally suspected;</li> <li>▪ Change in site conditions that decrease the potential hazard; or</li> <li>▪ Change in work task that will reduce exposure to hazardous materials.</li> </ul> |

## 9.3 Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. In general, readings are considered actionable if sustained readings are observed for 5 minutes or more or if intermittent peaks are seen in excess of 1 time the response level. A reading in excess of action level outlined below will require additional ventilation (natural or mechanical) for 30 minutes, followed by re-monitoring.

### Monitoring Procedures and Action Levels

Parameter	Zone Location and Monitoring Interval	Response Level	Response Activity
<b>Volatile Organic Compounds (VOCs) and volatile hydrocarbons</b> (total by PID)	Breathing zone, continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	< 5 ppm	Continue monitoring, may continue work in required PPE
		5- 25 ppm (sustained for 5 minutes)	STOP WORK and notify PM. Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). Work activities shall only continue once levels have decreased to or below 5 units above background. If levels continue above 5 units, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with Project Manager approval. Don Level C PPE (organic vapor respirator cartridges), continue monitoring, and initiate continuous air monitoring for benzene.
		> 25 ppm (sustained for 5 minutes)	Cease work, exit, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
	Edge of Exclusion Zone. See guidance in NYSDOH's Generic Community Air Monitoring Plan	See guidance in NYSDOH's Generic Community Air Monitoring Plan (Attachment G)..	

### Monitoring Procedures and Action Levels

Parameter	Zone Location and Monitoring Interval	Response Level	Response Activity
<b>Benzene</b> (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 Officer, Site Supervisor, and Project Manager.
<b>Dust not otherwise classified</b> (total by aerosol monitor)	Breathing zone every 30 minutes during field activities where exposure to excessive dusts are possible	< 5 mg/m <sup>3</sup>	Continue work in Level D and continue monitoring
		> 5 mg/m <sup>3</sup>	Upgrade to Level C (P100 respirator cartridges), implement dust suppression measures; contact the Site Safety Officer & Site Supervisor.
		> 10 mg/m <sup>3</sup>	Cease activities, implement more effective dust suppression measures; contact the Site Safety Officer & Site Supervisor.
<b>Dust not otherwise classified</b> (total by aerosol monitor)	Edge of Exclusion Zone, every 30 minutes during excavation activities	See guidance in NYSDOH's Generic Community Air Monitoring Plan (Attachment G)..	

## 10. PERSONAL PROTECTIVE EQUIPMENT

PPE is considered the last line of defense in hazard control. PPE is meant to protect workers when all other methods (elimination, substitution, engineering, and administrative) have been exhausted. All employees must be trained in the proper use and maintenance of PPE. See Procedure [S3AM-208-PR](#), Personal Protective Equipment.

A PPE assessment (see [S3AM-208-FM1](#)) can be performed to help determine PPE requirements. PPE upgrades for individual tasks or steps of a task are to be identified in the appropriate THA(s).

### 10.1 Site Minimum Personal Protective Equipment

Unless otherwise excluded by an approved Management of Change (MoC), the following personal protective equipment is required by AECOM and/or client procedures and requirements and shall be worn on site outside of designated "Safe Zones", such as offices and parking lots. Do **NOT** downgrade the PPE specified in the THA and/or this HASP without review and approval from SH&E Manager.

#### Site Minimum PPE <sup>1</sup>

✓ Hard hat	✓ Safety-toe work boots
✓ Safety glasses with side shields (may be clear or shaded)	✓ Long pants
✓ Reflective Vest	✓ Shirt with sleeves (short or long – cover shoulders)

### 10.2 Additional Personal Protective Equipment Needed on Site

The following PPE is required by the host facility, task hazard assessment (THA), or prescribed upgrades in response to air monitoring response (action) levels.

#### Head / Ears (select all that apply)

<input type="checkbox"/> Climbing helmet	<input checked="" type="checkbox"/> Earplugs
<input type="checkbox"/> Hard hat with chin strap	<input type="checkbox"/> Over-ear hearing protection (i.e., muffs)
<input type="checkbox"/> Wide brimmed hard hat	<input type="checkbox"/> Dual hearing protection (earplugs <b>and</b> muffs)
<input type="checkbox"/> Insect net	<input type="checkbox"/> Other: <span style="color: red;">[specify]</span>

#### Face / Eyes (select all that apply)

<input type="checkbox"/> Spoggles (Safety glasses with foam liner for dust protection)	<input type="checkbox"/> Face shield (impact)
<input type="checkbox"/> Chemical goggles	<input type="checkbox"/> Face shield (splash)
<input type="checkbox"/> Welding mask/goggles	<input type="checkbox"/> Other: <span style="color: red;">[specify]</span>

<sup>1</sup> All PPE must meet applicable ANSI, ASTM, or MSHA standards as applicable.

### Hands (select all that apply)

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Abrasion, cut and/or puncture resistant | <input checked="" type="checkbox"/> <u>Chemical resistant:</u> |
| <input type="checkbox"/> Impact resistant                                   | <input checked="" type="checkbox"/> Nitrile                    |
| <input checked="" type="checkbox"/> Leather                                 | <input type="checkbox"/> PVC                                   |
| <input type="checkbox"/> Mechanics  | <input type="checkbox"/> Rubber/Latex                          |
| <input type="checkbox"/> Other: [specify]                                   | <input type="checkbox"/> Other: [specify]                      |

### Legs / Feet (select all that apply)

- |  |   |
|--|---|
| <input type="checkbox"/> High ankle boots                    | <input type="checkbox"/> Rubber boots                             |
| <input type="checkbox"/> Metatarsal guards                   | <input type="checkbox"/> Waders                                   |
| <input type="checkbox"/> Electrically resistant boots        | <input type="checkbox"/> Snake gaiters <b>or</b> chaps            |
| <input type="checkbox"/> Puncture-resistant boots or insoles | <input type="checkbox"/> Disposable boot covers <b>or</b> booties |
| <input type="checkbox"/> Other: [specify]                    |   |

### Body (select all that apply)

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Sunscreen                                  | <input type="checkbox"/> <u>Personal flotation device (PFD):</u>                                   |
| <input checked="" type="checkbox"/> Insect repellent with DEET                 | <input type="checkbox"/> Type I <input type="checkbox"/> Type II <input type="checkbox"/> Type III |
| <input type="checkbox"/> Permethrin applied to clothing                        | <input type="checkbox"/> Type V – Auto-inflate with Type II performance                            |
| <input type="checkbox"/> Disposable coveralls                                  | <input type="checkbox"/> Type V – Mustang Suit   |
| <input type="checkbox"/> <u>Flame Retardant Clothing (FRC):</u>                | <input type="checkbox"/> <u>Fall Protection:</u>   |
| <input type="checkbox"/> Rating: [specify]                                     | <input type="checkbox"/> Full body harness   |
| <input type="checkbox"/> Weight: [specify]                                     | <input type="checkbox"/> Single lanyard with self-locking D-ring                                   |
| <input type="checkbox"/> Rating and weight not specified by client or facility | <input type="checkbox"/> Double lanyard with self-locking D-rings                                  |
| <input checked="" type="checkbox"/> <u>High-visibility clothing:</u>           | <input type="checkbox"/> Self-retracting lifeline with self-locking D-ring                         |
| <input type="checkbox"/> ANSI Class II   | <input type="checkbox"/> Shock absorber  |
| <input type="checkbox"/> ANSI Class III  | <input type="checkbox"/> Lad-safe or similar device  |
| <input checked="" type="checkbox"/> Not specified by client or facility        | <input type="checkbox"/> Suspension trauma straps  |
| <input type="checkbox"/> Other: [specify]                                      | <input type="checkbox"/> Self-rescue kit   |
| <input type="checkbox"/> Other: [specify]                                      | <input type="checkbox"/> Other: [specify]  |

### Respiratory Protection (select all that apply)

- |  |  |                              |                               |
|--|--|------------------------------|-------------------------------|
| <input checked="" type="checkbox"/> <u>Air-Purifying Respirator (APR):</u> | <input type="checkbox"/> <u>Filtering Facepiece Respirator (FFR) - <b>Required Use</b></u> |                              |                               |
| <input checked="" type="checkbox"/> Full-Face                              | <input type="checkbox"/> N95   | <input type="checkbox"/> N99 | <input type="checkbox"/> N100 |
| <input type="checkbox"/> Half-Face   | <input type="checkbox"/> R95   | <input type="checkbox"/> R99 | <input type="checkbox"/> R100 |
| <input type="checkbox"/> Cartridge: [Specify]                              | <input type="checkbox"/> P95   | <input type="checkbox"/> P99 | <input type="checkbox"/> P100 |
| <input type="checkbox"/> <u>Supplied Air Respirator:</u>                   | <input type="checkbox"/> Other: [Specify]  |                              |                               |
| <input type="checkbox"/> Self-Contained Breathing Apparatus (SCBA)         | <input checked="" type="checkbox"/> <b>FFR / Face Covering / Face Mask – Voluntary Use</b> |                              |                               |
| <input type="checkbox"/> Air-Line Respirator                               |  |                              |                               |

**Equipment (select all that apply)**

<input type="checkbox"/> <u>Air and Noise Monitoring</u>	<input checked="" type="checkbox"/> <u>Weather, Heat and Cold Stress Monitoring:</u>
<input type="checkbox"/> Dosimeter	<input type="checkbox"/> Portable weather station <b>or</b> meter
<input checked="" type="checkbox"/> See Section 9.1 above	<input checked="" type="checkbox"/> Smart phone with weather app
<input type="checkbox"/> Other: [specify]	<input type="checkbox"/> Wet Bulb Globe Thermometer (WBGT)
<input type="checkbox"/> <u>Communication Beyond Cell Phones</u>	<input type="checkbox"/> Other: [specify]
<input type="checkbox"/> Portable, hand-held radio	<input type="checkbox"/> <u>Wildlife / Wilderness Survival:</u>
<input type="checkbox"/> Satellite phone	<input type="checkbox"/> Air horn
<input type="checkbox"/> Other: [specify]	<input type="checkbox"/> Bear spray
<input checked="" type="checkbox"/> <u>Traffic / Work Area Controls:</u>	<input type="checkbox"/> Emergency Rations
<input checked="" type="checkbox"/> See Section 11.1 below	<input type="checkbox"/> Emergency Shelter(s)
<input type="checkbox"/> Other: [specify]	<input type="checkbox"/> Other: [specify]
<input checked="" type="checkbox"/> <u>Fire Control / Protection:</u>	<input type="checkbox"/> Other:
<input checked="" type="checkbox"/> 5 lb. ABC, Qty = 1 (per AECOM Fleet Vehicles)	<input type="checkbox"/> [specify]
<input type="checkbox"/> 10 lb. ABC (min.), Qty = 1 (Subcontractor Drill Rig)	<input type="checkbox"/> [specify]
<input type="checkbox"/> [specify]	<input type="checkbox"/> [specify]
<input checked="" type="checkbox"/> <u>First Aid Kit(s):</u>	<input type="checkbox"/> [specify]
<input checked="" type="checkbox"/> Type III, Class A Qty=1]	<input type="checkbox"/> [specify]
<input type="checkbox"/> Type [?], Class [?], Qty= [#]	<input type="checkbox"/> [specify]

# 11. SITE CONTROL

The purpose of site control is to protect the public from inadvertently coming into contact with site hazards and to protect AECOM employees being impacted by hazards. This section details the equipment and actions needed to promote optimal site control.

## 11.1 Site Work Zones

Site layout and site control need to be coordinated to achieve a productive work environment and efficient work process while minimizing exposure of employees and the public to hazards associated with the work. Consider the following items when planning the site layout and controls:

- "Line of Fire" hazards- overhead utilities, falling/ tipping equipment, release of energy/ pressure, flying debris
- Noise, dust, odor suppression
- Contamination containment and decontamination area layout
- Traffic control for site vehicles/ equipment (public traffic control requires Traffic Control Plan)
- Restricted access for areas requiring special training, skills, or certifications
- Restriction of work near railroads
- Presence or creation of excavations
- Loading/unloading areas
- Portable restrooms
- Dumpsters and bins
- Equipment lay down
- Heavy equipment parking
- Overnight safety and security needs

Check the description of the site controls **already** in place:

☒ Work area is within a facility/property with secure and restricted access provided by client or third party

☐ Work area is enclosed within a facility/property, but access is not restricted via locks, guards, or gates

☐ Work area is on a property that is open, but access by the public is unlikely

☐ Work area is on a property that is open and access by the public is likely

☐ Work area is in a roadway or right of way of a roadway (Traffic Control Plan required [S3AM-306-PR](#))

☐ Work area is on or near railroad, including right of way, active lines and crossings

☐ Other: [Insert description]



Check and describe the site controls that need to be added to protect the public and the AECOM work team.

Control Item	Description of Type and Application
<input checked="" type="checkbox"/> Fence	Chain Linked Fence w/ Barbed Wire
<input type="checkbox"/> Locks	
<input type="checkbox"/> Barricades	
<input type="checkbox"/> Cones	
<input type="checkbox"/> Tape	
<input type="checkbox"/> Hole Covers	
<input type="checkbox"/> Other:	

## 11.2 Simultaneous and Neighboring Operations

Simultaneous and neighboring operations often present a need for added coordination and communication to address hazards that are presented by multiple operations.

### Simultaneous Operations – Within the Site

☒ Yes, see table below for details

☐ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)	
Electrical Substation	NYSEG	John Ruspantini	(585) 484-6787	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
				<input type="checkbox"/> Yes	<input type="checkbox"/> No
				<input type="checkbox"/> Yes	<input type="checkbox"/> No

### Simultaneous Operations – Neighboring Sites

☐ Yes, see table below for details

☒ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)	
				<input type="checkbox"/> Yes	<input type="checkbox"/> No
				<input type="checkbox"/> Yes	<input type="checkbox"/> No
				<input type="checkbox"/> Yes	<input type="checkbox"/> No

## 11.3 Site Control Map/Diagram

See Figure 11-1.

## 11.4 Site Security

All projects should be reviewed for the potential for personal security issues (e.g., assault, robbery, threat, etc.).

All facilities maintained by AECOM must maintain an Operational Security Plan (OSP) describing the conditions of the site or facility and identifying basic emergency response procedures. This requirement applies to field trailers maintained by AECOM for use on project sites. A blank OSP template is available in Global Resilience Group Standard [GRG-001-RP4](#). The OSP must be maintained by the Project Manager at the field trailer and a copy provided to the Global Resilience Group, which can be found on [Ecosystem](#).

## 11.5 Client and/or Host Facility-Specific Safety Requirements

The client and/or host facility have specified **no** additional health and safety requirements.

## 12. EMERGENCY RESPONSE

Any situation that has resulted or poses an imminent threat to persons, property and/or the environment constitute an emergency and require immediate action by the individual discovering and/or involved in the situation. Immediate actions start with the signaling of an emergency that is accompanied by a ceasing of site activities (i.e., Stop Work). When safe to do so, immediate actions will be taken to prevent an imminent risk from resulting in an incident and/or minimize the potential for an escalation in the severity of the incident. Immediate actions for reasonably credible emergency situations or scenarios are described within the following sections.

### 12.1 Communication – Method(s) of Signaling an Emergency

In addition to verbal communication amongst the field team, the following methods of communicating or signaling an emergency will be used:

☒ Cell Phone    ☐ Hand Signal    ☐ Radio (Channel No. **(Insert)**)    ☐ Satellite Phone

### 12.2 Muster and Shelter-in-Place Locations

In the event of an emergency situation or imminent threat persons, property and/or environment, workers will report to the appropriate muster and/or shelter-in-place location. Workers will remain at the muster or shelter-in-place location until a headcount is completed and any "all clear" is issued by the proper authority for the site unless it is unsafe to remain at that location.

**Primary Muster Location:** Site entry

**Secondary Muster Location:** Corner of N. Green St and Hulbert St.

**Shelter-in-Place Location:** Field Vehicle

### 12.3 Location of Emergency Equipment

Site personnel will be made aware of the location of emergency equipment that can aid in the response to an emergency situation or imminent threat to persons, property and/or the environment during the site orientation, daily toolbox safety meetings, and/or crew reviews.

Item(s)	Item Description	Location(s)
First Aid Kit(s)	Type III, Class A	• Field vehicle
Automated External Defibrillator(s)	Standard AED	• N/A
Fire Extinguisher(s)	ABC Powder 10 lb. ABC (minimum)	• Field/ Support Vehicles • Subcontractor Drill Rig

Item(s)	Item Description	Location(s)
Spill Kit(s)	Universal	• Subcontractor Drill Rig
Satellite Phone(s)	N/A	• N/A
Wildlife Deterrent(s)	• N/A	• N/A
Emergency Shelter(s)	N/A	• N/A
Emergency Rations	N/A	• N/A
Personal Locating Device(s)	N/A	• N/A
Thermal Protective Aids	N/A	• N/A

## 12.4 Emergency Responders and Resources

In the event of a **life-threatening or critical emergency**, AECOM employees should immediately engage emergency responders and/or resources, as appropriate, to the type of emergency. Steps should be taken to meet and escort emergency responders and/or resources to location of the emergency whenever possible.

### Emergency Responders

Site Resource(s):	John Ruspantini	(585) 484-6787
Fire:	Auburn Fire Department	EMERGENCY: 911 NON-EMERGENCY: (315) 253-4031
Medical Transport:	Land: Ambulance	911
	Air: N/A	N/A
	Water: N/A	N/A
Police:	Auburn Police Department	EMERGENCY: 911 NON-EMERGENCY: (315) 253-3231
Poison Control:	Poison Control Center	800-222-1222
Pollution Emergency:	NYSDEC Spill Hotline	800-457-7362
INFO TRAC:	(AECOM's Account Number: 74984)	800-535-5053

### Utility and Pipeline Owners (For utility and pipeline related emergencies only)

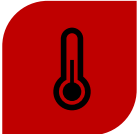







Utility/Pipeline Name	Provider/Facility Owner	Contact No.
Cable	Spectrum	(833) 750-0562
Electric	NYSEG	800-743-1701
Natural Gas	NYSEG	800-743-1702
Phone	Verizon	
Water	City of Auburn Public Works	(315) 253-9554
Sewer		

**Utility and Pipeline Owners (For utility and pipeline related emergencies only)**

Utility/Pipeline Name	Provider/Facility Owner	Contact No.
Call Before You Dig	(Utility One-Call Locating)	811

## 12.5 Fitness for Duty and Illness Reporting During the Pandemic

AECOM employees should always live our life-preserving principle of "Fitness for Duty", which requires employees to stay home from work when they are sick, as they are not "Fit for Duty" when ill. During times of pandemic, the importance of this step is increased. If you experience signs/symptoms of illness (see images below) or find out that you have come into contact with a person who has been confirmed positive with the Coronavirus, notify the site supervisor and the project manager, your Area, Regional, or Business Line SH&E Manager, and go home and/or stay home. Notify the AECOM Incident Reporting Hotline (**1-800-348-5046**) and/or the AECOM Nurse Line (**1-512-419-5016**). Managers will work with the local SH&E and/or Resiliency teams to respond according to the AECOM Pandemic Procedure: [SR1-003-PR2](#).

			
FEVER	TIREDNESS, CONFUSION	DRY COUGH	SHORTNESS OF BREATH
			
NASAL CONGESTION, SORE THROAT OR RUNNY NOSE	BLUE LIPS OR FACE	PERSISTENT PAIN OR PRESSURE IN THE CHEST	IF ANY OF THESE SYMPTOMS ARE IDENTIFIED, SEEK MEDICAL ATTENTION!

## 13. NOTIFICATIONS AND REPORTING

**NOTE! In the event of a life threatening emergency, call 911 FIRST. A life threatening emergency can include:**

- Loss of consciousness
- Seizures
- Uncontrolled loss of blood
- Heat Stroke
- Head or spinal cord injury
- Severe allergic reaction
- Abdominal trauma
- Difficulty breathing
- Cardiac arrest
- Broken bones

Once immediate actions have been taken, if safe to do so, notifications (verbal) and reporting (written) must be immediately completed. Notifications serve to engage additional resources in the management of the emergency and initiate additional processes such as medical case management, spill response, incident investigation, etc. Reporting initiates the formal documentation process and supports the development of key learnings to prevent a reoccurrence.

### 13.1 Initial Notifications

The person observing and/or involved with the emergency or incident is required to make the following initial notifications as soon as reasonably possible:

#### Call #1 – AECOM Site Supervisor or Site Safety Officer

Role	Person Assigned to Role	Contact No. <sup>Primary</sup>	Contact No. <sup>Alt.</sup>
<b>Primary Site Supervisor:</b>	Sean Connelly	M (716) 393-0870	D (716) 923-1103
<b>If unavailable,</b>			
<b>Alternate Site Supervisor:</b>	Rob Murphy, PG	M (716) 903-1346	D (716) 923-1176
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

#### Call #2 – DCS Americas Incident Reporting Hotline

**1-800-348-5046**

DIRECT TOLL-FREE

Hours of Operation: 24 Hours/Day; 7 Days/Week

*For injuries and illnesses, you should be transferred by the hotline to the AECOM Occupational Nurse:*

**AECOM Occupational Nurse**

**1-512-419-5016**

DIRECT

Hours of Operation: 24 Hours/Day; 7 Days/Week

### Call #3 – Affected Employee’s Direct Supervisor

Employees are encouraged to program their direct supervisor’s phone numbers into their cell phone.

### Call #4 – Vehicle Management or Insurance Provider (*Vehicle Motor Vehicle Accidents Only*)

Employees involved in motor vehicle accidents or who have discovered property damage caused to motor vehicles should call the appropriate party:

#### **ARI Fleet Management (*Fleet vehicles only*)**

**1-800-422-7647**

DIRECT TOLL-FREE

Hours of Operation: 24 Hours/Day; 7 Days/Week

#### **Rental Company (*Rental vehicles only*)**

**Refer to your rental agreement for contact numbers and hours of operation**

#### **Personal Insurance Provider (*Personal vehicles used for business travel only*)**

**Refer to your personal insurance policy for contact numbers and hours of operation**

## 13.2 Client-Specific Notifications

Role	Person Assigned to Role	Contact No. <sup>Primary</sup>	Contact No. <sup>Alt.</sup>
<b>Primary Client Contact Person:</b>	John Ruspantini	D (585) 484-6787	M (607) 725-3801
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

## 13.3 Additional Internal AECOM Notifications

The AECOM Site Supervisor will make the following additional internal notifications. If the AECOM Site Supervisor cannot be reached or is not capable of making the notifications, the notifications will be made by an alternate AECOM Site Supervisor or AECOM Site Safety Officer.

### 13.3.1 AECOM Project Management

Role	Person Assigned to Role	Contact No. <sup>Primary</sup>	Contact No. <sup>Alt.</sup>
<b>AECOM Project Manager:</b>	James L. Kaczor, PG	M (716) 866-0522	D (716) 923-1300
<b>If unavailable, AECOM Project Mgr. Alternate:</b>	Tamara Raby, PG	M 716-870-3446	D 716-923-1113
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

The Project Manager will perform any additional internal notification requirements based on the requirements of their region, business line, or client account.

### 13.3.2 AECOM Safety, Health and Environment (SH&E) Management

Role	Person Assigned to Role	Contact No. <sup>Primary</sup>	Contact No. <sup>Alt.</sup>
<b>Area SH&amp;E Manager:</b>	Pete Wray, CSP, CHMM, STS	M (302) 660-9178	M (302) 318-2880
<b>If unavailable, Regional SH&amp;E Manager:</b>	Candice Johnson	M 416-407-9661	
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

## 13.4 Subcontractor and/or Third-Party Contacts

The following subcontractor(s) and/or third parties are involved with field activities at the site under a contractual relationship with AECOM, a contractual relationship with an AECOM subcontractor, or as part of a separate, but collaborative effort on behalf of the client.

For emergencies affecting subcontractors and/or third-parties, the AECOM Site Supervisor, or PM for projects without full-time AECOM presence, should ensure that Subcontractor personnel follow their own internal incident reporting processes.

### 13.4.1 Soil Boring/ Monitoring Installation Subcontractor (Nothnagle Drilling)

Select One: ☒ AECOM SUB ☐ SUB OF AECOM SUB ☐ CLIENT DIRECT HIRE SUB ☐ THIRD PARTY

Role	Person Assigned to Role	Contact No. <sup>Primary</sup>	Contact No. <sup>Alt.</sup>
<b>Primary Contact Person:</b>	Stephen A. DiLaura ,CWD	D (585) 838-2328	NA
<b>If unavailable, Alternate Contact Person #1:</b>	Zachary Nothnagle	D (585) 538-2328	NA
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

### 13.4.2 Biosparging/Injection Subcontractor (TBD)

Select One: ☒ AECOM SUB ☐ SUB OF AECOM SUB ☐ CLIENT DIRECT HIRE SUB ☐ THIRD PARTY

Role	Person Assigned to Role	Contact No. <sup>Primary</sup>	Contact No. <sup>Alt.</sup>
<b>Primary Contact Person:</b>	[TBD]	? [Required]	? [Recommended]
<b>If unavailable, Alternate Contact Person #1:</b>	[TBD]	? [Required]	? [Recommended]
<b>If unavailable, Alternate Contact Person #2:</b>	[TBD]	? [Recommended]	? [Recommended]



Select One: ☒ AECOM SUB ☐ SUB OF AECOM SUB ☐ CLIENT DIRECT HIRE SUB ☐ THIRD PARTY

Role	Person Assigned to Role	Contact No. <sup>Primary</sup>	Contact No. <sup>Alt.</sup>
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

### 13.4.3 Investigation Derived Waste Management Subcontractor (TBD)

Select One: ☒ AECOM SUB ☐ SUB OF AECOM SUB ☐ CLIENT DIRECT HIRE SUB ☐ THIRD PARTY

Role	Person Assigned to Role	Contact No. <sup>Primary</sup>	Contact No. <sup>Alt.</sup>
<b>Primary Contact Person:</b>	[TBD]	? [Required]	? [Recommended]
<b>If unavailable,</b> <b>Alternate Contact Person #1:</b>	[TBD]	? [Required]	? [Recommended]
<b>If unavailable,</b> <b>Alternate Contact Person #2:</b>	[TBD]	? [Recommended]	? [Recommended]
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

## 13.5 Internal Reporting

### 13.5.1 Incident and Near Miss Reporting

All incidents and near misses (i.e., incidents without consequences), regardless of type and perceived severity, must be reported within **IndustrySafe** (AECOM's SH&E Database) within the timeframes listed below:

Incident Type	IndustrySafe Reporting Timeframe
<b>Significant Incident, including any injury to an AECOM employee or Subcontractor</b>	Within <b>4 hours</b>
<b>All Other Incidents</b>	Within <b>24 Hours</b>
<b>Note: Only the basic facts, who, what, when, where and how, are needed to complete the initial IndustrySafe report. SH&amp;E Managers will assist you in updating the report as additional information becomes available.</b>	

Significant incidents include:

- Fatality;
- Amputation;
- Hospitalization for treatment for more than 24 hours (admission);
- Any single event resulting in more than one employee requiring medical treatment or more than one employee being away from work for more than 3 days;
- Any SH&E-related Consent Agreement/Order/Lawsuit or enforcement action seeking more than \$10,000 or alleging criminal activity;
- Any spill or release of a hazardous material that is reportable to a regulatory agency;

- Any Notices of Violation resulting from not operating within a regulatory agency permit/license or consent;
- Any incident resulting in property damage expected to exceed \$10,000 United States dollars (USD);
- Any security-related incident that could have caused significant harm to an AECOM employee; and/or
- Any near miss event that may have resulted in any of the above consequences, but because of "luck" did not result in harm to persons, property or the environment.

Other incidents include:

- Any injury or illness to an AECOM employee or subcontractor, even if it does not require medical attention, including non-work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public or client representative occurring on an AECOM-controlled work site;
- Re-occurring conditions such as back pain or cumulative trauma disorders (e.g., carpal tunnel syndrome);
- Fire, explosion or flash that is not an intended result of a planned event (e.g., remediation process, laboratory procedure);
- Any incident involving company-owned, rented or leased vehicles (including personal vehicles used for company business); and/or
- Any failure to comply with requirements of a regulatory permit issued to AECOM.

## 13.5.2 Safety Observation Reporting

All safety observations must be reported within **IndustrySafe™** or **Lifeguard™** (AECOM's SH&E Databases), as dictated by the AECOM Project Manager, in a timely manner. It is recommended that safety observations are reported within 7 to 14 days of the observation.

## 13.5.3 SH&E Database Access

Incidents, near misses, and audits/inspections must be entered into **IndustrySafe™**, which is one of AECOM's SH&E Databases. Safety observations may also be entered into **IndustrySafe™** at the AECOM Project Manager's discretion. **IndustrySafe™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. IndustrySafe may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.



↑ Incidents, Near Misses, Audits/Inspections and Safety Observations ↑

Safety observations may also be entered into **Lifeguard™**, which is one of AECOM's SH&E Databases, at the AECOM Project Manager's discretion. **Lifeguard™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. **Lifeguard™** may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.



↑ Safety Observations



## 13.5.4 Reporting Assistance

If your field schedule, access to internet, and/or limited cellular phone coverage have the potential to impact timely incident, near miss, and/or safety observation reporting, please contact your AECOM Project Manager and/or SH&E Manager for assistance.

## 14. RESPONSE PLANS: REASONABLE CREDIBLE EMERGENCY SCENARIOS

Based on site history, operations, and setting along with the approved scope of work, the following emergency scenarios have been determined to be reasonably credible to occur. Immediate actions and post-emergency follow-up actions, when applicable, are discussed below for each reasonably credible emergency scenario.

### 14.1 Injuries and Illnesses

#### 14.1.1 Immediate Actions

##### 14.1.1.1 Engage Medical Resources

In the event of a **life-threatening or critical emergency**, AECOM employees should **dial 911 or the site-specific number** for the emergency responder and follow the recommended instructions. After dialing 911 or the site-specific number and in **less serious situations**, an injured employee or a co-worker should contact the **Incident Hotline at 1-800-348-5046** to ensure that the employee receives the best care at the best time (i.e., within the first hour following an injury or potential injury). By contacting the Incident Hotline, the worker can be connected with AECOM's nurses for first aid advice. If recommended by the nurse, the supervisor or a co-worker should drive the injured employee to the project-designated clinic or hospital.

##### 14.1.1.2 Care for the Injured or Ill Person(s)

Employees trained in first aid, CPR and/or Automated External Defibrillators (AED) should render initial care in a manner consistent with their training. This care should be provided until the injury or illness is resolved (i.e., first aid cases) or transportation to the appropriate medical facility is arranged and present on the site (i.e., treatment beyond first aid incidents).

##### First Aid, CPR and AED Trained Personnel

Name	Company	Contact No.	1 <sup>st</sup> Aid	CPR	AED
Sean Connelly	AECOM	(716) 393-0870	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
[Add Additional Rows]	[If needed]		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

##### 14.1.1.3 Transport to Nearest Medical Facility for Treatment

For injuries and illnesses that require treatment beyond first aid, the injured/ill person(s) shall be transported to the nearest medical facility for treatment. For life-threatening or critical emergencies, Emergency Medical Services (EMS) should handle the transport. EMS will determine the hospital to which the injured/ill person(s) will be transported. The AECOM Field Supervisor and/or Site Safety Officer shall confirm with EMS the final destination of the injured/ill

persons. The nearest hospital equipped for emergency medical care, driving directions and map are provided in **Attachment A**.

For less serious situations, the AECOM Site Supervisor, AECOM Site Safety Officer (SSO) and/or their designee shall transport and accompany the injured/ill person(s) to the nearest Occupational Clinic (preferred) or hospital, if an occupational clinic is not available, not within a reasonable driving distance, or cannot be reached during their hours of operation. The nearest occupational clinic, driving directions and map are provided in **Attachment A**.

#### **14.1.1.4 Engage AECOM Occupational Nurse with Medical Treatment Provider**

The AECOM Site Supervisor, AECOM SSO or their designee who is accompanying the injured/ill person(s) to the medical treatment facility shall notify the AECOM Occupational Nurse of the situation, communicate the destination of the injured/ill person(s) and assist the nurse in connecting with the medical treatment provider to facilitate medical case management.

### **14.1.2 Follow-Up Actions**

Outside of notifications and reporting, the AECOM Site Supervisor, AECOM SSO or their designee shall coordinate the post-treatment transportation of injured/ill person(s).

## **14.2 Motor Vehicle Breakdowns and Flat Tires**

If safe to do so, remove the car from the traveled way. To the extent possible, AECOM personnel should **NOT** change flat tires or perform similar repairs.

- For rental vehicles, contact the rental company
- For fleet vehicles, contact **ARI Fleet Management: 1-800-422-7647**
  - **Prompt 1 – Roadside Assistance**
  - **Prompt 3 – Maintenance Management**
- For personal vehicles used on AECOM business, contact an emergency provider.

## **14.3 Motor Vehicle Collisions**

All vehicles should be rented through Carson Wagonlit Travel (accessible via Ecosystem) to ensure that AECOM insurance is included in the rental rate. All other insurances should be declined. AECOM's rental vehicle insurance policy for National/Enterprise or Avis can be found on the DCS Americas [United States](#) or [Canada](#) travel pages.

**Drivers MUST print and carry the applicable insurance policy for the rental. For company owned vehicles, drivers MUST also print and carry proof of insurance.**

### **14.3.1 Immediate Actions (Recommended Responses)**

- Assess the situation and move all occupants (except the injured) out of further harm's way.
- If safe to do so, remove the car from the traveled way.

- Call 911, if necessary
  - If appropriate, wait for police to arrive before moving vehicles.
- Provide insurance information to other drivers if necessary or requested and collect the same:
  - Driver's Information:
    - Name and contact number
    - Driver's license number, expiration date and issuing state/province
    - Insurance policy number, carrier/provider and provider's contact number
  - Vehicle Information:
    - Make, model and year
    - License plate/tag number and issuing state/province
    - Owner's name, address and contact number
  - Passenger's Information:
    - Name and contact number
  - Witness Information:
    - Name and contact number
- If possible, obtain names and phone numbers of witnesses.
- Sketch the accident scene and/or take photographs of the scene, if possible and **safe to do so**.
- Take photographs of the damage to vehicles and property, if possible and **safe to do so**.
- If police are **NOT** on scene, file an accident report at the local police station.

**NOTE: DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE, OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.**

## 14.3.2 Follow-Up Actions

### 14.3.2.1 Police Report

- If the police were **NOT** on scene, file an accident report at the local police station.
- Include a copy of the police report with the IndustrySafe report (upload report to IndustrySafe).

### 14.3.2.2 Drug and Alcohol (D&A) Testing

Driver's that may have caused or contributed to motor vehicle collisions resulting in \$2,500 U.S. Dollars (USD) or more in damage to individuals, vehicles and/or property shall undergo drug and alcohol testing. The AECOM Site Supervisor, AECOM SSO or designee shall:

- Contact Lindsay Scammell at **1-804-515-8552** to coordinate the drug and alcohol testing;
- Accompany and transport the driver to and from the D&A testing facility; and

- Coordinate transportation for the driver pending the results of the D&A testing.

## 14.4 Environmental Spills/Releases

AECOM employees are not expected to take action or to participate in rescues or responses to chemical releases (including of petroleum products) beyond the initial discovery of the release and immediate mitigation actions such as closing a valve, placing absorbents, and notifying the client and or public emergency response system (911), unless there is a contractual provision for this response and specially trained employees.

### 14.4.1 Immediate Actions – Reportable Quantity Regulatory Agency Notifications

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the Reportable Quantity or not, will be reported according to the incident reporting procedure. In determining whether a spill or release must be reported to a regulatory agency, the Site Supervisor or qualified worker will assess the quantity of the spill or release and evaluate the reporting criteria against the state-specific reporting requirements, applicable regulatory permit, and/or client-specific reporting procedures. **If reporting to a US state or Federal regulatory agency is required, AECOM has 15 minutes from the time of the spill/release to officially report it. In Canada, spills notification varies by Province. Employees should review the local regulatory requirement, document it in this plan and communicate it to all personnel.**

Chemical-specific United States (U.S.) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantities for the known chemicals onsite are shown in the table below.

Hazardous Substance	Regulatory Synonyms	Final RQ (lbs.)
1,1,1-Trichloroethane	TCA	1,000
Arsenic	N/A	1
Benzene	N/A	10
Cadmium	N/A	10
Carbon Tetrachloride	N/A	10
Chromium	N/A	5,000
Ethyl Benzene	N/A	1,000
Lead	N/A	10
Mercury	N/A	1
Methyl Ethyl Ketone	MEK	5,000
Nickel	N/A	100
Pentachlorophenol	PCP	10
Selenium	N/A	100
Tetrachloroethylene	Perchloroethylene, PCE	100
Toluene	N/A	1,000
Trichloroethylene	Trichloroethene, TCE	100
Xylene	N/A	100

CERCLA RQ's can be found at: <http://www.epa.gov/oem/docs/er/302table01.pdf>

### ***NYSDEC Petroleum Spill Requirements***

All petroleum spills that occur at the site must be reported to the NYSDEC Spill Hotline (1-800-457-7362) within 2 hours of discovery, except spills which meet all of the following criteria:

- The quantity is known to be less than 5 gallons; and
- The spill is contained and under the control of the spiller; and
- The spill has not and will not reach the State's water or any land; and
- The spill is cleaned up within 2 hours of discovery.

A spill is considered to have not impacted land if it occurs on a paved surface such as asphalt or concrete. A spill in a dirt or gravel parking lot is considered to have impacted land and is reportable.

NYSDEC's Spill Regulations/Guidelines can be found at: <https://www.dec.ny.gov/chemical/8692.html>.

The spill containment program addresses the following site-specific information:

- Potential hazardous substance spills and available controls;
- Initial notification and response;
- Spill evaluation and response; and
- Post-spill evaluation.

## **14.4.2 Immediate Actions – Spill Evaluation and Response**

The Field Lead/Site Supervisor and/or SSO are responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area is isolated and demarcated to the extent possible. When an incidental release occurs, clean-up personnel receive instructions in a pre-clean-up meeting as to spill conditions, PPE, response activities, decontamination, and waste handling.

The procedures of the Emergency Response section of this HASP are immediately implemented when the spill is determined to require emergency precautions and action, if necessary, to protect those outside the clean-up area, notification of the appropriate authorities is made. The table in Section 14.4.1 lists the spill conditions that trigger notification of Federal, state, and local agencies.

The following are general measures that response/clean-up personnel take when responding to a spill:

- To minimize the potential for a hazardous spill, hazardous substances, control/absorbent media, drums and containers, and other contaminated materials are properly stored and labeled.
- When a spill occurs, only those persons involved in overseeing or performing spill containment operations will be allowed within the designated hazard areas. If necessary, the area will be roped or otherwise blocked off. Unauthorized personnel are kept clear of the spill area.
- Appropriate PPE is donned before entering the spill area.
- Appropriate spill control measures are applied during spill response.



- Whenever possible without endangerment of personnel, the spill is stopped at the source or as close to the source as possible.
- Ignition points are removed if fire or explosion hazards exist.
- Surrounding reactive materials are removed.
- Drains or drainage in the spill area are blocked or surrounded by berms to exclude the spilled waste and any materials applied to it.
- Provisions are made to contain and recover a neutralizing solution, if used.
- Small spills or leaks from a drum, tank or pipe will be evacuate an appropriate distance in all directions to allow clean-up and to prevent employee exposure.
- For small spills, sorbent materials such as sand, sawdust, or commercial sorbents are placed directly on the spill to prevent further spreading and aid in recovery.
- Spill area sprayed with appropriate foam where the possibility of volatile emissions exists.
- If the spill results in the formation of a toxic vapor cloud, from vaporization, reaction with surrounding materials, or the outbreak of fire, further evacuation may be required.
- To dispose of spill waste, all contaminated sorbents, liquid waste, or other spill clean-up will be placed in small quantities in approved drums for proper storage or disposal as hazardous waste. The weight of the drums shall not exceed the chemical-specific weight listed in the table above.

### 14.4.3 Post Spill Evaluation

As part of the incident investigation and reporting documentation, a written spill response report shall be prepared at the conclusion of clean-up operations. The report will include, at a minimum, the following information:

- Date of spill incident;
- Cause of incident;
- Spill response actions;
- Any outside agencies involved, including their incident reports; and
- Lessons learned or suggested improvements.

The spill area is inspected to ensure the area has been satisfactorily cleaned. The use of surface and air sampling is utilized in this determination, as necessary. The root cause of the spill shall be examined, and corrective steps taken to ensure the engineering and control measures in place have performed, as required. If alternative precautions or measures are needed, they are made available and implemented.

All durable equipment placed into use during clean-up activities is decontaminated for future utilization. All spill response equipment and supplies are re-stocked as required.

## 14.5 Fire

AECOM employees are not expected to attempt to put out fires. Stop work; notify all AECOM personnel, move upwind and contact 911 and/or emergency response at the site. If employees have been properly trained in the

operation of a fire extinguisher, they may attempt to put out a small fire, provided that the following conditions are met:

- The fire must be small (i.e., smaller than a trash can) and in its early stages;
- The employee must have an escape route;
- The employee must be trained and know they have the right type of extinguisher;
- The employee must be safe from toxic gases; and
- There must be no hazardous conditions that could quickly accelerate the fire (i.e., presence of chemicals, especially dry grass, etc.).

Above all, if in doubt, the employee must **NOT** attempt to fight the fire.

## 14.6 Environmental Impacts

AECOM strives to avoid or control environmental impacts from our operations through planning and implementation of best practices as well as preparing responses to react to environmental incidents. Environmental Compliance procedure S3AM-204-PR provides details on permitting and planning requirements.

AECOM will take the appropriate steps to mitigate environmental impacts by implementing the controls listed above and addressing any spills or fires as outlined in Sections 14.4 and 14.5, respectively.

## 14.7 Inclement Weather

Inclement weather includes but is not limited to heavy rain or storms and associated floods, heavy winds, lightning, snowstorms and blizzards, and sandstorms and haboobs. Weather conditions which are normal or expected can cause hazards, such as cold weather in winter or excessive heat in the summer. The best approach to preventing exposure to these hazards is project planning. Where possible, plan to perform work at seasonably appropriate times of the year. Starting several days to a week prior to field work, begin reviewing projected weather forecasts to determine if work should be delayed, or accelerated, to avoid days with higher chances of inclement weather. Weather conditions can change rapidly. Therefore, field personnel and the project managers should be prepared to utilize Stop Work Authority if uncontrolled hazardous situations develop. Additional precautionary measures for reasonably foreseeable weather conditions are provided below.

### 14.7.1 Ambient Temperature (Heat and Cold)

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. Where possible, plan work to avoid the hottest (or coldest) part of the day. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. Use vehicles or covered area for shelter and take breaks as needed.

#### 14.7.1.1 Hot Weather

In hot weather and/or work area conditions, keep hydrated, prevent over exposure to the sun with clothing or use of sun cream and take frequent breaks out of the sun. Use the “buddy system” to monitor effects of heat stress as it

can be difficult to identify the impacts of heat in yourself. Create shaded work areas if appropriate. Use a strong sunscreen and wear a full-brimmed hat when in the sun to protect the back of the neck and shoulders. Refer to SH&E Procedure [S3AM-113-PR1](#), Heat Stress, for more information.

#### **14.7.1.2 Cold Weather**

In cold/wet weather and/or work area conditions, be aware of potentially slippery surfaces (wet or icy). Wear boots with good tread and carefully select your walking path to eliminate or reduce the need to traverse wet or icy surfaces. Wear warm / waterproof clothing and take breaks in a warm location. If heavy snows or icy weather are anticipated, consider your driving route prior to leaving for the site or returning at the end of the day. It may be necessary to stop work earlier in the day to allow time to return to lodging if road conditions are at risk of deteriorating. Refer to SH&E Procedure [S3AM-112-PR1](#), Cold Stress, for more information.

### **14.7.2 Storms**

Heavy or unexpected storms, whether they be rain, snow, or wind, represent a changed condition in which multiple hazards could be present. Stormy weather increases hazards at the job site by making travel more treacherous, both on foot and in vehicles. Visibility can be reduced. Manual tasks become more difficult as conditions worsen, increasing the chances of injury. Mental states may deteriorate increasing the risks of hazards attributable to frustration or exhaustion. Other hazards may exist; for example, winds could cause objects to blow away or strike workers or equipment or blow dust or debris into eyes. For these reasons, be aware of changing weather conditions and be prepared to stop-work to secure the project site and depart prior to storms whenever possible. If storms suddenly develop, remember that the loss of equipment or materials is far preferable to taking risks of injury by attempting to demobilize when storms are active.

### **14.7.3 Lightning**

One of the most serious weather threats is lightning. A two-tier notification system consisting of alerts and stand downs shall be used to allow ample time for field teams to cease their activities, secure the work area, and seek shelter.

#### **14.7.3.1 Immediate Actions – Alerts and Stand Downs**

Alerts are issued by AECOM Site Supervisor and/or AECOM Site Safety Office when inclement weather, including lightning is detected within 50 miles (80 km) of the site. Alerts indicate that work crews should be prepared to cease all field activities and secure the work area. Stand Downs are issued by AECOM Site Supervisor and/or AECOM Site Safety Officer when inclement weather is detected within 30 miles (50 km) of the work area. Stand downs indicate that all work crews shall immediately cease all field activities and seek shelter. Stand downs remain in effect until the inclement weather has passed. For thunderstorms, the stand down will remain in effect for a minimum of 30 minutes following the last detection of lightning.

#### **14.7.3.2 Immediate Actions - Guidance for Lightning**

**Go Indoors:** Remember the phrase, "**When thunder roars, go indoors.**" If you see lightning and cannot count to 30 before hearing thunder, the lightning is too close for comfort. Find a safe, enclosed shelter when you hear thunder. Safe shelters include homes, offices, shopping centers, and hard-top vehicles with the windows rolled up.

**Crouch Close to the Ground and Separate:** If you are caught in an open area, crouch down in a ball-like position (**feet and knees together**) with your head tucked and hands over your ears so that you are down low with minimal contact with the ground. **Do NOT lie down.** Lightning causes electric currents along the top of the ground that can be deadly over 100 feet away. Crouching down is the best combination of being low and touching the ground as little as possible.

**Separate:** If you are in a group during a thunderstorm, separate from each other. This separation will reduce the number of injuries if lightning strikes the ground.

If a person is struck by lightning:

- Call 911 or other Emergency Services Contact.
- Assess the scene to ensure that continuing risk to rescuers does not exist if lightning strikes. For other electrical-related emergencies (non-lightning), ensure the source of electricity has been deenergized.
- Check to see if the victim is breathing and proceed with CPR if victim is not breathing.

## 15. PERSONAL ACKNOWLEDGEMENT AND DISCLAIMER

By signing below, the undersigned acknowledges that he/she has reviewed the AECOM Health and Safety Plan for the **Auburn Green Street Former MGP** site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work and will comply with the provisions contained therein. The employee understands that they are **NOT** to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the employee understands to notify the Site Supervisor and the **Incident Hotline at 800-348-5046** for any incident, ***including ANY injury even if no first aid or medical treatment is required.***

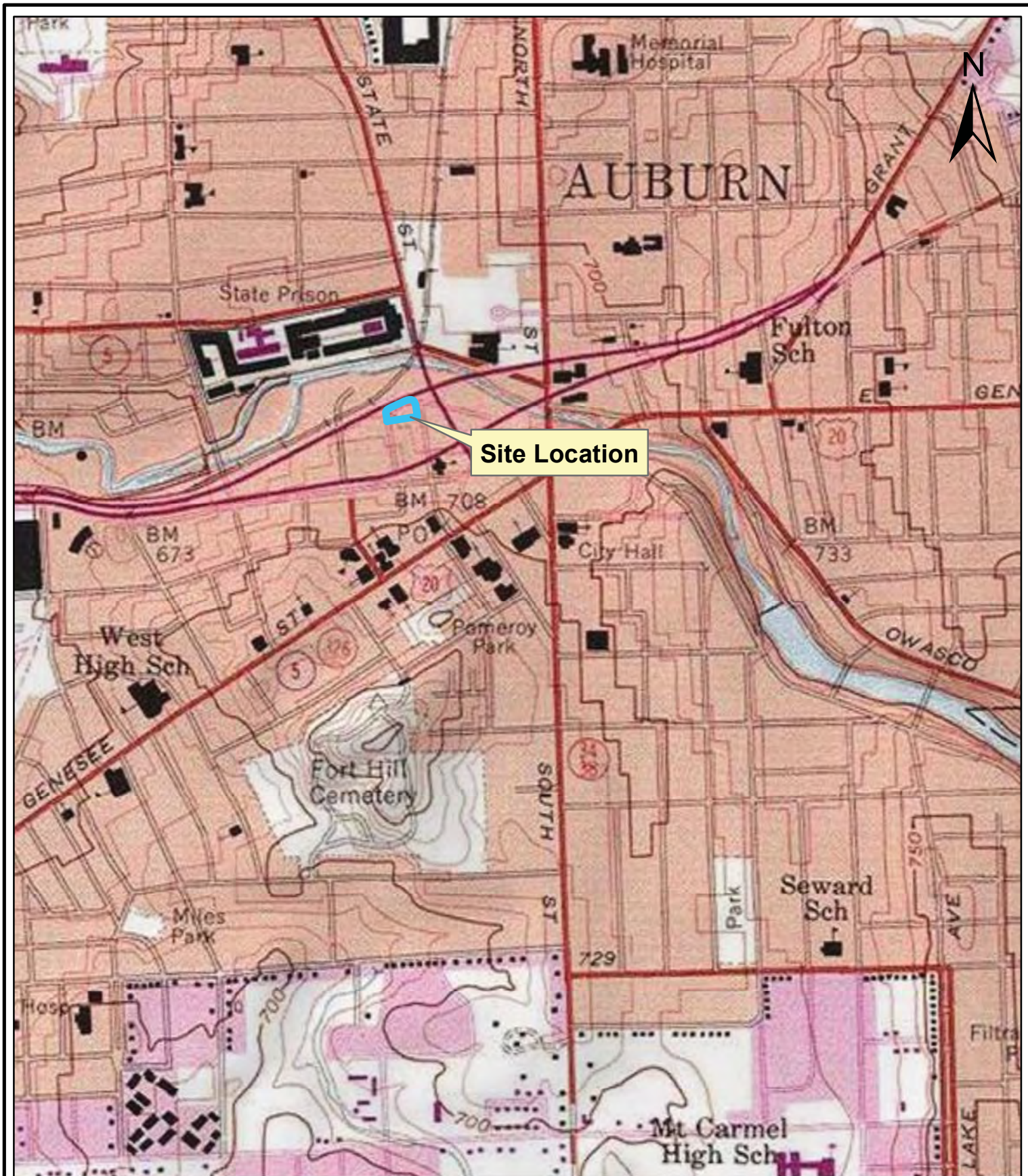
Print Name	Signature	Organization	Date

### 15.1 Disclaimer


This HASP, and each of its provisions, is applicable only to, and for use only by, AECOM, its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third-party contractors on industrial sites or projects where AECOM is providing engineering, construction management, or similar services, without the express written permission of AECOM, will be at that party's sole risk, and AECOM Corporation shall have no responsibility. The existence and use of this Plan by AECOM shall not be deemed an admission or evidence of any acceptance of any safety responsibility by AECOM for other parties unless such responsibility is expressly assumed in writing by AECOM in a specific project contract.

# FIGURES





# Legend

 Approximate Site Boundary

0 700 1,400 2,800 Feet



Former Auburn Green Street MGP Site  
Green Street  
Auburn, Cayuga County, New York

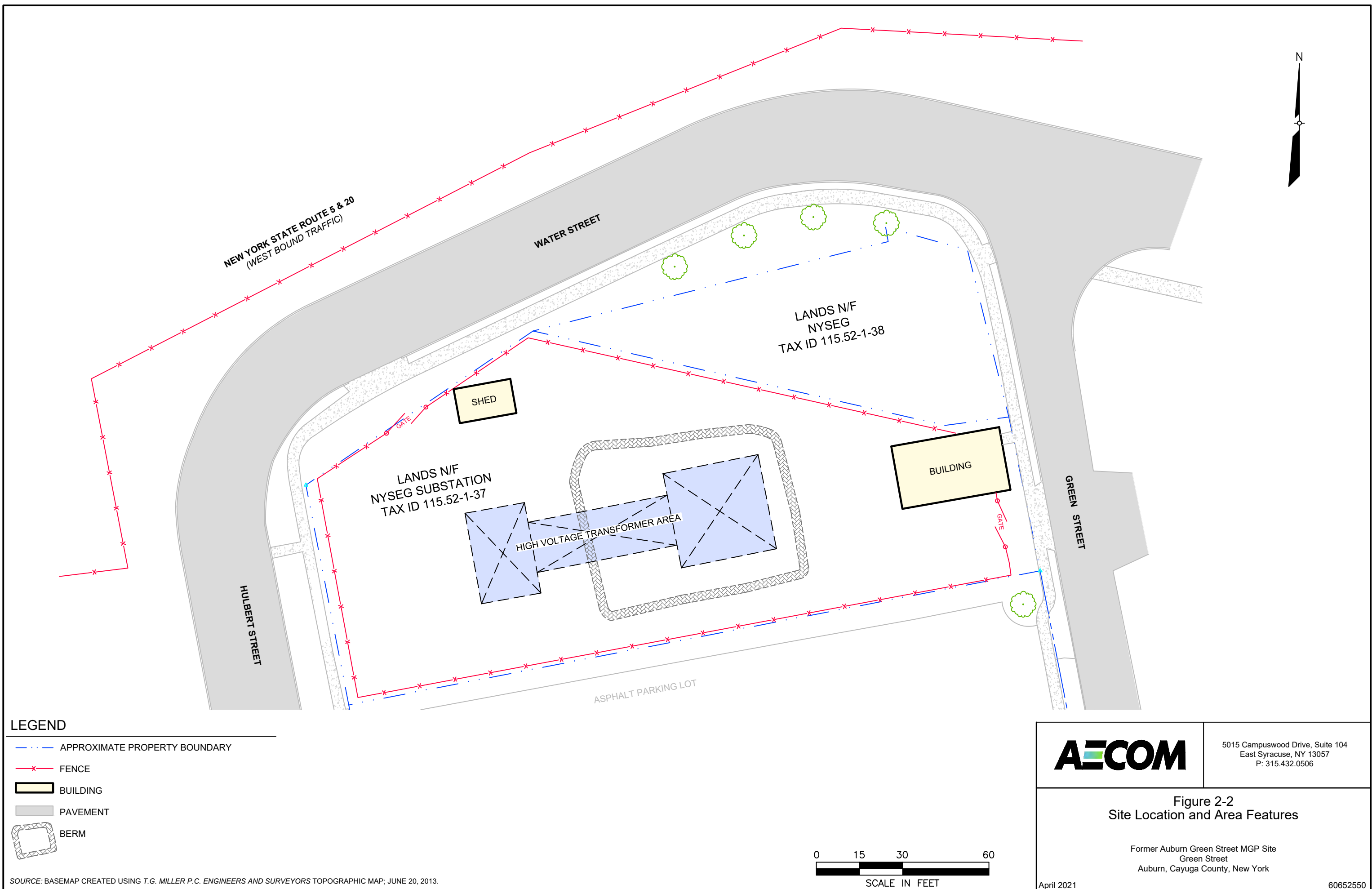
Figure 2-1

Site Location Map

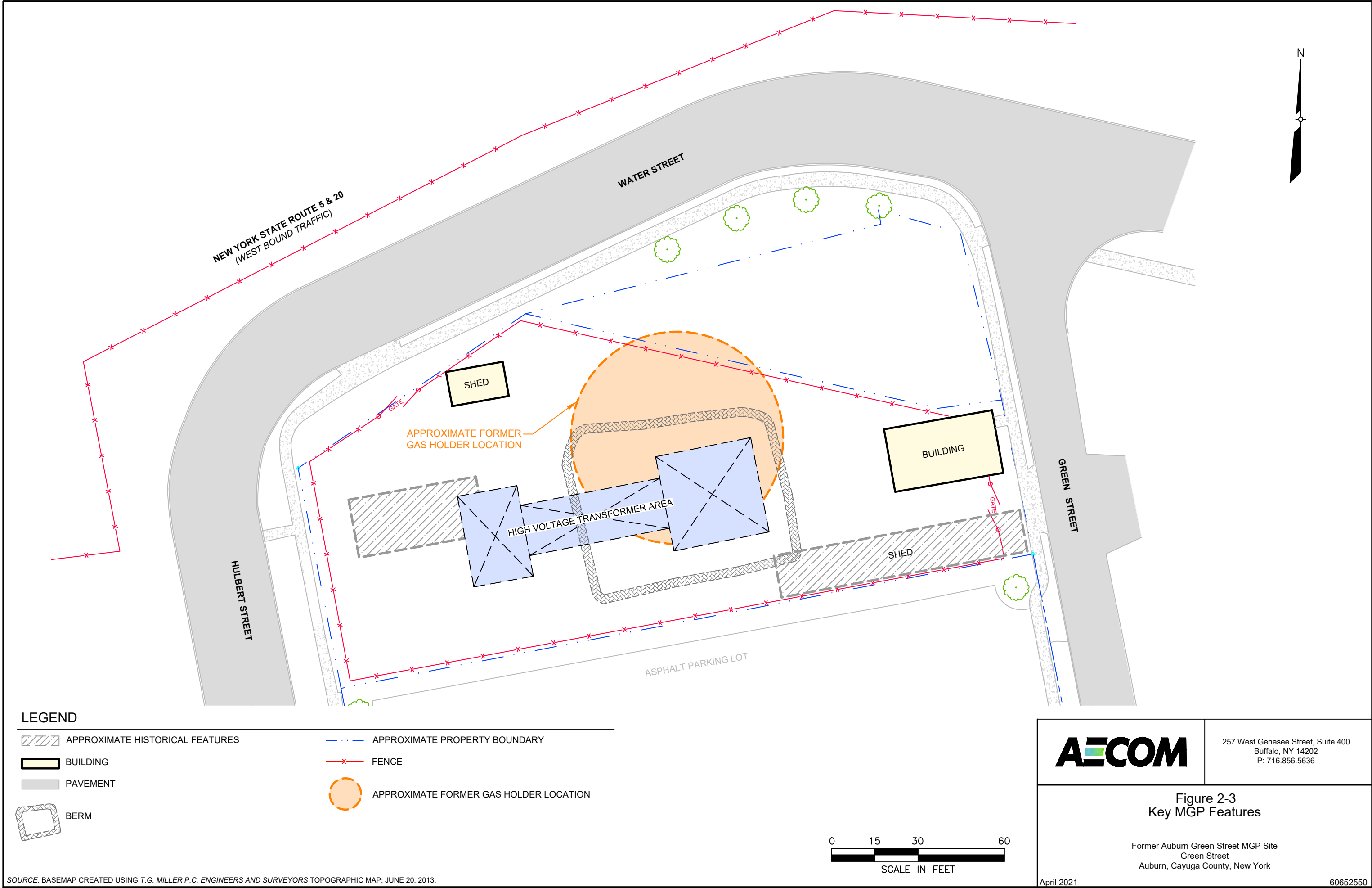
AECOM

April 2021

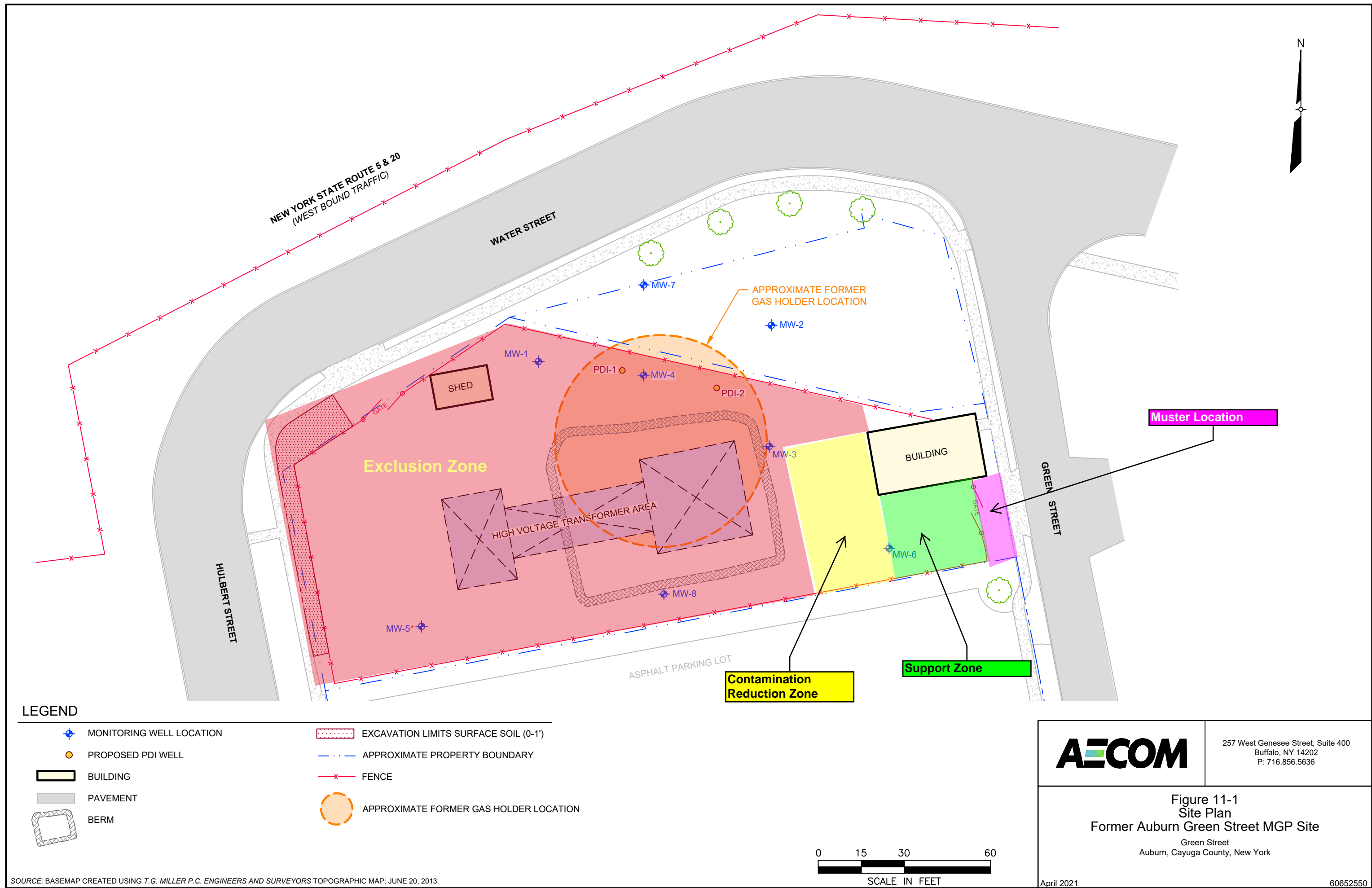








SOURCE: BASEMAP CREATED USING T.G. MILLER P.C. ENGINEERS AND SURVEYORS TOPOGRAPHIC MAP; JUNE 20, 2013.



SOURCE: BASEMAP CREATED USING T.G. MILLER P.C. ENGINEERS AND SURVEYORS TOPOGRAPHIC MAP, JUNE 20, 2013.

# ATTACHMENT **A**

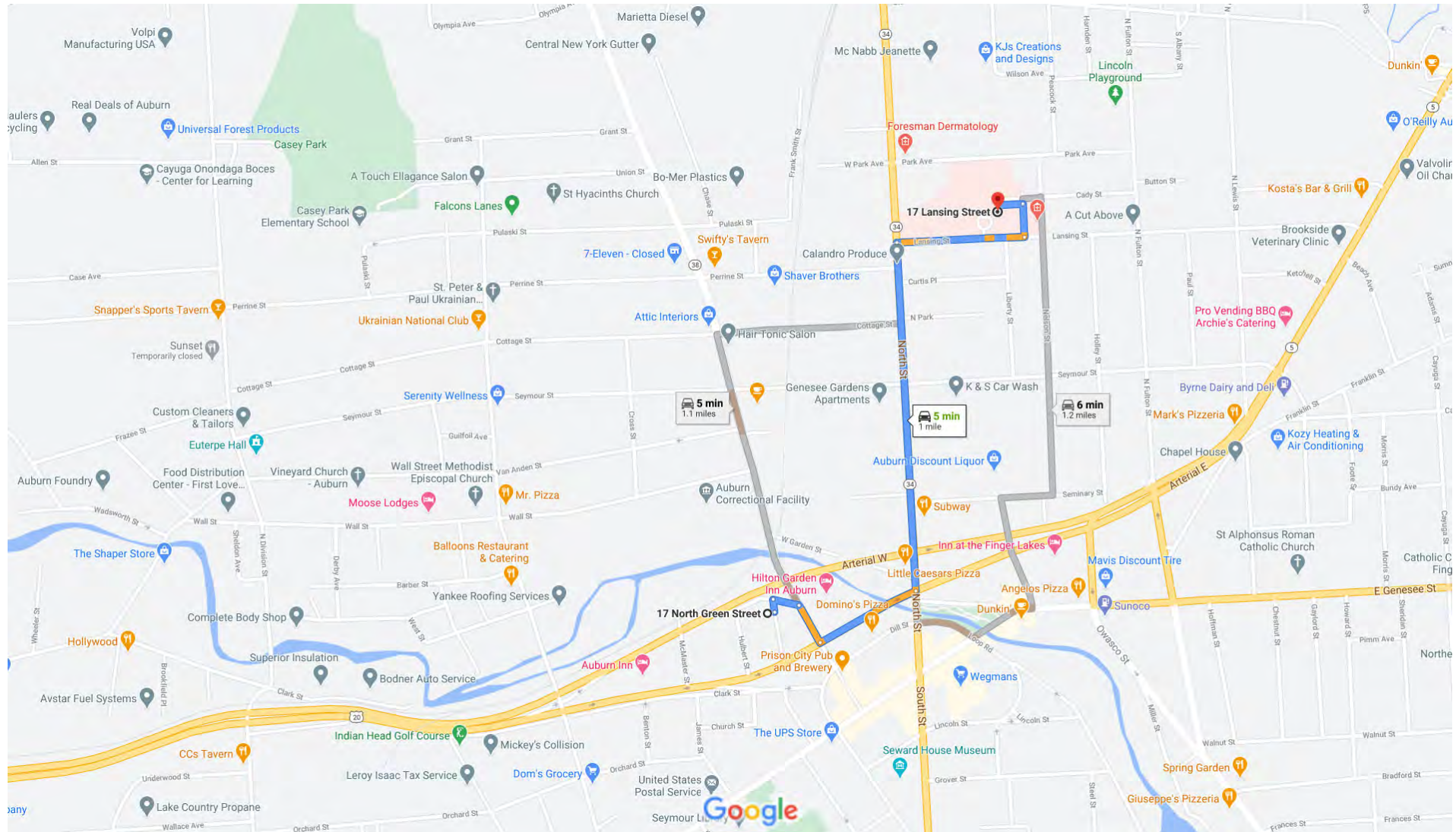
## **Hospital and Clinic Directions/Maps**

## **Incident Reporting and Response Flow Chart**



17 N Green St, Auburn, NY 13021 to 17 Lansing St, Auburn, NY 13021

Drive 1.0 mile, 5 min



Map data ©2021 500 ft

17 N Green St

Auburn, NY 13021

**Take State St to Arterial E**

1 min (0.1 mi)

- ↑ 1. Head north on N Green St toward Hulbert St  
92 ft
- 2. Turn right onto Hulbert St/Water St  
200 ft
- 3. Turn right onto State St  
325 ft

**Take North St to Lansing St**

2 min (0.7 mi)

- ↩ 4. Turn left at the 1st cross street onto Arterial E  
0.2 mi
- ↩ 5. Turn left at the 1st cross street onto North St  
0.5 mi

**Continue on Lansing St to your destination**

1 min (0.3 mi)

- 6. Turn right onto Lansing St  
0.2 mi
- ↩ 7. Turn left  
249 ft
- ↩ 8. Turn left  
164 ft

**17 Lansing St**

Auburn, NY 13021

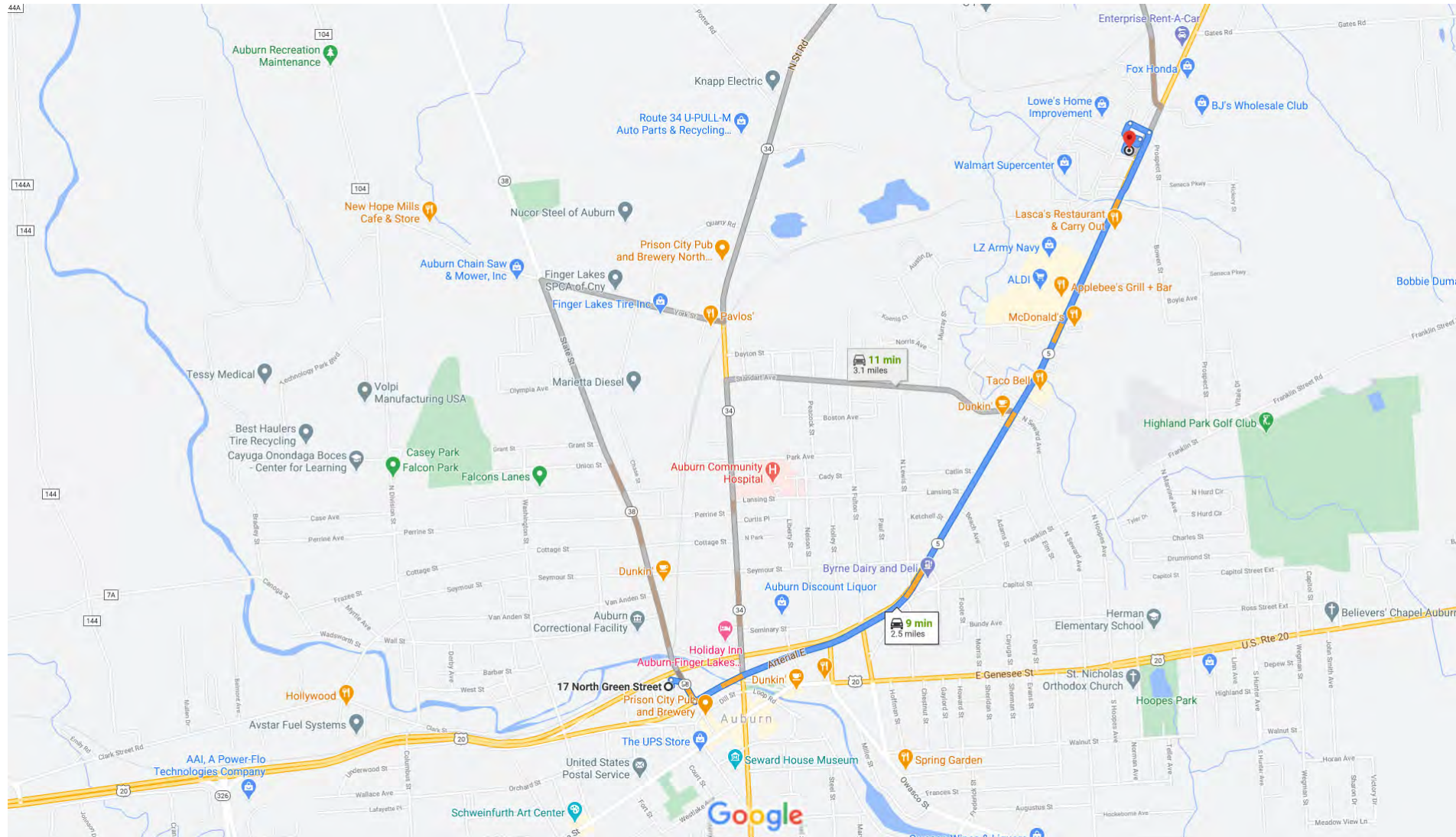
These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.





17 North Green Street, Auburn, NY to Finger Lakes Medical Care Center

Drive 2.5 miles, 9 min



Map data ©2021 1000 ft

17 N Green St

Auburn, NY 13021

Take State St to Arterial E

- 1 min (0.1 mi)
- ↑

1. Head north on N Green St toward Hulbert St

92 ft
- ↱

2. Turn right onto Hulbert St/Water St

200 ft
- ↱

3. Turn right onto State St

325 ft

Drive from NY-5 E/Grant Ave to Sennett

- 6 min (2.2 mi)
- ↶

4. Turn left at the 1st cross street onto Arterial E

0.8 mi
- ↑

5. Continue onto NY-5 E/Grant Ave

i

 Pass by Burger King (on the left in 0.9 mi)

1.4 mi

Drive to your destination

- 2 min (0.2 mi)
- ↶

6. Turn left

315 ft
- ↶

7. Turn left

430 ft
- ↱

8. Turn right

i

 Destination will be on the left

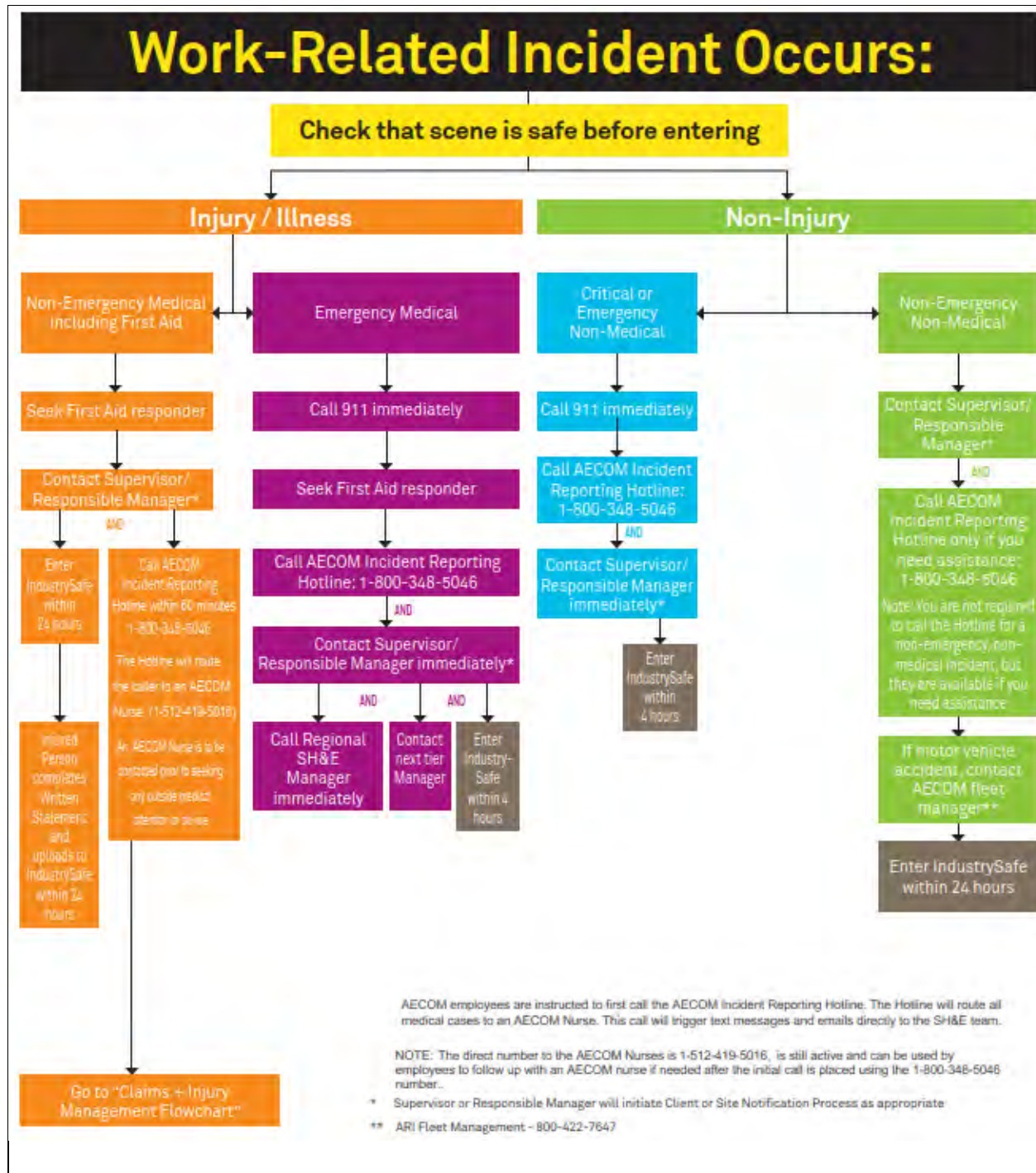
463 ft

Finger Lakes Medical Care Center

303 Grant Ave, Auburn, NY 13021

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

## A-3: INCIDENT REPORTING AND RESPONSE FLOW CHART





# ATTACHMENT **B**

## **Task Hazard Assessment (THA) and Tailgate Meeting Forms**

Each discrete task being performed during the project (i.e., Driving, Inspection, Sample Collection, etc.) requires a Task Hazard Assessment (THA; form [S4\[DCS\]AM-209-FM6-A](#)). If you don't have a THA for a task, obtain or develop one. The [DCS Americas Templated THA Library](#) may also be used to find previously approved THAs.

The THAs MUST be reviewed at the start of each shift and signed by all staff involved in the operation. The THAs should be consulted and updated throughout the day if conditions change using the 'On-Site Edits' lines.

## B-1: TASK HAZARD ASSESSMENT INSTRUCTIONS

Each unique task or work group should have their own THAs. If workers have a THA for their task(s) in hand, they should simply review it and document the site-specific edits in **red pen** in the appropriate section. If workers do **NOT** have a THA for all tasks to be performed, a THA must be obtained or drafted *prior to starting work* on that task. Use additional pages as needed.

- Identify the basic steps of the task that must be performed in order and their associated hazards. Identify controls or barriers to mitigate each identified hazard.
- Clearly identify any **STOP WORK** triggers
- Document stop work and change management if conditions/ scope changes.
- Use 4-Sight to identify and mitigate site-specific hazards throughout the day. Modify the THA as needed. Contact site supervisors or the PM for any significant scope changes or changes of expected conditions.
- All THAs shall be 3 pages (maximum) or less (preferred). If they are longer, the task is too broad.
- All hazards will use standardized nomenclature (Hazard Wheel), should be specific, detail how someone could be hurt, and what the outcome could be.
- All actions to mitigate hazards must be specific, clearly aligned with its respective hazard and not generic. Avoid words such as "proper", "correct", or "appropriate". Use specifics and numerical values (i.e., wear disposable nitrile gloves, stand back 6 feet/1.8 meters, take a 10 minute break every hour).
- PPE cannot be the only line of defense - PPE is always the last line of defense, so think through what other controls (engineering, administrative, etc.) could mitigate hazards.

### Discuss as Applicable and Modify THA as Needed

Note: Check ☐ if reviewed or mark N/A

1 Biological, Chemical, Electrical, and Physical Hazards	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
2 Decontamination Procedures	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
3 Ergonomics- Lifting, Body Position	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
4 Lock Out/ Tag Out	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
5 Short Service Employees- visual identifier and mentor/ oversight assignment	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
6 Simultaneous/ Neighboring Operations	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
7 Slip/ Trip/ Fall Hazards	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
8 Specialized PPE Needs	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
9 Traffic Control	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
10 Waste Management/ Decontamination	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
11 Weather Hazards/ Heat Stress/ Cold Stress	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
12 Changes in Personnel, Equipment/Machinery, Methods and Materials	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
13 Work Permit requirements (identify):	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A
14 Other (describe):	<input type="checkbox"/> Reviewed <input type="checkbox"/> N/A

## B-1: TASK HAZARD ASSESSMENT INSTRUCTIONS (Continued)

### Using the Matrix:

1. Identify basic steps of the task and associated hazards.
2. Calculate the initial risk rating.
3. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating.
4. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

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

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & Safety Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & Safety Director

## **B-2: PROJECT TASK HAZARD ASSESSMENTS (THAs)**

# Task Hazard Assessment

<b>Task Name:</b> Field and Field Office – Precautions for Coronavirus	<b>Control #:</b> Rev # 6 (6/17/2020)
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>	Essential Services Letter required for travel if required by ocal ordinance	<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**THIS THA MUST BE FULLY REVIEWED AND ACKNOWLEDGED DAILY BY ALL AECOM STAFF and AECOM SUBS ON-SITE**

**All job steps, hazards, work practices & PPE are to be clearly understood and implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input type="checkbox"/> Gloves: <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____
	<p>For certain tasks (see THA below) the following are required:          Potable water and soap (preferable) or hand sanitizer w/ 60% alcohol          Disinfectant wipes          Tissues          Nitrile gloves          Safety goggles          Coveralls          Disinfectant spray <a href="#">List of Cleaning Products to Kill Coronavirus</a></p> <p>Face covering when you are not able to maintain 6' social distance or where required by client or government order. Face coverings can be made from household materials by using needles, thread, cloth, tee-shirts, bandanas, etc. KN95, N95, dust/face masks are also acceptable. Local requirements may vary. <a href="https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html">https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html</a></p> <p>PPE Note: Consider checking sources such as gas stations and specialty markets, as these may have equipment or materials not available at general grocery stores.</p>
<b>Tools &amp; Equipment:</b>	

**REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!**

<b>Job Steps</b> <i>List all steps required to perform a task in the sequence they are performed</i>	<b>Potential Hazards</b> <i>How could you be hurt? What would the injury be?</i>	<b>Risk</b> <i>(initial)</i>	<b>Critical Actions to Mitigate Hazards</b> <i>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. <b>Identify any 'Stop Work' triggers.</b></i>	<b>Risk</b> <i>(final)</i>
1. Fitness for Duty check (performed at home prior to work)	1a. Being unfit for duty – impacted by illness including coronavirus	12	1a. Ensure you are fit for duty Are you or have you been in any of these situations? ➤ I have had close contact with a confirmed case or a symptomatic person under investigation for coronavirus in the last 14 days. ➤ A doctor requested me to be tested for coronavirus or instructed me to self-quarantine? ➤ A member of my household or someone I was in close contact within the last 14 days experienced some of the following symptoms: fever, cough, shortness of breath, fatigue, sore throat, chills, gastro-intestinal disease or diarrhea, loss of taste/smell. ➤ I have or previously had some of the following symptoms in the last 7 days: fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body ache, headache, new loss of taste/smell, sore throat, congestion or runny nose, nausea or vomiting, or diarrhea..	4

# Task Hazard Assessment

<b>Task Name:</b>	<b>Field and Field Office – Precautions for Coronavirus</b>	<b>Control #:</b>	<b>Error! Reference source not found.</b>
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			<p>➤ Where required, my temperature check today shows a fever, without the use of fever reducing medications in the last 24 hours? (100.4 F [37.8C] or above or exceeding criteria required by local order or client requirements).</p> <p><b>If response is a YES, then do not access the workplace.</b> If AECOM employee, contact your Supervisor and the AECOM Nurse at <b>512-419-5016</b> for advice.</p> <p><b>If response is a NO or Yes, but released by AECOM nurse, you can proceed to work.</b> You may be asked to check your temperature again when you arrive to your workplace.</p>		
<b>On-Site Edits:</b>					
2.	Travel by vehicle or air required	2a. Being in an enclosed space with poor air circulation in close contact with other people.	12	2a. For Vehicle travel, review the <a href="#">“Preparations for Travel when Driving</a> (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure” THA for driving and the <a href="#">“Preparations for Travel when flying to Minimize Coronavirus Exposure”</a> for flying.	4
<b>On-Site Edits:</b>					
3.	General Field Work	3a. Working Around Others	12	3a. <b>Personnel must maintain at least 6-foot distance from each other</b> (see note below if this seems to be unachievable). Practice social distancing at tailgate meetings, in break rooms and job trailers. Completely avoid (if possible) or limit the number of people in job trailers and other confined areas at any one time so that this distance can be maintained. If possible, hold meetings outside. If indoors, open window(s) for circulation. Wipe down window handles prior to opening. Even when practicing social distancing, we must limit the amount of people in any one group to less than 10 people.	4
		3b. Handling Shared Equipment and Tools	12	<p>Clean all surfaces of your hands often with soap and water for at least 20 seconds. If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands, including around and under fingernails and rub them together until they feel dry. When using hand sanitizer, be sure your hands are completely dry prior to touching any objects or surfaces.</p> <p>Wear safety glasses or goggles and avoid contact/touching of face, eyes, nose, and mouth. Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw used tissues in the trash. Immediately wash or sanitize your hands.</p> <p><b>NOTE:</b> . Face coverings will also be worn where clients, states or municipalities require them. If you feel your task cannot be performed by maintaining social distancing, face coverings will be worn in combination with additional behavioral or PPE controls. If additional guidance is required, contact your SH&amp;E manager to discuss the use of additional controlsPlease keep in mind, face coverings alone will not protect you from Coronavirus, so additional controls must be added.</p> <p>If the need arises to enter a personal residence, <b>prepare a separate task specific THA</b> for this task.</p>	

# Task Hazard Assessment

<b>Task Name:</b>	<b>Field and Field Office – Precautions for Coronavirus</b>	<b>Control #:</b>	<b>Error! Reference source not found.</b>
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	3c. Exposure during Lunch and Bathroom Breaks	12	3b. Wipe down and disinfect equipment before use with soap/water or disinfectant wipes. Wear disposable gloves when wiping surfaces down with disinfectant. Regularly wash hands when handling tools or equipment. Wash hands before eating or drinking.	4
	3d. Lack of food/water/supplies	4	3c. Be sure to wash hands with soap/water whenever a bathroom is nearby. At minimum, do so during bathroom and lunch breaks. Use a paper towel to open door handle when exiting bathroom. If using outside toilet facilities (i.e. Porta Johns), wash hands with soap and water or hand sanitizer both before and after opening/closing the door.  Where possible, employees are encouraged to pack meals and snacks as needed for the project duration and avoid visiting stores and restaurants. If necessary, modify your schedule to avoid restaurants and public restrooms during peak, i.e., crowded, periods to minimize contact with the public. Use drive-through service for food pick-up if available.  Avoid eating lunch as a group, if you must, do so outside or in a space with windows open (wipe down windows prior to opening). Maintain 6 feet or more and do not share dishes (e.g., bag of chips, communal salad bowl, etc.) Refrain from sharing a field office coffee pot.  Many locations may have shortages of food, water, or supplies or closed restaurants. Bring food, water, and supplies to allow you to work a full shift without additional provisions.	1
<b>On-Site Edits:</b>				
4. Office Work	4a. Working around others	12	4a. Work from home when possible.  Clean hands often with soap and water for at least 20 seconds after using the restroom, after you have been in a public place, before and after eating or after blowing your nose, coughing, or sneezing. If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands, including around and under fingernails, and rub them together until they feel dry. Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw used tissues in the trash. Immediately wash or sanitize your hands.  Sit at least six feet apart from others. Change workstations and meeting room setup to accommodate this social distancing. Even if you are practicing social distancing, we must still limit groups of people to less than 10. Do not eat or hang out in common areas.  Maintain social distancing during tailgate meetings and/or THA reviews, supervisor should seek verbal agreement from all and note this rather than passing pen and clipboard around for signature. Avoid passing round other items such as sign-in sheets as well.  Make hand-sanitizers, sanitizing wipes, and other hygienic supplies readily available.	4
	4b. Encountering frequent "touch points" and handling shared equipment	12	4b. Wipe down keyboards, mouse, phone, headset/headphones, any other "touch points". Limit contact of shared items. Wipe down surfaces before contacting them. Wash hands after handling or wear disposable gloves.	4

# Task Hazard Assessment

<b>Task Name:</b>	<b>Field and Field Office – Precautions for Coronavirus</b>	<b>Control #:</b>	<b>Error! Reference source not found.</b>
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			<p>In reception areas, use your own pen to sign in and out of offices. Remove unnecessary items such as business card holders, communal candy jars, etc.</p> <p>Work with facilities to assign someone to clean AND disinfect frequently touched surfaces daily. Follow the manufacturer's instructions for all cleaning and disinfection products (e.g., concentration, application method and contact time.</p>	
<b>On-Site Edits:</b>				

## Additional Notes:

**Where required, supplies (i.e., disinfectant spray/wipes, soap/hand sanitizer, nitrile gloves) should be made available prior to starting work. Request re-supply if stock runs low.**

Use disinfectant products that contain at least 70% alcohol. Use alcohol-based hand sanitizer that contains at least 60% alcohol. Wash hands with soap and water whenever available. Remember that soap (including bar soap) is generally available and is considered superior to hand sanitizer or disinfectant wipes/spray.

Common touch points and surfaces include but are not limited to:

- Arms on chairs
- Tabletops
- Doorknobs and handles
- Countertops
- Elevator Buttons
- Coffee Pots
- Refrigerator / microwave / dishwasher / toaster handles
- Water Dispensers
- Cabinet and file drawer knobs / handles
- Shared office supplies such as staplers, paper cutters, scissors, packaging tape dispensers, writing utensils
- Phone receivers, keypads
- Copier / printer / fax control buttons
- Sink faucets
- Light switches



# Task Hazard Assessment

<b>Task Name:</b>	<b>Field and Field Office – Precautions for Coronavirus</b>	<b>Control #:</b>	Error! Reference source not found.
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If any staff are showing any possible symptoms of or have been in recent direct contact with others showing symptoms of CORONAVIRUS, **STOP WORK**. Notify the site supervisor and the project manager and go home and/or stay home. Contact the AECOM Incident Reporting Hotline (1-800-348-5046) and/or the AECOM Nurse Line (1-512-419-5016), and notify the Area SH&E Manager. A list of common symptoms to look out for can be found here: [AECOM Guidance for Coronaviruses](#)

Visit the CDC webpage on cleaning and disinfecting procedures: [CDC Guidance for Community and Residential Cleaning-Disinfection for Coronavirus](#).

A list of approved disinfectants for use against SARS-CoV-2, the cause of CORONAVIRUS, is available here: [US EPA List of Disinfectants Effective Against Coronaviruses](#)

## Revision Log

Version	Issued / Revised By	Date	Revision Summary
THA Revisions			
0	Amanda Lanning & Kelly Dwyer	March 23, 2020	Original version
1	Patrick Walz	March 26, 2020	Added new Step 1, Fitness for Duty Check. Modified language related to stopping work when PPE supplies are unavailable. Added instructions for making diluted bleach solution. Modified vehicle use instructions to allow long-term rental and fleet vehicle use.
2	Scott Dietz	April 2, 2020	Added new Step 5, Traveling/Out of Town Work
3	Patrick Walz & Joan Root	April 13, 2020	Modified language related to hotel stays. Moved instructions for making diluted bleach solution from PPE section to Step 6 and added hazards and mitigations. Added note regarding requirements for face coverings to PPE section, and added tips for obtaining sources of PPE.
4	Scott Dietz, Kelly Dwyer, Patrick Walz, & Devon Molitor	May 1, 2020	Added revision log. Modified language related to office cleaning to clarify that facilities should be contacted to arrange office cleaning. Modified Step 3 to clarify social distancing requirements and added "note" with steps to take when not possible.
5	Walz, Dietz, Dwyer, Indorato, Gregory, Molitor, Cooter	May 5, 2020	Modified the Fit for Duty language, removed requirement to wear nitrile gloves when driving and opening/closing doors and windows, modified language if AECOM personnel must enter a personal residence.
6	Walz, Dietz, & Shelley Brown	June 17, 2020	Modified the symptoms of coronavirus, removed language regarding travel and hotel stays and provided link to new travel THAs which cover those topics in greater detail. Various additional minor modifications to text and formatting. Modified initial risk ratings.
Project-Specific Revisions			

# Task Hazard Assessment

**Task Name:** Field and Field Office – Precautions for Coronavirus

**Control #:** Error! Reference source not found.

## 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



## Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	Signature
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Visitor Acknowledgement	
Visitors review task hazards and acknowledge understanding	
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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to [DCSA.THA.Library@AECOM.com](mailto:DCSA.THA.Library@AECOM.com)

# Task Hazard Assessment

<b>Task Name:</b>	Field and Field Office – Precautions for Coronavirus	<b>Control #:</b>	Error! Reference source not found.
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

# Task Hazard Assessment

<b>Task Name:</b>	<b>Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure</b>	<b>Control #:</b>	<b>Rev # 1 (6/12/2020)</b>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**THIS THA MUST BE FULLY REVIEWED AND ACKNOWLEDGED DAILY BY ALL AECOM STAFF and AECOM SUBS ON-SITE**

**All job steps, hazards, work practices & PPE are to be clearly understood and implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input type="checkbox"/> Hard Hat <input type="checkbox"/> Safety Glasses <input type="checkbox"/> HiVis Vest <input type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____
	Additional materials and supplies required: Potable water and soap (preferable) or hand sanitizer w/ 70% alcohol Disinfectant wipes Tissues Disposable gloves Face coverings/face masks One Gallon Zip Lock Bags Safety goggles Disinfectant spray <a href="#">List of Cleaning Products to Kill Coronavirus</a>
<b>Tools &amp; Equipment:</b>	

**REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!**

<b>Job Steps</b> <i>List all steps required to perform a task in the sequence they are performed</i>	<b>Potential Hazards</b> <i>How could you be hurt? What would the injury be?</i>	<b>Risk</b> <i>(initial)</i>	<b>Critical Actions to Mitigate Hazards</b> <i>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. <b>Identify any 'Stop Work' triggers.</b></i>	<b>Risk</b> <i>(final)</i>
1. Planning the trip	1a. Potential exposure to Coronavirus	4	1a. Map route in advance to utilize the least populated route of travel. Avoid entering public places. If traveling more than 250 miles in one direction, develop a Journey Management Plan and be sure to add controls for protection against Coronavirus.	2
<b>On-Site Edits:</b>				
2. Preparing vehicle for driving	2a. Possible exposure from touching contaminated surfaces, tools, equipment and materials in vehicle.	8	2a. If feasible, use your personal vehicle or procure a fleet vehicle or a rental car (contact rental car company in advance) that hasn't been driven in the past 72 hours and always clean and disinfect the vehicle in accordance with the <b>Vehicle Cleaning THA</b> prior to driving. If possible, park the vehicle with the windows closed facing the sun (on sunny days), to allow the vehicle to heat up for 2-3 hours.	4

# Task Hazard Assessment

<b>Task Name:</b>	<b>Preparations for Travel When Driving</b>	<b>Control #:</b>	<b>Error! Reference source not found. Rev # 1 (6/12/2020)</b>
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<b>On-Site Edits:</b>					
3.	Driving to and from destination	3a. Possible exposure from passengers	8	3a. Limit to one person per vehicle whenever possible. If a passenger must ride with you, limit to one passenger and have them sit in the rear passenger side seat. Crack and/or open windows and use fan to recirculate air.	4
<b>On-Site Edits:</b>					
4.	Stopping for fuel, restroom breaks and food	4a. Possible exposure due to contact with members of the general public at gas stations, convenience stores, restrooms, etc.	12	4a. Plan trip to eliminate the need to stop for food, fuel or restroom breaks. If you must stop, avoid entering public places if possible. For refueling, don face covering and disposable gloves. When finished, doff disposable gloves, dispose of in trash receptacle and wash hands with soap and water or hand sanitizer with at least 70% alcohol. If you must enter public places, practice social distancing and wear a face covering. If you must use public restrooms, don disposable gloves prior to entering, doff and dispose of in trash receptacle when exiting. Wash hands with soap and water for at least 20 seconds or use a hand sanitizer before and after entering public places and restrooms. Have soap and water, antibacterial hand wipes or spray, 70% + alcohol hand sanitizer available.	4
<b>On-Site Edits:</b>					
5.	Out of town work	5a. Exposure at hotels	12	5a. Where logistically feasible, if a project extends beyond a day's duration, plan on traveling home rather than staying in a hotel if this can be done within AECOM's fatigue management program. Book through CWT and in known chains to ensure maximum cleanliness, even if the hotel needs to be a further distance from the site. Call the hotel ahead of your stay to find out what controls (i.e. cleanliness, disinfection, face cover required, etc.) they have in place for their guests. If long stay, there may be other options to consider such as Airbnb (full house) to minimize contact with people. Ask for room on the first floor to avoid using the elevator if possible. Maintain social distance (minimum six feet) with people. Do not touch anything if not needed in your hotel or room as the first measure. If in doubt of cleanliness of the accommodation, bring it up to the accommodation responsible person. Wipe down all touch point surfaces in hotel room with disinfectant or alcohol wipes. Put a "do not disturb" sign on door handle to prevent hotel staff from entering room to clean during the day. If possible, open window(s) for circulation. Wipe down window handles prior to opening and use gloves to open. Refrain from using hotel room coffee machines. Wash hands frequently.	4

# Task Hazard Assessment

**Task Name:** Preparations for Travel When Driving

**Control #:** Error! Reference source not found. **Rev # 1 (6/12/2020)**

<b>On-Site Edits:</b>					
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## Additional Notes:

**Where required, supplies (i.e., disinfectant spray/wipes, soap/hand sanitizer, nitrile gloves) should be made available prior to starting work. Request re-supply if stock runs low.**

Use disinfectant products that contain at least 70% alcohol. Use alcohol-based hand sanitizer that contains at least 60% alcohol. Wash hands with soap and water whenever available. Remember that soap (including bar soap) is generally available and is considered superior to hand sanitizer or disinfectant wipes/spray. If disinfectants are unavailable, prepare diluted bleach solution as described in Step 6 and use in their place.

If any staff are showing any possible symptoms of or have been in recent direct contact with others showing symptoms of CORONAVIRUS, **STOP WORK**. Notify the site supervisor and the project manager and go home and/or stay home. Contact the AECOM Incident Reporting Hotline (1-800-348-5046) and/or the AECOM Nurse Line (1-512-419-5016).

A list of common symptoms to look out for can be found here:

[AECOM Guidance for Coronaviruses](#)

Visit the CDC webpage on cleaning and disinfecting procedures: [CDC Guidance for Community and Residential Cleaning-Disinfection for Coronavirus](#)

A list of approved disinfectants for use against SARS-CoV-2, the cause of CORONAVIRUS, is available here: [US EPA List of Disinfectants Effective Against Coronaviruses](#)

## Revision Log

Version	Issued / Revised By	Date	Revision Summary
THA Revisions			
0	Scott Dietz	June 1, 2020	Original version
1	Scott Dietz	June 12, 2020	Added "Out of town work"

# Task Hazard Assessment

<b>Task Name:</b>	<b>Preparations for Travel When Driving</b>	<b>Control #:</b>	Error! Reference source not found. <b>Rev # 1 (6/12/2020)</b>
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Project-Specific Revisions			

# Task Hazard Assessment

**Task Name:** Preparations for Travel When Driving

**Control #:** Error! Reference source not found. **Rev # 1 (6/12/2020)**

## All Employees:

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## Hierarchy of Controls



- ▶ **Most hazards need more than one control**
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### Visitor Acknowledgement

*Visitors review task hazards and acknowledge understanding*

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# Task Hazard Assessment

<b>Task Name:</b>	Preparations for Travel When Driving	<b>Control #:</b>	Error! Reference source not found. <b>Rev # 1 (6/12/2020)</b>
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

# Task Hazard Assessment

**Task Name:** Coronavirus Vehicle Cleaning THA

**Control #:** Rev # 1 (6/1/2020)

<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**THIS THA MUST BE FULLY REVIEWED AND ACKNOWLEDGED DAILY BY ALL AECOM STAFF and AECOM SUBS ON-SITE**

**All job steps, hazards, work practices & PPE are to be clearly understood and implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input type="checkbox"/> HiVis Vest <input type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Nitrile <input type="checkbox"/> Hearing Protection Gloves: <input type="checkbox"/> Other: See list below _____ Disposable gloves, in proper size for operator( avoid latex due to allergy concerns) Face coverings or mask Safety Glasses
<b>Tools &amp; Equipment:</b>	<p>Paper towels Trash container/bags Safety glasses Small bucket of water Dish soap Disinfectant spray or wipes <a href="#">List of Cleaning Products to Kill Coronavirus</a></p> <p>Note: Many of the same household cleaners (such as non-bleach, unscented, non-chlorinated disinfectant cleaners and wipes) that kill coronaviruses on hard surfaces at home can also clean most car interiors without causing damage. Alcohol solutions that contain at least 70 percent alcohol are effective against coronavirus, according to the CDC. Nearly every interior surface of a vehicle can be cleaned with isopropyl alcohol. Vigorous washing with soap and water can also destroy the coronavirus. Soap and water are safe for most car interiors.</p> <p><b><u>Warning!</u></b></p> <ul style="list-style-type: none"><li>• Don't use bleach or hydrogen peroxide on the inside of the vehicle.</li><li>• Don't use scented wipes or wipes containing bleach.</li><li>• Don't use ammonia-based cleaners on car touch screens or dashboards, as they can damage anti-glare and anti-fingerprint coatings.</li><li>• Never combine cleaning chemicals as doing so may lead to toxicity.</li><li>• If using alcohol, avoid any potential source of sparks/ignition. <b>DO NOT SMOKE!</b></li></ul>

# Task Hazard Assessment

<b>Task Name:</b>	<b>Coronavirus Vehicle Cleaning THA</b>	<b>Control #:</b>	Error! Reference source not found.
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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 <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions to Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
1. Plan for cleaning/disinfecting	1a. Exposure to harsh disinfectants 1b. Not having the supplies necessary to perform the task (inadequate cleaning) 1c. Damaging vehicle interior surfaces	8 8 8	1a. Read the Safety Data Sheet or warnings/precautions on the label. Wear the PPE specified. At a minimum, gloves and safety glasses shall be worn.  1b. Confirm that you have the necessary supplies and equipment before proceeding. If possible, prepare a supply kit with all necessary cleaning/disinfecting prior to travel.  1c. Consult the owners manual to verify how to clean the various surfaces. Some surfaces may be adversely impacted by certain cleaners and by an excess application of water.	4  4  4
On-Site Edits:				
2. Prepare the vehicle for cleaning	2a. Inadequate cleaning because of obstructed surfaces	6	2a. Don gloves and safety glasses. Open all vehicle doors and remove all trash, water bottles, tools, equipment, etc., that are not part of the vehicle. Clean or discard as appropriate.	4
On-Site Edits:				
3. Inspect the vehicle and clean if necessary	3a. Insufficient cleaning due to excessively soiled surfaces  3b. Damaging electronics	8  6	3a. Inspect the vehicle interior for any visibly soiled surfaces. If these are identified, clean those surfaces with a few drops of dish detergent in a bucket of water using a clean cloth.  3b. Avoid using excess water onto the surfaces	4  4
On-Site Edits:				
4. Disinfect frequent touch points (see Additional Notes section for list)	4a. Accidental transfer of coronavirus to others.  4b. Improperly applying disinfectant and ruining vehicle surfaces	8  10	4a. Disinfect all frequently touched surfaces using the disinfectant identified. Consult the Additional Notes section for a list of surfaces to be considered.  4b. Test on small, inconspicuous surface first. Apply disinfectant in accordance with the instructions. Avoid excessive application.	4  4

# Task Hazard Assessment

<b>Task Name:</b>	<b>Coronavirus Vehicle Cleaning THA</b>	<b>Control #:</b>	Error! Reference source not found.
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	4c. Eye, skin, or inhalation exposure to disinfectant	10	4c. Apply disinfectant in accordance with the directions. Wear PPE as required.	4
<b>On-Site Edits:</b>				
5. Hold time	6a. Eye, skin or lung irritation from residual disinfectant	8	6a. Keep the vehicle doors open for 10-15 minutes after disinfecting to allow the vehicle to air out. If possible, park the vehicle with the windows closed facing the sun (on sunny days), to allow the vehicle to heat up for 2-3 hours.	2
	6b. Frequent changeover of vehicles	8	6b. To the extent feasible, all vehicles should have a 72-hour wait/hold time between different drivers. Currently, the Coronavirus is believed to survive up to 72 hours on certain hard surfaces. Waiting 72-hours further minimizes the risk of exposure.	4
<b>On-Site Edits:</b>				

## Additional Notes:

Surfaces can be a source of COVID-19 exposure and sharing vehicles can result in different people touching the surfaces of the vehicle. Vehicles should be cleaned and disinfected **before use, after use, and when changing drivers.** The cleaning should be conducted by the **vehicle operator.** Cleaning supplies shall be stored in each vehicle to allow for periodic cleaning before and after use and during the day, as needed.

Common touch points and surfaces on vehicles include but are not limited to the following:

- Center console
- Dashboard surface
- Glove box,
- Inside door handles
- Keys/key fob
- Outside door handles
- Overhead console
- Parking brake handle

# Task Hazard Assessment

<b>Task Name:</b>	Coronavirus Vehicle Cleaning THA	<b>Control #:</b>	Error! Reference source not found.
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<ul style="list-style-type: none"><li>• Rear view mirror</li><li>• Seat belts buckles</li><li>• Seat control</li><li>• Shift lever</li><li>• Steering wheel</li><li>• Sun visors</li><li>• Radio controls</li><li>• Touch screens</li></ul> <p>If any staff are showing any possible symptoms of or have been in recent direct contact with others showing symptoms of CORONAVIRUS, <b>STOP WORK</b>. Notify the site supervisor and the project manager and go home and/or stay home. Contact the AECOM Incident Reporting Hotline (1-800-348-5046) and/or the AECOM Nurse Line (1-512-419-5016).</p> <p>A list of common symptoms to look out for can be found here: <a href="#">AECOM Guidance for Coronaviruses</a></p> <p>Visit the CDC webpage on cleaning and disinfecting procedures: <a href="#">CDC Guidance for Community and Residential Cleaning-Disinfection for Coronavirus</a></p> <p>A list of approved disinfectants for use against SARS-CoV-2, the cause of CORONAVIRUS, is available here: <a href="#">US EPA List of Disinfectants Effective Against Coronaviruses</a></p>
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## Revision Log

Version	Issued / Revised By	Date	Revision Summary
THA Revisions			
1	Lisa Rygiel	June 1, 2020	Original version
Project-Specific Revisions			

# Task Hazard Assessment

<b>Task Name:</b>	Coronavirus Vehicle Cleaning THA	<b>Control #:</b>	Error! Reference source not found.
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# Task Hazard Assessment

**Task Name:** Coronavirus Vehicle Cleaning THA

**Control #:** Error! Reference source not found.

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# Task Hazard Assessment

<b>Task Name:</b>	Coronavirus Vehicle Cleaning THA	<b>Control #:</b>	Error! Reference source not found.
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Include a copy of the new THA or a photo of the THA modifications as appropriate.



# Task Hazard Assessment

<b>Task Name:</b>	<b>Gauging Liquid Levels in Groundwater Monitoring Wells</b>	<b>Control #:</b>	<b>01-01-05-07</b>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>Leather, nitrile</u> <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
<b>Tools &amp; Equipment:</b>	Hand Tools	Liquid level/Interface probe	Decon materials		

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>	
1. Visually clear proposed gauging locations	1a. Exposure to biologic hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reaction, rabies	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant; use a broom or a rake to move vegetation, not your hand or foot; move slowly	4	
	1b. Damage to equipment or vehicles due to surface / subsurface obstructions	6	1b. Investigate travel path. Look for surface obstructions such as rubble, debris, old foundations or rebar. Use spotter is available or park in such a manner as to not have to back-up.	4	
	1c. Slips / trips / falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1c. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from the ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well gauging in the area safe.	4	
	1d. Struck by vehicle resulting in severe trauma or death	10	1d. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest	4	
<b>On-Site Edits:</b>					
2. Opening well casings / flush-mount covers and well plug lock	2a. Cuts / lacerations / crushing, bruises	6	2a. Avoid touching sharp materials/ edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling, d on knee pads.	2	
	2b. Back strain	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2	

# Task Hazard Analysis

<b>Task Name:</b>	<b>Gauging Liquid Levels in Groundwater Monitoring Wells</b>	<b>Control #:</b>	Error! Reference source not found.
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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 <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
	2c. Vapor exposure resulting in inhalation hazards or illness  2d. Biologic hazards: insects, poisonous plants, and animals	4  6	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.  2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	2  4
<b>On-Site Edits:</b>				
3. Lowering fluid meter probe and measuring tape to detect fluid level and total depth	3a. Cuts / lacerations / bruises to knees (flush mount) 3b. Aches and strains from repetitive motion 3c. Exposure to chemical hazards in groundwater resulting in skin irritation or illness	4  4  3	3a. Inspect ground before kneeling. Remove any objects. Don knee pads  3b. Do not use awkward positioning. Keep back straight, take regular rest/stretch breaks. Change position regularly.  3c. Use smooth movements to avoid splashes. Don nitrile gloves over cut resistant gloves and safety glasses with side shields. Check gloves for damages/ rips.	2  2  2
<b>On-Site Edits:</b>				
4. Removing fluid meter measuring tape and probe from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness 4b. Cross contamination of equipment 4c. Cuts / lacerations / bruises to knees (flush mount) 4d. Aches and strains from repetitive motion 4e. Trips / falls from entanglement in measuring tape	4  4  4  4  3	4a. Stay upwind to avoid vapor exposure.  4b. Clean the tape and probe using non-phosphate soap and distilled water. Wipe with clean paper towel. Collect decontamination materials for waste disposal. Wear disposable nitrile gloves.  4c. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch.  4d. See Step 3b.  4e. Check for location of measuring tape before walking or moving around.	2  2  2  2  2

# Task Hazard Analysis

<b>Task Name:</b>	<u>Gauging Liquid Levels in Groundwater Monitoring Wells</u>	<b>Control #:</b>	Error! Reference source not found.
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On-Site Edits:						
5.	Closing well casings / flush-mount covers	5a. Cuts / lacerations / crushing / bruises	4	5a. Avoid touching sharp materials/ edges. Keep face, hands, fingers, and feet clear when opening and closing well cover. Don knee pads and inspect ground before kneeling down.	2	
		5b. Back strain from heavy / awkward materials handling	4	5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly. * Verify that well covers are secure upon departure.	2	
On-Site Edits:						
6.	Gather gauging equipment and tools, place in work vehicle	6a. Cuts / lacerations / crushing / bruises from gathering or dropping equipment	3	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing.	2	
		6b. Aches and strains from improper lifting	4	6b. Bend and lift with legs. Keep back straight. Take regular rest/ stretch breaks. Change position regularly. Team lift is required for items over 50 lbs. (or awkward items). * Verify all tools and equipment are removed from the site.	2	
On-Site Edits:						

## Additional Notes:

# Task Hazard Analysis

**Task Name:** Gauging Liquid Levels in Groundwater Monitoring Wells

**Control #:** Error! Reference source not found.

## All Employees:

**STOP WORK** if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

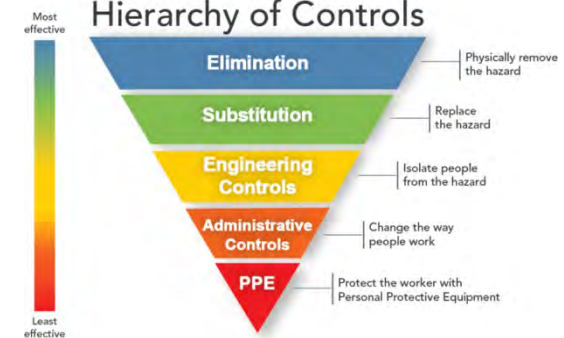
Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

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For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



## Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

### Worker Sign On

*I participated in the on-site review and fully understand the content of this Task Hazard Assessment.*

Printed Name	Signature
1. Supervisor:	
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### Visitor Acknowledgement

*Visitors review task hazards and acknowledge understanding*

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# Task Hazard Analysis

<b>Task Name:</b>	<u>Gauging Liquid Levels in Groundwater Monitoring Wells</u>	<b>Control #:</b>	Error! Reference source not found.
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

# Task Hazard Assessment

<b>Task Name:</b>	<b>Groundwater Sampling – Low Flow</b>	<b>Control #:</b>	<b>01-01-05-12</b>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: Leather, nitrile, cut resistant _____ <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
<b>Tools &amp; Equipment:</b>	Hand tools	YSI	Pump		

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
1. Visually clear proposed sampling locations	1a. Exposure to biological hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reactions, rabies.	6	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant, use a broom or a rake to move vegetation, not your hand or foot, move slowly	4
	1b. Slip/trips, falls due to uneven terrain resulting in broken bones or torn ligaments.	6	6	1b. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well sampling in the area safe.	4
	1c. Struck by vehicle resulting in severe trauma or death	10	4	1c. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest.	4
<b>On-Site Edits:</b>					
2. Open well casing/flush-mount covers and well plug lock.	2a. Cuts/lacerations/crushing, bruises	6	6	2a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling. Don knee pads.	2
	2b. Back strain from improper lifting	4	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2
	2c. Vapor exposure resulting in	4	4	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.	2

# Task Hazard Analysis

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Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
		inhalation hazards or illness  2d. Biologic hazards; insects, poisonous plants, and animals	6	2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:					
3.	Installing tubing in well and setting up equipment.	3a. Cuts/lacerations/crushing, bruises	6	3a. Avoid touching sharp material/edges. Keep face, hands, fingers feet clear when cutting tubing and setting up equipment. Wear cut resistant ANSI 2 gloves with disposable nitrile over gloves	2
On-Site Edits:					
4.	Removing tubing from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness 4b. Cuts/lacerations/bruises to knee (flush mount)	4 4	4a. Stay upwind to avoid vapor exposure 4b. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch	2 2
On-Site Edits:					
5.	Closing well casings/flush mount covers	5a. Cuts/ lacerations/crushing, bruises  5b. Back strain from heavy/awkward material handling	4 4	5a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers feet clear when closing well cover. Don knee pads and inspect ground before kneeling down. 5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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<b>On-Site Edits:</b>					
6.	Gather sampling equipment and tools, place in work vehicle	6a. Cuts/lacerations/crushing/bruises from gathering or dropping equipment 6b. Aches and strains from improper lifting	3 4	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing. 6b. Bend and lift with legs. Keep back straight. Take regular rest/stretch breaks. Change position regularly. Team lift is required for items over 50 lbs (or awkward items)	2 2
<b>On-Site Edits:</b>					
7.		7a.		7a.	
<b>On-Site Edits:</b>					

## Additional Notes:



# Task Hazard Analysis

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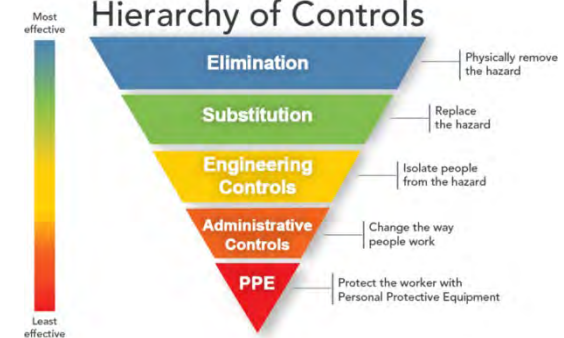
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<b>On-Site Edits:</b>					
3.	Oversight of rig inspection	3a. Mechanical failure of equipment 3b. Emergency shut off disabled	10 6	3a. Verify that drilling contractor inspects equipment daily using S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection or equivalent. 3b. Verify that kill switch on rig is tested and operational	4 3
<b>On-Site Edits:</b>					
4.	Drilling Oversight	4a. Flying debris, caught by/ struck by injuries  4b. Caught in/by equipment  4c. Exposure to contaminants causing injury or illness  4d. Noise-induced hearing loss from loud drilling operations	8  10 8 5	4a. 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. 4b. 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). 4c. Position yourself upwind of the borehole whenever possible. Perform air monitoring using a PID as described in the HASP. <b>STOP WORK</b> if the action level is exceeded. 4d. 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.	4  4 4 3
<b>On-Site Edits:</b>					

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On-Site Edits:					
6.		6a.		6a.	
On-Site Edits:					
7.		7a.		7a.	
On-Site Edits:					

## Additional Notes:

# Task Hazard Analysis

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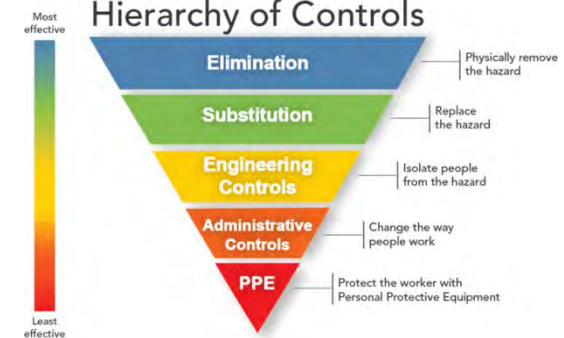
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# Task Hazard Analysis

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# Task Hazard Assessment

<b>Task Name:</b>	Investigation Derived Waste Management	<b>Control #:</b>	01-01-14-02
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: Leather or work gloves with Nitrile undergloves <input type="checkbox"/> Hearing Protection <input checked="" type="checkbox"/> Other: Tyvek as needed to protect skin and clothing				
<b>Tools &amp; Equipment:</b>	Socket set	55-gallon open top drum	Emergency eyewash and rinse water	Spill kit Photoionization detector with 11.7 eV lamp	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
1. Secure work area from traffic		1a. Struck by traffic	10	1a. Establish work area so that each site vehicle used for activity are in close proximity of each other; this would prevent unnecessary trips outside of work zone and into potential traffic area. Establish barricaded area using cones and barricade tape. Wear required highly visible clothing.	4
<b>On-Site Edits:</b>					
2. Prepare work area		2a. Trips & falls 2b. Tools and emergency equipment not present	6 8	2a. Clear any trip/fall hazards from work area. Scan ground prior to moving or walking 2b. Obtain tools and emergency equipment and stage adjacent to work area	4 4
<b>On-Site Edits:</b>					
3. Remove drum lid		3a. Pinch points at drum ring 3b. Sharp edges on drum ring or rim	6 7	3a. Use socket set to loosen drum ring, avoid placing fingers in to pinch points. Make sure cut-resistant gloves fit properly (not too big so fingertips get caught) 3b. Evaluate rim and ring for sharp edges, avoid handling as much as possible. Wear cut resistant gloves	4 4



# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found. <b>Investigation Derived Waste Management</b>	<b>Control #:</b>	Error! Reference source not found.
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On-Site Edits:					
4. Load soil into drums	4a. Exertion/sprains/strains	8	4a. Exertion/sprains/strains <ul style="list-style-type: none"><li>Use proper lifting techniques; this consists of bending your knees and lifting with your back straight.</li><li>Shovel loads heavier than 50 lbs or awkward to handle use a mechanical loading device or ask for help.</li><li>Grasp shovel handle properly: Position one hand at base of shovel handle and your other hand near the top of the handle.</li><li>Rotate task with others if needed and take breaks.</li></ul>	7	
	4b. Exposure to contaminants	6	4b. Exposure <ul style="list-style-type: none"><li>Set up upwind of drum.</li><li>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).</li><li>Perform air monitoring as per HASP. <b>STOP WORK</b> if action level is exceeded.</li></ul>	4	
	4c. Slips/trips/falls	6	4c. Be alert for uneven and slippery terrain. Keep tools and equipment away from walking paths.	4	
	4d. Sharp edges on drum rim	6	4d. Inspect rim for sharp and rough edges, avoid leaning into drum or placing hands onto rim edge Wear cut-resistant gloves	2	
On-Site Edits:					
5. Replacing drum ring	5a. Pinch points	7	5a. Use socket set to tighten drum ring, avoid placing fingers in to pinch points. Make sure gloves fit properly (not too big so fingertips get caught)	5	

# Task Hazard Analysis

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<b>On-Site Edits:</b>					
6.	Moving/relocating drums	6a. Exertion	15	6a. Exertion <ul style="list-style-type: none"> <li>If drums must be moved utilize a drum dolly.</li> <li>DO NOT ATTEMPT TO "WALK" or "ROCK" DRUMS TO MOVE THEM.</li> <li>Drums can become unstable and easily tip-over causing possible damage and personal injury as well as releasing the material contained.</li> </ul>	4
		6b. Trips and Falls	6	6b. See 2a above	5
<b>On-Site Edits:</b>					
7.		7a.		7a.	
<b>On-Site Edits:</b>					

## Additional Notes:

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found. <b>Investigation Derived Waste Management</b>	<b>Control #:</b>	Error! Reference source not found.
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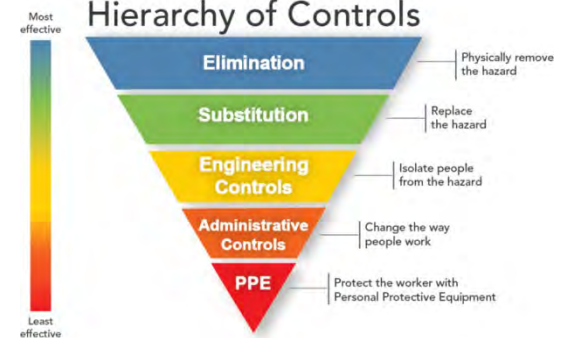
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# Task Hazard Analysis

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# Task Hazard Assessment

<b>Task Name:</b>	Land Survey – At-Grade	<b>Control #:</b>	01-01-10-06
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>Leather/mechanic</u> <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
<b>Tools &amp; Equipment:</b>	Survey Equipment	Hammer	Stakes/pins		

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
1. Setup and use typical survey equipment	1a. Straining back or other parts of body due to improperly lifting or moving heavy objects	4	1a. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from over the side of the truck bed	2
	1b. Bruising or broken bone in finger due to getting caught in a pinch point in the survey equipment.	4	1b. Avoid placing hands near the sides or bottom of the tailgate. Ensure no other workers have their hands near the pinch points and that hands should be all clear. Carefully use the survey equipment watching for pinch points. Wear leather or Kevlar gloves	3
	1c. Straining, tearing or fracturing body parts from slipping, tripping or falling from carrying too much equipment at one time	4	1c. Do not try to carry too much. If you are carrying something over your shoulder and in both hands, you are at a much greater chance to trip and cannot catch yourself. Make multiple loads or get assistance.	2
	1d. Straining a wrist, arm or neck or sustaining other ergonomic injury due to prolonged survey work	4	1d. Survey work can be repetitive – stretch regularly and report ergonomic injuries (strain, etc) as soon as you notice them.	3
	1e. Injury or illness caused by unwanted contact with various animals, insects or other biological hazards	4	1e. There are many different types of biological hazards that can be encountered on a work site. These include ticks, spiders, mosquitoes, chiggers, poisonous or other noxious plants, alligators, bears, small mammals, bird droppings, small mammals, snakes, etc. Consult S3AM-313-PR1 and the multiple attachments to determine the biological hazards that may be present and the mitigation measures for each. <b>Update to make site-specific</b>	3

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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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 <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
		1f. Sunburn caused by over-exposure to direct sunlight	4	1f. Have sunblock available and apply and reapply as per directions. Avoid direct solar exposure when possible. Seek breaks in shaded areas	2
<b>On-Site Edits:</b>					
2.	Hammering stakes/nails/benchmarks into ground	2a. Sustaining serious personal injury or utility damage from contacting nearby utilities	8	2a. Ensure subsurface clearance protocol and permit requirements are being followed (in many states one-call must be performed before driving benchmarks – which can be 36 inch long- into ground) before beginning work. If a utility, pea gravel, or non-native fill material is encountered, <b>STOP WORK</b> and call the PM	3
		2b. Straining back or pulling other muscles from repetitive hammering action	4	2b. Do not turn at waist, turn with arms and shoulders and keep both feet square. Be mindful to take breaks and rotate shifts.	3
		2c. Pinching hands or developing blisters from improper use of hammers and other equipment.	4	2c. Note line of fire and position hands where you cannot get struck by the hammer. Pay attention to the task at hand and avoid distractions. Wear gloves to avoid blisters and reduce chance of injury.	2
		2d. Eye injury due to flying debris	4	2d. Inspect tools and stakes/pins for chips, burs, and “mushrooming”. Ensure no one is standing within 10’ of your work area. Wear safety glasses when using the hammer to prevent flying debris from hitting eyes	2
<b>On-Site Edits:</b>					
3.	Working near roadway	3a. Sustaining critical injuries caused by being struck by oncoming vehicles	15	3a. Place “Surveyor Ahead” signs when possible. Work outside guardrail whenever possible. Keep AECOM vehicle parked between you and oncoming traffic, with wheels pointed away from road, and all flashing lights on. Place cones between traveled way, and you. If working adjacent to high-speed roadway (55 mph or above), you MUST have a spotter who is observing traffic at all times. Wear high-visible vest.	4
<b>On-Site Edits:</b>					

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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4.		4a.		4a.	
On-Site Edits:					
5.		5a.		5a.	
On-Site Edits:					
6.		6a.		6a.	
On-Site Edits:					
7.		7a.		7a.	
On-Site Edits:					

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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Additional Notes:



# Task Hazard Analysis

**Task Name:** Error! Reference source not found.

**Control #:** Error! Reference source not found.

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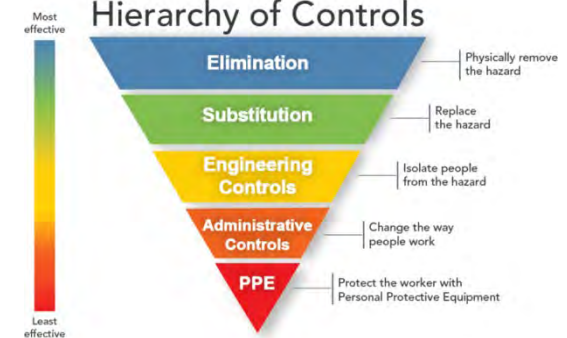
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- ▶ **What am I about to do?**
- ▶ **What can go wrong?**
- ▶ **What can be done to make it safer?**
- ▶ **What have I done to communicate the hazards?**

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



## Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

### Worker Sign On

*I participated in the on-site review and fully understand the content of this Task Hazard Assessment.*

Printed Name	Signature
1. Supervisor:	
2.	
3.	
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### Visitor Acknowledgement

*Visitors review task hazards and acknowledge understanding*

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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to [DCSA.THA.Library@AECOM.com](mailto:DCSA.THA.Library@AECOM.com)

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

# Task Hazard Assessment

<b>Task Name:</b>	Load and Unload Vehicle	<b>Control #:</b>	01-01-12-04
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: High vis mechanix style gloves <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other:
<b>Tools &amp; Equipment:</b>	Hand truck or dolly

**REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!**

<b>Job Steps</b> <i>List all steps required to perform a task in the sequence they are performed</i>	<b>Potential Hazards</b> <i>How could you be hurt? What would the injury be?</i>	<b>Risk (initial)</b>	<b>Critical Actions To Mitigate Hazards</b> <i>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.</i>	<b>Risk (final)</b>
1. Load & Unload Vehicle	1a. Sprains/strains/overexertion  1b. Pinch points between load and vehicle or between load items  1c. Slips/trips/falls  1d. Nicks and cuts from equipment edges	8       10    10   6	1a. To minimize the risk: <ul style="list-style-type: none"> <li>Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials.</li> <li>Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist. Do not lift over 49 lbs. without assistance. Seek assistance when needed and know your lifting limit</li> <li>Minimize distance needed to move materials and stage loading and unloading areas as close as possible.</li> </ul> 1b. Know where your hands and other people's hands are at all times. Wear high vis gloves as a reminder. Avoid placing fingers under load while positioning. Use caution with tailgates and vehicle doors, especially under windy conditions.  1c. Inspect and clear walking path prior to beginning loading. Do not stack loads that impair visibility.  1d. Inspect materials and equipment for rough edges and burrs. Wear cut resistant gloves.	4       4    4   4
<b>On-Site Edits:</b>				

# Task Hazard Analysis

<b>Task Name:</b>	Load and Unload Vehicle	<b>Control #:</b>	Error! Reference source not found.
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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 <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>		Risk <i>(initial)</i>	
		Critical Actions To Mitigate Hazards <i>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.</i>		Risk <i>(final)</i>	
2. Secure & cover exposed loads	2a. Line of fire hazards from straps/bungee cords	15		4	
	2b. Load shift in transit	10		4	
	2c. Theft of tools & equipment	8		4	
On-Site Edits:					
3.	3a.			3a.	
On-Site Edits					
4.	4a.			4a.	

# Task Hazard Analysis

<b>Task Name:</b>	Load and Unload Vehicle	<b>Control #:</b>	Error! Reference source not found.
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Additional Notes:

# Task Hazard Analysis

<b>Task Name:</b>	Load and Unload Vehicle	<b>Control #:</b>	Error! Reference source not found.
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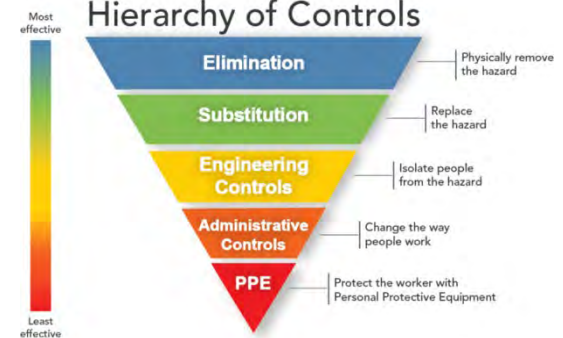
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<i>Visitors review task hazards and acknowledge understanding</i>
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# Task Hazard Analysis

<b>Task Name:</b>	Load and Unload Vehicle	<b>Control #:</b>	Error! Reference source not found.
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

# Task Hazard Assessment

<b>Task Name:</b>	<b>Monitoring Well Construction</b>	<b>Control #:</b>	<b>01-01-05-05</b>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	X Hard Hat X Safety Glasses X HiVis Vest X Safety Toe Boots X Gloves: _____ <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
<b>Tools &amp; Equipment:</b>	First Aid Kit Hand tools	Fire Extinguisher	Decon Supplies	4-gas multi-meter	

<b>REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!</b>					
<b>Job Steps</b> <i>List all steps required to perform a task in the sequence they are performed</i>		<b>Potential Hazards</b> <i>How could you be hurt? What would the injury be?</i>	<b>Risk</b> <i>(initial)</i>	<b>Critical Actions To Mitigate Hazards</b> <i>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.</i>	<b>Risk</b> <i>(final)</i>
1. Contact One-Call, private utility contractor, and/or site personnel to locate and mark underground utilities.		1a. Failure to have underground utilities identified could result in explosion, electrocution, injury, death, property damage.	10	1a. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location.	4
<b>On-Site Edits:</b>					
2. Unload equipment		2a. Cuts or hand injuries from pinch points	6	2a. Inspect equipment for damage and sharp edges, replace all broken or damaged equipment. 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	2
		2b. Back strain/ overexertion when unloading equipment	6	2b. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from the side of the truck bed.	2
<b>On-Site Edits:</b>					



# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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<b>REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!</b>				
<b>Job Steps</b> <i>List all steps required to perform a task in the sequence they are performed</i>	<b>Potential Hazards</b> <i>How could you be hurt? What would the injury be?</i>	<b>Risk</b> <i>(initial)</i>	<b>Critical Actions To Mitigate Hazards</b> <i>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. <b>Identify any 'Stop Work' triggers.</b></i>	<b>Risk</b> <i>(final)</i>
3. Set up work zone	3a. Struck by vehicle or equipment traffic 3b. Slip, Trip or Fall	8 6	3a. Establish work zone using traffic control devices, signs, cones, etc. in advance of initiating monitoring well abandonment activities. Restrict access to observers and passersby. 3b. Maintain good housekeeping in work area, do not carry equipment where visibility of ground is impaired, remove or mark all trip hazards in work area.	4 2
<b>On-Site Edits:</b>				
4. Position drill rig over pre-cleared borehole in position to tower up mast	4a. Struck-by, crushed-by, caught-by drill rig.  4b. Contact with overhead utilities.  4c. Slip, trip, and fall (STF) hazards from uneven 4d. Hydraulic failure causing release to the environment.	<b>10</b>  <b>10</b> 8 <b>10</b>	4a. 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. 4b. 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. 4c. Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to drilling and remove or isolate STF hazards. 4d. 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.	4  4 4 3
<b>On-Site Edits:</b>				
5. Commence drilling	5a. Pinch points  5b. Entanglement  5c. Noise	6 <b>10</b>	5a. 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. 5b. 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. 5c. Wear hearing protection while equipment is in use.	2 4 2

# Task Hazard Analysis

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	5d. Back strain/ overexertion when unloading equipment	6 8	5d. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	4
<b>On-Site Edits:</b>				
6. Well Casing Assembly and Installation	6a. Muscle strain.	8	6a. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds.	4
	6b. Slip, trip, and fall (STF) hazards from uneven	8	6b. Check walking/movement path for STF obstructions. Conduct pre-site walk with crew prior to work and remove or isolate STF hazards.	4
	6c. Injury from improper tool use.	8	6c. Do not use tools for unintended purposes (such as a saw to open bags of bentonite instead of an approved cutting tool).	3
	6d. Dust inhalation.	6	6d. Wear a dust mask and minimize dust when pouring powdered bentonite, concrete, or cement.	2
	6e. Cutting PVC, cuts, lacerations	8	6e. Use PVC cutter for cutting PVC. Wear cut-resistant gloves (Level 2), keep fingers and other body parts away from cutting tool blade.	3
	6f. Exposure to airborne chemicals or explosive atmosphere	8	6f. 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.	4
	6g. Crushed by, pinch point on drill rig	10	6g. Keep body parts away from moving parts on drill rig.	4
<b>On-Site Edits:</b>				
7. Installation of sand filter pack/bentonite	7a. Injury from cutting bags open	8	7a. Use a safety knife. No fixed-blade knives allowed on site. Wear minimum Level 2 cut-resistant gloves. Cut away from the body	4
	7b. Eye and respiratory injury due to dust and other airborne particles	6	7b. 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 quartz sand (moving bags, pouring, mixing, and putting bags in trash).	2
	7c. Back or muscle strain due to improper load or lifting techniques	8	7c. 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.	4

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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On-Site Edits:					

<b>Additional Notes:</b>

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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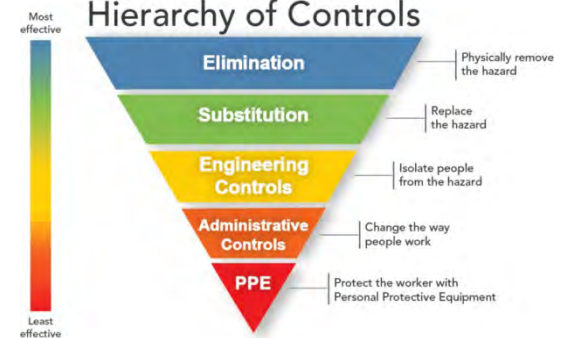
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# Task Hazard Analysis

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# Task Hazard Assessment

<b>Task Name:</b>	<b>Monitoring Well Development (Utilizing Surge Blocks)</b>	<b>Control #:</b>	<b>01-01-05-13</b>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>Leather/Nitrile</u> <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
<b>Tools &amp; Equipment:</b>	Tubing	Surge Block	Pump		

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
1.	Inspect and Open Wells	1a. Pinch Points between cover and ground, abrasion while opening lid with ratchet.	4	1a. UtRemove/replace manhole covers so that they do not pinch fingers. Wear leather gloves for this task.	2
		1b. Back Strain	6	1b. Utilize proper lifting procedure when removing covers – Bend at the knees and lift with your legs rather than bending/lifting with your back.	2
<b>On-Site Edits:</b>					
2.	Attach surge block to tubing and lower in well.	2a. Pinch points	4	2a. Note and avoid pinch points between block and well casing. Wear coated nitrile gloves, or leather gloves when handling tubing.	2
		2b. Overhead hazards, back strain.	6	2b. Watch out for overhead hazards. If well is at deeper depth to be performed comfortably by one person it may be necessary to use two people to insert/handle tubing.	4
<b>On-Site Edits:</b>					
3.	Surge well.	3a. Repetitive Motion injury from moving surging up and down.	6	3a. Take frequent breaks as needed to prevent fatigue to shoulder/arm/back muscles caused by surging well. Be aware of the signs/symptoms of repetitive stress injuries (tingling, sharp pains, numbness) and report all symptoms immediately.	2

# Task Hazard Analysis

<b>Task Name:</b>	<b>Monitoring Well Development (Utilizing Surge Blocks)</b>	<b>Control #:</b>	Error! Reference source not found.
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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 <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
<b>On-Site Edits:</b>					
4.	Bail or pump water from well. Purge Water Handling	4a. Repetitive motion bailing/pumping well.	6	4a. Take frequent breaks as needed to prevent fatigue to shoulder/arm/back muscles caused by surging well. Be aware of the signs/symptoms of repetitive stress injuries and report all symptoms immediately.	2
		4b. Exposure from splashes during bailing/pumping activities.	4	4b. Wear additional PPE (Tyvek) if deemed necessary, pace bailing actions. Wear eye protection, long pants, nitrile gloves, and steel-toed boots.	2
		4c. Spill or release of impacted water.	4	4c. Have spill pillows/socks available to contain any release or impacted water spill.	2
		4d. Slip, trip, fall.	6	4d. Wear appropriate PPE (eye protection, long pants, leather gloves, long sleeves, steel-toed boots.	2
		4e. Back strain.	6	4e. Use proper lifting technique (lift with the knees) while handling purge water containers/buckets. Secure bucket lids to prevent splashes/spills.	2
<b>On-Site Edits:</b>					
5.	Remove tubing from well.	5a. Exposure to contaminants.	4	5a. When removing tubing use nitrile gloves and paper towels (if necessary to wipe down tubing) as removed. Wipe tubing in downward motion.	2
		5b. Overhead/Horizontal hazards.	4	5b. Remove and coil tubing as removed or lay-out on ground surface. Ensure that tubing on ground surface does not hinder any nearby operations.	2
		5c. Back strain.	6	5c. Depending on depth of well, two people may be needed to hold/guide tubing out of the well. Dispose of tubing within a contractor trash bag.	2
<b>On-Site Edits:</b>					
6.	Decontamination - Soak/spray durable equipment to prevent cross-contamination between	6a. Exposure to decontamination chemicals	4	6a. Wear appropriate PPE (eye protection, long sleeves and pants, nitrile gloves, steel-toed boots). Avoid contact with all decontaminated chemicals (Liquinox, Alconox, Simple Green, methanol, and any other solvents used on development equipment).	2

# Task Hazard Analysis

<b>Task Name:</b>	Monitoring Well Development (Utilizing Surge Blocks)	<b>Control #:</b>	Error! Reference source not found.
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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 <i>List all steps required to perform a task in the sequence they are performed</i>	Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
multiple well locations; properly store disposable equipment			Store decontaminated equipment in clean dry area.	
<b>On-Site Edits:</b>				
7. Replace well cap and cover	7a. Pinch Points	4	7a. Refer to <b>1b</b> and <b>2a</b> above.	2
<b>On-Site Edits:</b>				

Additional Notes:



# Task Hazard Analysis

<b>Task Name:</b>	Monitoring Well Development (Utilizing Surge Blocks)	<b>Control #:</b>	Error! Reference source not found.
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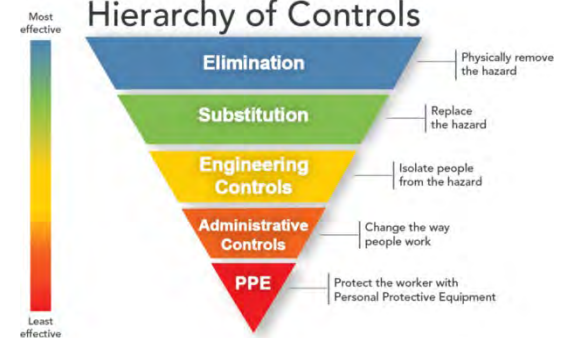
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For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



## Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

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# Task Hazard Analysis

<b>Task Name:</b>	Monitoring Well Development (Utilizing Surge Blocks)	<b>Control #:</b>	Error! Reference source not found.
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

# Task Hazard Assessment

<b>Task Name:</b>	<b>Portable Generator Operation</b>	<b>Control #:</b>	<b>01-01-08-03</b>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: _____ <input type="checkbox"/> Hearing Protection <input checked="" type="checkbox"/> Other: _____				
<b>Tools &amp; Equipment:</b>	Spill kit	Fire extinguisher	Eye wash and rinse water		

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 <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
1.	Selecting proper generator and electrical connections	1a. Inadequate power for needs	6	1a. Verify that the generator will provide sufficient wattage to safely operate the equipment you need.	2
		1b. Overheating/fire of electrical cords	6	1b. Select a UL rated 3 pronged heavy- duty outdoor construction rated extension cord with proper wire gauge to handle the load.	2
		1c. Lack of sustainability causing fire hazards	8	1c. When long term power is needed, evaluate alternative sources for sustainability.	4
<b>On-Site Edits:</b>					
2.	Familiarize yourself with generator hazards and prevention measures	2a. Not recognizing the potential hazards associated with a generator (fires, sprains/strains, electric shock, etc.)	12	2a. Read Owners Manual!	2
<b>On-Site Edits:</b>					
3.	Load and unload generator	3a. Sprains, strains, exertion, pinch points	10	3a. 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.	6
			6	3b. Always allow a generator to cool completely before attempting to load/unload.	2

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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		3b. Burns to hands from hot parts			
<b>On-Site Edits:</b>					
4.	Position & setting up generator	4a. Carbon monoxide poisoning & entrainment of Carbon monoxide gas into adjacent buildings/structures	15	4a. 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 immediate if symptoms are experienced. Set generator away from doors, windows, and potential entrainments sources such as air intakes, HVAC systems, etc.	4
		4b. Electric shock	12	4b. Verify that generator is grounded using a grounding rod and that it is equipped with a Ground Fault Circuit Interrupter.	4
		4c. Nearby materials catching fire	8	4c. Position generators away from flammable/combustible materials. Routinely inspect all areas where generators are positioned to verify that area is kept clear of combustible materials.	4
		4d. Noise-related hearing loss	6	4d. Position generator as far away as possible from workers. Use barriers to deflect noise where possible.	2
<b>On-Site Edits:</b>					
5.	Inspect generator and check fluids	5a. Fires from malfunction	9	5a. Inspect the generator for any signs of damage, fuel or oil leaks, etc.	3
		5b. Mechanical failure from low oil	8	5b. Verify that oil is at appropriate level and appears clean	4
<b>On-Site Edits:</b>					
6.	Fuel generator	6a. Fires from fueling	12	6a. 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.	4

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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		6b. Fuel spills	8	6b. 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.	8
		6c. Splash of fuel to eyes/face	6	6c. Wear safety glasses when fueling. Have eyewash and clean rinse water available in case of splash.	6
On-Site Edits:					
7.	Starting and operating generator	7a. Electric shock from improper use	12	7a. 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.	4
		7b. Exertion/strain/sprain from pull starting	4	7b. 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.	2
On-Site Edits:					
8. Periodic maintenance		8a. Fires and mechanical failure from inadequate maintenance	6	8a. 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.	4
On-Site Edits:					

# Task Hazard Analysis

<b>Task Name:</b>	Error! Reference source not found.	<b>Control #:</b>	Error! Reference source not found.
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Additional Notes:

# Task Hazard Analysis

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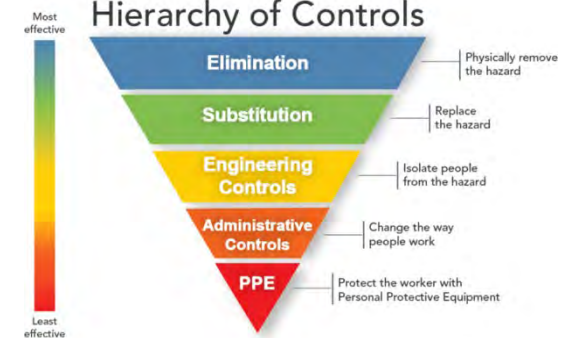
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# Task Hazard Assessment

<b>Task Name:</b>	<b>Slug Test</b>	<b>Control #:</b>	<b>01-01-05-10</b>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: Leather, Nitrile <input checked="" type="checkbox"/> Hearing Protection If ambient noise lever > 85dBa <input type="checkbox"/> Other: _____				
<b>Tools &amp; Equipment:</b>	Transducer, PBC slug or pump	Absorbent material	Interface probe	Carbon bucket	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!					
Job Steps <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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.</i>	Risk <i>(final)</i>
1.	1. Load tools and slug test supplies	<b>1a.</b> Injury from exertion, fall, exposure, and contact  <b>1b.</b> Damage or injury from shifting equipment in transit	6	<b>1a.</b> Review list of material required. Load enough supplies and materials for completion of the job to avoid unnecessary trips. <ul style="list-style-type: none"> <li>➤ Load vehicle close to materials location in a clear, well-lighted area</li> <li>➤ Use proper lifting techniques (Bend and lift with the knees, not the back. Get a firm grip and do not twist while lifting the transducer or other objects)</li> <li>➤ Don work gloves when handling objects.</li> </ul> <b>1b.</b> Secure objects and supplies prior to travel	4
	<b>On-Site Edits:</b>				
2.	Access to well vault; remove lock and protective cap from well	<b>2a.</b> Pinch points/abrasion	6	<b>2a.</b> Wear leather or similar work gloves while removing locks or opening well caps.	4
		<b>2b.</b> Exposure to site contaminants and biological hazards	6	<b>2b.</b> Don appropriate PPE (i.e., nitrile gloves). <ul style="list-style-type: none"> <li>➤ Inspect well cap for insects (i.e., bees, etc.).</li> <li>➤ Use insect spray if needed.</li> </ul>	4
		<b>2c.</b> Inhalation injury from organic vapor, risk of fire or explosion from elevated organic vapor levels.	10	<b>2c.</b> Review and understand action levels in the HASP. <ul style="list-style-type: none"> <li>➤ Monitor breathing zone of workers with PID if product odors are present.</li> <li>➤ Monitor any enclosure with PID if product odors are present.</li> <li>➤ Ensure Level C PPE is available for potential upgrade as required in the HASP</li> </ul>	4

# Task Hazard Analysis

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<b>On-Site Edits:</b>				
3. Introduce transducer, PVC slug, or pump into well to change water level elevation and collect readings	<u>3a.</u> Exposure to site contaminants <u>3b.</u> Exertion resulting in muscle strain / sprain	<b>10</b> 8	<u>3a.</u> See 2c. above. <u>3b.</u> Use proper lifting techniques, do not lift > 50 pounds without assistance.	4 4
<b>On-Site Edits:</b>				
4. Introduce the PVC slug.  <i>Note: The PVC slug must remain submerged for a falling head slug test or remove the PVC slug for a rising head slug test.</i>	<u>4a.</u> Exposure to site contaminants <u>4b.</u> Exertion  <u>4c.</u> Product release	<b>10</b> 8  8	<u>4a.</u> See 2c. above <u>4b.</u> See 3b. above Use proper lifting techniques that consists of bending at the knees and lifting with your legs while maintaining your back in a straight position. ➤ Wear PPE including gloves when handling transducer and other equipment and supplies.  <u>4c.</u> Place absorbent pads around well	4 4 4
<b>On-Site Edits:</b>				
5. Demobilize to next location or complete scope; Retrieve transducer, PVC slug, or pump if applicable from the well	<u>5a.</u> Muscle Strain and Sprain form Exertion <u>5b.</u> Exposure to groundwater contaminate <u>5c.</u> Exposure to decontaminating materials	6 8 6	<u>5a.</u> See 3b. above <u>5b.</u> Avoid splashing. Pull pump slowly. Wear nitrile gloves, safety glasses, long sleeve shirt <u>5c.</u> As above	4 4 4
<b>On-Site Edits:</b>				
	6a.		6a.	

# Task Hazard Analysis

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<b>Additional Notes:</b>

# Task Hazard Analysis

<b>Task Name:</b> Slug Test	<b>Control #:</b> Error! Reference source not found.
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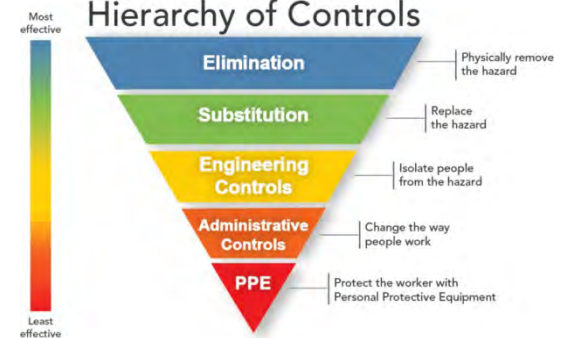
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# Task Hazard Analysis

<b>Task Name:</b> Soil Sampling (Surface) with trowel	<b>Control #:</b> Error! Reference source not found.
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On-Site Edits:					
3. Breakdown and decontaminate equipment.		5a.Contact with contaminants and cut hazards	6	5a. Inspect before handling for chips or cracks in glass containers. Wear nitrile gloves over cut resistant gloves. If nitrile tears, stop work and replace glove.	2
		5b.Breaking a sample container resulting in cut, or contact with contents/preservatives	6	5b. Handle containers with care and position over padded or soft surface in case it slips from hand. Place in packing materials that will protect against collisions.	2
		3e. Striking another person	4	3e.Before moving equipment, verify that no one is in the swing radius.	3
On-Site Edits:					
4.		4a.		4a.	
On-Site Edits:					
5.		5c.		5c.	
On-Site Edits:					
6.		6a.		6a.	

# Task Hazard Analysis

<b>Task Name:</b> Soil Sampling (Surface) with trowel	<b>Control #:</b> Error! Reference source not found.
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7.	7a.		7a.		

Additional Notes:



# Task Hazard Analysis

**Task Name:** Soil Sampling (Surface) with trowel

**Control #:** Error! Reference source not found.

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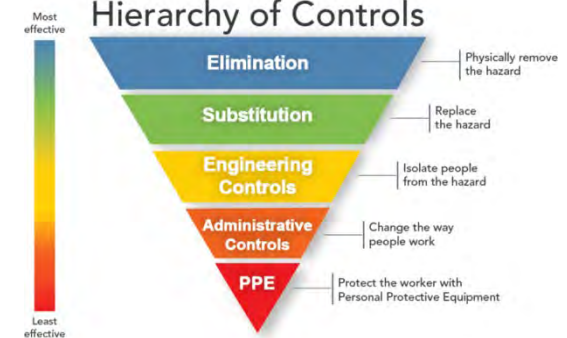
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# Task Hazard Assessment

<b>Task Name:</b>	<b>Well Pad Construction</b>	<b>Control #:</b>	<b>01-01-05-06</b>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: <u>Cut Resistant,</u> <input checked="" type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____				
<b>Tools &amp; Equipment:</b>	First Aid Kit	Spill Kit	Fire Extinguisher Hand Tools	Traffic cones or other suitable barrier	

<b>REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!</b>					
<b>Job Steps</b> <i>List all steps required to perform a task in the sequence they are performed</i>	<b>Potential Hazards</b> <i>How could you be hurt? What would the injury be?</i>	<b>Risk (initial)</b>	<b>Critical Actions To Mitigate Hazards</b> <i>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. <b>Identify any 'Stop Work' triggers.</b></i>	<b>Risk (final)</b>	
1. Contact One-Call, private utility contractor, and/or site personnel to locate and mark underground utilities.	1a. Failure to have underground utilities identified could result in explosion, electrocution, injury, death, property damage.	<b>10</b>	1a. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location.	1	
<b>On-Site Edits:</b>					
2. Unload equipment	2a. Cuts or hand injuries from pinch points 2b. Back strain/ overexertion when unloading equipment	6 6	2a. Inspect equipment for damage and sharp edges, replace all broken or damaged equipment. 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 2b. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from the side of the truck bed.	2 2	
<b>On-Site Edits:</b>					

# Task Hazard Analysis

<b>Task Name:</b>	<b>Well Pad Construction</b>	<b>Control #:</b>	Error! Reference source not found.
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<b>REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!</b>					
<b>Job Steps</b> <i>List all steps required to perform a task in the sequence they are performed</i>		<b>Potential Hazards</b> <i>How could you be hurt? What would the injury be?</i>		<b>Risk</b> <i>(initial)</i>	
				<b>Critical Actions To Mitigate Hazards</b> <i>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. <b>Identify any 'Stop Work' triggers.</b></i>	
				<b>Risk</b> <i>(final)</i>	
3. Set up work zone		3a. Struck by vehicle or equipment traffic		8	
		3b. Slip, Trip or Fall		6	
<b>On-Site Edits:</b>					
4. Excavating Well Pad Area		4a. Underground Utility Strike		10	
		4b. Back or muscle strain		6	
		4c. Struck by shovel		6	
<b>On-Site Edits:</b>					
5. Installing Well Pad Frame		5a. Cutting Wood Frame		8	
		5b. Injury from assembling well frame		8	
<b>On-Site Edits:</b>					

# Task Hazard Analysis

<b>Task Name:</b>	Well Pad Construction	<b>Control #:</b>	Error! Reference source not found.
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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 <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>	Risk <i>(initial)</i>	Critical Actions To Mitigate Hazards <i>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. <b>Identify any ‘Stop Work’ triggers.</b></i>	Risk <i>(final)</i>
6. Pouring and Troweling Concrete Pad		6a. Exposure to cement dust and mixed cement, skin, eye, and inhalation irritation.  6b. Back or muscle strain	6  6	6a. 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).  6b. 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.	2  2
On-Site Edits:					
7.		7a.		7a.	
On-Site Edits:					

Additional Notes:

# Task Hazard Analysis

<b>Task Name:</b>	Well Pad Construction	<b>Control #:</b>	Error! Reference source not found.
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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.

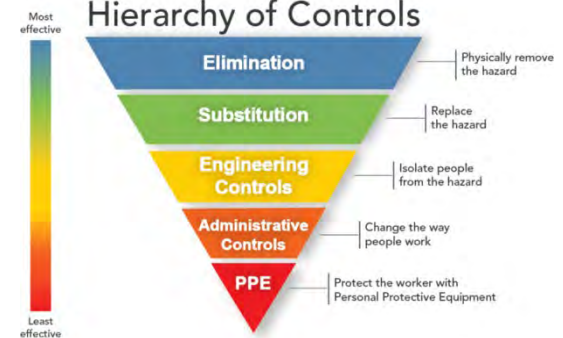
Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ▶ **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



## Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

Worker Sign On	
<i>I participated in the on-site review and fully understand the content of this Task Hazard Assessment.</i>	
Printed Name	Signature
1. Supervisor:	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Visitor Acknowledgement
<i>Visitors review task hazards and acknowledge understanding</i>
1.
2.
3.
4.
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7.
8.
9.
10.

Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to [DCSA.THA.Library@AECOM.com](mailto:DCSA.THA.Library@AECOM.com)

# Task Hazard Analysis

<b>Task Name:</b>	Well Pad Construction	<b>Control #:</b>	Error! Reference source not found.
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

## **B-3: BLANK THA AND DAILY TAILGATE MEETING FORMS**



# Task Hazard Assessment – DCSA

<b>Task Name:</b>	Error! Reference source not found. <a href="#">Click here to enter text.</a>	<b>Control #:</b>	Error! Reference source not found. <a href="#">Click here to enter text.</a>
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<b>Project Name:</b>	Auburn Green Street Former MGP Site	<b>Client:</b>	NYSEG	<b>Date:</b>	4/16/2021
<b>Permits Required? (list):</b>		<b>Work Location:</b>	17 N. Green Street, Auburn, NY 13021		

**This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.**

<b>Required PPE:</b>	<input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses <input checked="" type="checkbox"/> HiVis Vest <input checked="" type="checkbox"/> Safety Toe Boots <input checked="" type="checkbox"/> Gloves: _____ <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Other: _____
<b>Tools &amp; Equipment:</b>	

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 <i>List all steps required to perform a task in the sequence they are performed</i>		Potential Hazards <i>How could you be hurt? What would the injury be?</i>		Risk <i>(initial)</i>	
Critical Actions To Mitigate Hazards <i>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.</i>		Risk <i>(final)</i>			
1.		1a.			
On-Site Edits:					
2.		2a.			
On-Site Edits:					
3.		3a.			

# Task Hazard Assessment – DCSA

<b>Task Name:</b> Error! Reference source not found. <a href="#">Click here to enter text.</a>	<b>Control #:</b> Error! Reference source not found. <a href="#">Click here to enter text.</a>
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<b>REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!</b>					
	<b>Job Steps</b> <i>List all steps required to perform a task in the sequence they are performed</i>	<b>Potential Hazards</b> <i>How could you be hurt? What would the injury be?</i>	<b>Risk</b> <i>(initial)</i>	<b>Critical Actions To Mitigate Hazards</b> <i>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. <b>Identify any 'Stop Work' triggers.</b></i>	<b>Risk</b> <i>(final)</i>
<b>On-Site Edits:</b>					
4.		4a.		4a.	
<b>On-Site Edits:</b>					
5.		5a.		5a.	
<b>On-Site Edits:</b>					
6.		6a.		6a.	
<b>On-Site Edits:</b>					
7.		7a.		7a.	
<b>On-Site Edits:</b>					

# Task Hazard Assessment – DCSA

<b>Task Name:</b>	Error! Reference source not found. <a href="#">Click here to enter text.</a>	<b>Control #:</b>	Error! Reference source not found. <a href="#">Click here to enter text.</a>
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**Additional Notes:**

# Task Hazard Assessment – DCSA

**Task Name:** Error! Reference source not found. Click here to enter text.

**Control #:** Error! Reference source not found. Click here to enter text.

## All Employees:

**STOP WORK** if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

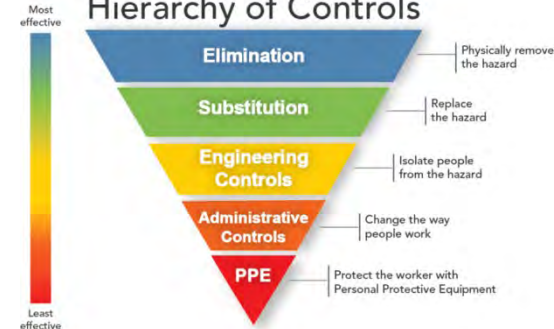
Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

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- ▶ **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



## Hierarchy of Controls



- ▶ **Most hazards need more than one control**
- ▶ **What should you do? Stack your controls**
- ▶ **PPE can NEVER be your only means of protection**

### Worker Sign On

*I participated in the on-site review and fully understand the content of this Task Hazard Assessment.*

Printed Name	Signature
1. Supervisor:	
2.	
3.	
4.	
5.	
6.	
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10.	

### Visitor Acknowledgement

*Visitors review task hazards and acknowledge understanding*

1.
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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to [DCSA.THA.Library@AECOM.com](mailto:DCSA.THA.Library@AECOM.com)

# Task Hazard Assessment – DCSA

<b>Task Name:</b>	Error! Reference source not found. <a href="#">Click here to enter text.</a>	<b>Control #:</b>	Error! Reference source not found. <a href="#">Click here to enter text.</a>
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Include a copy of the new THA or a photo of the THA modifications as appropriate.

## Americas

## Daily Tailgate Meeting

S3AM-209-FM5

**Instructions:** Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics. **This meeting is a daily refresher, not a full orientation.** Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.

AECOM Supervisor Name:

Phone Number:

AECOM SH&amp;E Rep. Name:

Phone Number:

Meeting Leader:

Date:	Project Name/Location: NYSEG, N. Green St., Auburn, NY	Project Number: 60652550
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Today's Scope of Work:

Muster Point Location: Site Entrance	First Aid Kit Location: In Vehicle	Fire Extinguisher Location: NA	Spill Kit Location: NA
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## 1. Required Topics

- ☒ Fitness for Duty requirements, all sign in / sign out
- ☒ Required training (incl. task specific) completed and current
- ☒ SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, preplanning hazard assessments / risk registers, controls, procedures, requirements, etc.)
- ☒ Task Hazard Assessments (THAs) are to be reviewed and completed for each task immediately prior to conducting
- ☒ STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA
- ☒ Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition
- ☒ Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location
- ☒ Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all
- ☒ Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified
- ☒ Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public
- ☒ Required checklists/records available, understood (describe):
- ☒ Lessons Learned / SH&E improvements (describe):

## 2. Discuss if Applicable to Today's Work

- ☒ ☐ Check ☒ as reviewed or mark ☐ as not applicable
- ☐ ☐ Biological/ Chemical / Electrical Hazards
  - ☐ ☐ Ergonomics - Lifting, Body Position
  - ☐ ☐ Lock Out/ Tag Out
  - ☐ ☐ Short Service Employees - visual identifier and mentor/ oversight assignment
  - ☐ ☐ Simultaneous/ Neighboring Operations
  - ☐ ☐ Slip/ Trip/ Fall Hazards
  - ☐ ☐ Specialized PPE Needs
  - ☐ ☐ Traffic Control
  - ☐ ☐ Waste Management/ Decontamination
  - ☐ ☐ Weather Hazards / Heat Stress / Cold Stress
  - ☐ ☐ Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.)
  - ☐ ☐ Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach):
  - ☐ ☐ Other Topics (describe/attach):
  - ☐ ☐ Client specific requirements (describe):

## 3. Daily Check Out by Site Supervisor

Describe incidents, near misses, observations or Stop Work interventions from today:

Describe Lessons Learned/ Improvement Areas from today:

**The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.**

Site Supervisor Name	Signature	Date Time (at end of day / shift)
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Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

Daily Tailgate Meeting (S3AM-209-FM5)

Revision 9 January 15, 2019

PRINTED COPIES ARE UNCONTROLLED. CONTROLLED COPY IS AVAILABLE ON COMPANY INTRANET.

4. Daily Check for COVID-19		
Question	Yes	No
Is social distancing being practiced?		
Are hand sanitary/wipes available for project team?		
Are tail gate safety meetings held outdoors?		
Are remote/call in job meetings held?		
Is PPE (i.e. gloves, masks, eye protection) being used?		
Are field cleaning/disinfection practices being implemented?		
Are workers/visitors excluded based on close contact with individuals diagnosed with COVID-19, recent travel to restricted areas or countries, symptomatic (fever, chills, cough/shortness of breath)?		
Does any worker have a temperature of >100.4° F, persistent cough or shortness of breath? If so, describe actions taken: _____		

**All employees:**

- **STOP WORK** if concerned / uncertain about safety / hazard or additional precaution is not recorded on the THA.
- **Be alert and communicate any changes in personnel or conditions at the worksite to the supervisor.**
- **Reassess task, hazards, & mitigations on an ongoing basis; amend the THA if needed.**

**SITE WORKERS (including AECOM Contractors and Subcontractors): Your signature below means that you understand:**

- \* The requirement to participate in creating, reviewing, & updating hazard assessments (THA) applicable to your task(s).
- \* The hazards & control measures associated with each task you are about to perform.
- \* The permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
- \* That no tasks or work is to be performed without a hazard assessment.
- \* Your authority & obligation to "Stop Work" intervene, speak up/ listen up.

**Your initials (right columns) certify that you arrived & departed fit for duty, & have reported all incidents/near misses; meaning:**

- \* You are physically and mentally fit for duty and have inspected your required PPE to ensure satisfactory condition.
- \* You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
- \* You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or impairment/fatigue issue to the AECOM Supervisor.
- \* You signed out as fit / uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit

(Attach additional Site Worker sign-in/out sheets if needed) Identify number of attached sheets: \_\_\_\_\_

**SITE VISITOR / SITE REPRESENTATIVE**

Name	Company Name	Arrival Time	Departure Time	Signature



# ATTACHMENT C

## AECOM SH&E Procedures

All AECOM SH&E Procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures ecosystem page.

Programmatic procedures referenced in this document (for example SH&E Training) **DO NOT** need to be printed for inclusion in this HASP. Only procedures that are needed for field activity reference and application **MUST** be printed in full and included in this section.

Hazard/ Activity (Note: Text in this column links to procedure)	Site Specific Description (Where, What Phase of Work, Frequency, Etc.)	Applicable Procedure
<input checked="" type="checkbox"/> <a href="#">Bloodborne Pathogens</a>	First Aid Providers	S3AM-111-PR
<input checked="" type="checkbox"/> <a href="#">Cold Stress</a>	Continuous exposure when ambient air temperature is below 32 °F (0 °C) <b>or</b> when ambient air temperature is below 50 °F (10 °C) with wet/damp conditions.	S3AM-112-PR
<input checked="" type="checkbox"/> <a href="#">Compressed Air Systems and Testing</a>	Biosparge Injections	S3AM-337-PR
<input checked="" type="checkbox"/> <a href="#">Compressed Gases</a>	Calibrating Field Instruments (i.e., PID, etc.)	S3AM-114-PR
<input checked="" type="checkbox"/> <a href="#">Corrosive Reactive Materials</a>	Handling pre-preserved bottles for split sampling	S3AM-125-PR
<input checked="" type="checkbox"/> <a href="#">Drilling, Boring &amp; Direct Push Probing</a>	Working with/alongside direct push rig	S3AM-321-PR
<input checked="" type="checkbox"/> <a href="#">Electrical Safety</a>	Working along an electrical substation.	S3AM-302-PR
<input checked="" type="checkbox"/> <a href="#">Hand and Power Tools</a>	Collecting soil, sediment samples	S3AM-305-PR
<input checked="" type="checkbox"/> <a href="#">Heat Stress</a>	Continuous exposure when ambient air temperature is above 80 °F (26.6 °C) <b>and</b> a standard work uniform is worn <b>or</b> when ambient air temperature is above 70 °F (21.1 °C) <b>and</b> impermeable chemical protective clothing is worn.	S3AM-113-PR
<input checked="" type="checkbox"/> <a href="#">Heavy Equipment</a>	Oversight activity observing operations where excavators/ construction equipment are working	S3AM-309-PR
<input checked="" type="checkbox"/> <a href="#">Noise</a>	Working with/alongside direct push/ drill rig	S3AM-118-PR
<input checked="" type="checkbox"/> <a href="#">Non-Ionizing Radiation</a>	Frequent exposure to sunlight during daylight hours	S3AM-121-PR
<input checked="" type="checkbox"/> <a href="#">Overhead Lines</a>	Working with/alongside drill rig	S3AM-322-PR

<b>Hazard/ Activity</b> (Note: Text in this column links to procedure)	<b>Site Specific Description</b> (Where, What Phase of Work, Frequency, Etc.)	<b>Applicable Procedure</b>
<input checked="" type="checkbox"/> <a href="#">Pandemic Virus</a>	Potential exposure during travel and field task(s)	SR1-003-PR2
<input checked="" type="checkbox"/> <a href="#">Respiratory Protection</a>	Potential Exposure to Hazardous Chemicals	S3AM-123-PR
<input checked="" type="checkbox"/> <a href="#">Underground Utilities</a>	Installing borings.	S3AM-331-PR
<input checked="" type="checkbox"/> <a href="#">Wildlife, Plants and Insects</a>	Potential exposure during field activities.	S3AM-313-PR

# Pandemic Procedure

SR1-003-PR2

## 1. Purpose and Scope

Providing the requirements for preparation and planning for potential pandemic emergencies that may occur while AECOM staff are working.

Applies to all AECOM staff working inside and outside an AECOM office, including location and project environments as well as business related travel.

## 2. Background

### 2.1 Pandemic

A pandemic virus emerges because of a process called antigenic shift, which causes an abrupt or sudden and major change in flu-like viruses. Public health officials closely monitor the movement of flu-like viruses through avian and swine populations. The public health fear is that the virus may obtain the ability to shift and incorporate the ability to infect humans directly through human-to-human contact. At that point, the threat of a regional epidemic, or a global pandemic may be realized.

Flu-like viruses can weaken the immune system, making the person more vulnerable to serious infections such as pneumonia, or can worsen chronic medical conditions. Public health officials watch both avian and swine flu outbreaks closely to monitor potential for an antigen shift and progression to a human transmissible disease.

Government health agencies continually monitor flu-like viruses and other diseases worldwide. Human cases are reported and updated by the World Health Organization (WHO) and U.S. Centers for Disease Control (CDC). This information is used by responsible government agencies for planning and response actions as required to minimize the spread and effects of disease outbreaks. It is important that information provided by CDC or WHO is made available to employees when there is potential for impact on work conditions or local community health.

#### 2.1.1 Swine Influenza

Influenza A (H1N1) is a flu virus of swine origin that first caused illness in March and April, 2009. Influenza A (H1N1) flu spreads in the same way that regular seasonal influenza viruses spread, mainly through the coughs and sneezes of people who are sick with the virus, but it may also be spread by touching infected objects and then touching your nose or mouth. Influenza A (H1N1) is now established in human populations as a seasonal influenza virus. There is an Influenza A vaccine available for humans.

#### 2.1.2 Avian Influenza

Avian influenza (bird flu) occurs mainly in wild birds but can spread to domestic birds and can cause outbreaks. Human cases are rare but have occurred from direct close contact with infected birds and poultry or contaminated materials. There is no vaccine available for humans related to this virus at this time.

#### 2.1.3 Coronavirus

Coronavirus (COVID-19) is the result of a virus identified as SARS-CoV-2. Coronaviruses are large family of viruses found in both animals and humans. Some infect people and are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) with symptoms such as fever, cough and shortness of breath. There currently is no human vaccine available for this virus.

## 2.2 Flu-Like Contingency Planning

### 2.2.1 Roles & Responsibilities of Governing Agencies

#### 2.2.1.1 Global Health Monitoring

The WHO coordinates health issues for the United Nations and provides leadership on global health matters. The WHO assists member nations with recommendations regarding global pandemics and declares global pandemic phases to help organizations to plan for the impacts. The major phases are:

<b>a. Phase 1:</b>	No viruses circulating among animals have been reported to cause infections in humans.
<b>b. Phase 2:</b>	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is therefore considered a potential pandemic threat.
<b>c. Phase 3:</b>	An animal or human-animal flu-like reassortment virus (the process by which viruses swap gene segments) has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver.
<b>d. Phase 4:</b>	There is verified human-to-human transmission of an animal or human-animal flu-like reassortment virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upwards shift in the risk for a pandemic. Any country that suspects or has verified such an event should urgently consult with WHO so that the situation can be jointly assessed, and a decision made by the affected country if implementation of a rapid pandemic containment operation is warranted. Phase 4 indicates a significant increase in risk of a pandemic but does not necessarily mean that a pandemic is a forgone conclusion.
<b>e. Phase 5:</b>	There is human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.
<b>f. Phase 6:</b>	The pandemic phase is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.
<b>g. Post-peak period:</b>	During the post-peak period, pandemic disease levels in most countries with adequate surveillance will have dropped below peak observed levels. The post-peak period signifies that pandemic activity appears to be decreasing; however, it is uncertain if additional waves will occur and countries will need to be prepared for a second wave.
<b>h. Post-pandemic period:</b>	Flu-like disease activity will have returned to levels normally seen for seasonal flu-like illness. At this stage, it is important to maintain surveillance and update pandemic preparedness and response plans accordingly. An intensive phase of recovery and evaluation may be required.

#### 2.2.1.2 Country Specific Pandemic Plans

Most nations have developed pandemic plans that include monitoring the regional spread of disease, the recommended medical practices, and related guidance. AECOM operations outside the US must keep abreast of country specific requirements and recommendations.

#### 2.2.1.3 United States

The federal government is responsible for coordinating a nationwide flu-like pandemic response.

- a. The U.S. Department of Homeland Security coordinates all non-medical support and response actions.

- b. The Department of Health and Human Services (HHS) coordinates overall public health and medical emergency response. Under Executive Order 13295 (revised April 1, 2005), the Secretary of Health and Human Services has the authority for apprehension, detention and conditional release of individuals to prevent the spread of a flu-like illness caused by a novel or re-emergent flu-like virus that causes or has the potential to cause a pandemic. Under HHS, the CDC is responsible for controlling the introduction and spread of infectious diseases and provides information to help health care providers, public health officials and the public. CDC's Division of the Strategic National Stockpile (SNS) distributes antiviral drugs, personal protective equipment, and respiratory protection devices to all 50 states and U.S. territories to help them respond to outbreaks.
- c. Under the Department of Defence (DOD) Directive 6200.3, military facilities require identification of a Public Health Emergency Officer who coordinates Military Treatment Facilities emergency response plans with local emergency planning.

#### **2.2.1.4 State and Local Governments**

Each state has authority to manage and respond to pandemic conditions. It is important that projects and offices contact their local and state governments for emergency contact information.

### **3. Procedure and Responsibilities**

AECOM Managers, HR (Human Resources), SH&E (Safety, Health and Environment) including Occupational Health, Legal Counsel, and Resilience Coordinators will collaborate and drive efforts to plan for, respond to, manage and recover from pandemic disruption to the business. This collaboration may also require input and cooperation from various other support functions who should be consulted in a timely fashion in order to expedite a return to normal business operations or to provide alternate solutions such as remote work. In the event of a declared Stage 5 or Stage 6 of a Pandemic event, the AECOM Managers, HR, SH&E, Occupational Health, Legal Counsel and Resilience Coordinators will make decisions and take necessary steps to protect the business from the pandemic, up to, and including, travel bans to/from certain areas, telecommuting, and other decisions as needed for business continuity with a focus on the health and welfare of the employee. Local Resilience Teams will take the lead in responding to pandemic-related business disruptions with overarching guidance provided by Global Resilience.

#### **3.1 Corporate Roles and Responsibilities**

AECOM offices will be prepared to respond to either a global, national or regional pandemic condition in accordance with the Organizational Resilience Standard - AECOM Global. The standard provides the common platform to organize mission-critical, Resilience Teams to prepare for, actively navigate and / or recover from significant business disruptions. It also provides the context for plans and procedures to minimize any impact on AECOM's business in terms of severity and duration.

##### **3.1.1 Prevention and Containment**

- a. If a pandemic condition exists or is imminent within a local office or field location, consult the location specific Emergency Response Plan (ERP) or Business Continuity Plan for immediate response guidelines.
- b. Upon notification from State Emergency Planning agency that a national or regional pandemic condition exists or is reasonably expected to occur, the facilities and administration teams working with the SH&E Department will provide sufficient and accessible infection control supplies in all local affected business locations in keeping with AECOM's [Infectious Disease and Pandemic Cleaning Instruction - AECOM Global](#).
- c. Face masks may be supplied, if recommended by WHO/CDC. Supplies of anti-viral medications will not be stockpiled, distributed, or administered unless specified by community health administrators.
- d. Annual influenza vaccinations are encouraged.

- e. As applicable, communications through email or intranet, training programs, or work place postings may be utilized to provide information concerning prevention and containment. Information may include, but is not limited to:
  - i. Initial symptoms of the disease, disease prevention techniques, how to respond if an individual suspects infection and when return to work is appropriate after the illness.
  - ii. Personal practices and habits for minimizing exposure, such as: frequent hand washing, avoiding exposing other employees when sick, annual flu vaccinations if appropriate, and consulting a personal physician to determine personal risk.
  - iii. Social distancing techniques such as minimizing large group gatherings, reducing employee face-to-face meetings through the use of video / phone conferencing/ Microsoft Teams, and eliminating unnecessary travel during severe outbreaks.
- f. Flexible worksite and flexible work hours options should be implemented as appropriate.
- g. Employees shall notify their supervisor if they are going to miss work because of illness. Information concerning sick leave and health benefits can be obtained through the employee's HR representative, by consulting applicable policies and procedures specific located on the [AECOM Integrated Management Systems \(IMS\) platform](#), and through [MyHR](#).
- h. As applicable, business and meeting travel may be limited to "business essential" only.
- i. Management will notify any applicable clients or suppliers of potential business impacts that may be experienced as a result of a pandemic. Management will update clients/suppliers once operations are restored to full capacity.

### **3.1.2 Anti-Viral Medication**

- a. Media coverage of flu-like outbreaks has focused on the availability of oral anti-viral medications (not vaccines). These prescription medications are known to help with treating uncomplicated flu-like virus effects in limited applications. There are potential side effects of the drugs, and some viruses have shown resistance to the drug.
- b. Based on this information, unless legally mandated by a country's government, AECOM will not attempt to stockpile sources of anti-viral drugs to be used for employees in the event of a pandemic. Resources of these drugs may be maintained by a country's National Strategic Stockpile.
- c. Employees should contact their personal health care provider regarding recommendations for support medications that may be necessary in the event of a flu pandemic.

## **3.2 General AECOM Employee Guidelines**

### **3.2.1 Employee Illness**

- a. Employees should report the illness to your Supervisor immediately.
- b. Employees who are ill with flu-like symptoms (Fever >100.4 F/38 C, cough, shortness of breath) should stay home. If they have a fever, they should stay home until at least 24 hours after they are free of fever without the use of fever reducing medications.
- c. Employees should not travel if they are ill.
- d. Employees who become sick during work hours should immediately go home.
- e. Employees at higher risk of complications, or who become seriously ill, should contact their health care provider immediately.

### 3.2.2 Employee Family Member Illness

- a. Employees who are well but who have a family member at home with the flu may choose to stay home or can go to work as usual. Employees with ill family members should monitor their health daily before coming to work and stay home if they become ill.
- b. Employees who choose to stay home to care for ill family members should contact their supervisor or HR representative to discuss flu-related issues such as using sick time/paid time off or if telecommuting is an option.
- c. Employees should not bring an ill family member with them to the office, even for brief periods.

### 3.2.3 Supervisors

- a. If an employee calls in sick because of the flu or a flu-like illness, the supervisor is to advise them to stay home. Expect employees to be out of work for 3-5 days (in most cases). Additional quarantine may be required based on the recommendations of CDC / WHO.
- b. Should the supervisor be informed by the employee that he/she has the flu or flu-like symptoms, the supervisor should report the employee illness to HR and SH&E representative only, maintaining the employee's privacy.
- c. Because symptoms may not appear until after an incubation period, (24 hours prior to symptoms), the supervisor should try to account for any close contacts (3ft/1m for 30 minutes) the affected employee might have had in order to evaluate if co-workers may have been exposed. Report the potential exposure of co-workers to your HR or SH&E representative.
- d. Do not allow employees with the flu or flu-like symptoms to remain at work. In-office quarantine (isolation) of an employee with flu-like symptoms (e.g., work in a secluded office area) is not permitted.

**Important Reminder:** The names of employees who are ill with the flu are **CONFIDENTIAL** and can only be discussed with HR representatives or company nurses.

### 3.2.4 HR or SH&E Representatives

- a. During Phase 5 and 6 of a potential / actual Pandemic, the SH&E representative will track cases of flu illness at your location using the Coronavirus Affected Employee Form obtained from the AECOM Occupational Health Nurse and submit to [nurse@aecom.com](mailto:nurse@aecom.com) upon identification of employee/s who are confirmed positive for the virus, exhibiting symptoms of the virus or on self-quarantine and provide updates at least weekly. These numbers also to be reported to your Local Resilience Coordinator (LRC) to allow Resilience Teams (RT) to assess appropriate responses in accordance with the [Disruptive Event Response Instruction - AECOM Global](#). Each state/country has specific resilience reporting contacts located on the [Global Resilience Team contact list](#).
- b. Inform fellow employees if a co-worker possibly exposed them to a flu-like illness, while maintaining strict confidentiality regarding the identity of the co-worker, so that employees can self-monitor for symptoms and stay home if they become sick. (Sample notification: We have been notified that there has been a potential exposure to the coronavirus in this office/building. As a precaution, it is recommended that all employees potentially affected begin self-monitoring for symptoms and to stay home if you become ill. Ensure that you follow the office procedure for notification of management of unexpected absences). For additional information, refer to the AECOM Global update through the Ecosystem
- c. A medical release of a clearance to return to work (following an extended absence) may not be available because of a busy health care system. Requiring a physician's release to return to work should be considered in cases of hospitalization or medical leave of absence in line with local HR protocols.
- d. Address staff rumours immediately through investigation and follow-up, then inform management of communication with employee and onward reporting to the Local Resilience Coordinator.

### 3.2.5 HR Representative

- a. Advise employees and supervisors regarding sick time or paid time off options.
- b. Discuss with supervisors if telecommuting is an option for the employee.

### 3.2.6 Managers/SH&E Representative

- a. Provide information to staff regarding good hygiene, including cough and sneeze etiquette and proper hand washing. Hold periodic meetings to refresh awareness of prevention measures.
- b. Remind employees to check with their health care provider to determine if flu inoculations are recommended.
- c. Follow-up with facilities and office managers to provide tissues, disinfectant wipes, hand sanitizers and no-touch receptacles for disposal.
- d. Coordinate with facilities managers to arrange for commonly touched surfaces such as doorknobs and countertops to be cleaned frequently in accordance with AECOM's [Infectious Disease and Pandemic Cleaning Instruction - AECOM Global](#).

## 3.3 Travel Worldwide to Areas Affected by a Pandemic

AECOM's Global Security & Resilience (GSR) shall be consulted to obtain advice, approvals or restrictions, and support, for employees traveling worldwide to and returning from areas affected by a pandemic or potential pandemic. Travel to high risk locations as defined by the [Country Risk Score Index](#) will also require approval. AECOM's [Corporate guidance can be found on the Ecosystem](#) and is updated weekly.

Persons visiting areas with reports of outbreaks of concern can reduce their risk of infection by observing the following measures:

### 3.3.1 Before Traveling to an Affected Area

- a. Educate yourself and others who may be traveling with you through consultation with AECOM's GSR Travel Security Portal ([Drum Cussac](#)) and AECOM's policies and procedures located on the [AECOM Integrated Management Systems \(IMS\) platform](#).
- b. Confirm applicable and routine vaccinations are current. See your doctor or health-care provider, or (for employees) follow the international business and travel requirements on the [International Travel Procedure](#). When traveling from the US, contact our travel resource, WorkCare Travel Consultant directly at 800-455-6155 and outside the US, contact iSOS (International SOS) at +1 215 942 8226 (Membership # 11BMMS000147), ideally 4-6 weeks before travel, to get any additional vaccination medications or information you may need. In many cases, a medical examination may be required prior to travel.
- c. Assemble a travel health kit containing basic first aid and medical supplies. Be sure to include a thermometer and alcohol-based hand gel or wipes for hand hygiene. See the [AECOM Travel Health- Pack Smart Checklist](#).
- d. Identify in-country health-care resources in advance of your trip. Employees may contact iSOS, HR or WorkCare for assistance in identifying available resources.

### 3.3.2 During Travel to an Affected Area

- a. As with other infectious illnesses, one of the most important preventive practices is careful and frequent hand washing for at least 20 seconds. Cleaning hands often with soap and water removes potentially infectious material from skin and helps prevent disease transmission. Waterless alcohol-based hand gels or wipes may be used when soap is not available, and hands are not visibly soiled.



- b. If an employee becomes sick with symptoms such as a fever accompanied by cough and sore throat, or difficulty breathing or if they develop any illness that requires prompt medical attention, a consular officer (refer to the country's representatives on the GSR Travel Portal-Drum Cussac ) or iSOS can assist you in locating approved medical services and informing your family or friends. The employee should defer any further travel until they are free of symptoms, unless traveling locally for medical care or instructed to evacuate by your project management, security, or upon advice of occupational health nurses. AECOM employees on foreign travel should notify their HR representative of any serious illness. Local employees should contact their supervisor according to their specified reporting policy.
- c. In the event of a flu outbreak, avoid all direct contact with birds or swine and avoid farms and markets. There is the possibility that other animal groups may become reservoirs of the infection in the future so current information from WHO/CDC should be checked for updated guidance.

### 3.3.3 After Return from Travel

- a. Monitor your health for 14 days after return for any fever or breathing difficulties.
- b. If you become ill with a fever plus a cough and sore throat, or trouble breathing during this 14-day period, consult your primary care physician. Do not come into work until advised by your primary care physician that it is safe to do so. Communicate the following:
  - i. your symptoms;
  - ii. where you travelled; and
  - iii. if you have had direct contact with animals, birds, or severely ill persons.
- c. Do not travel while ill, unless you are seeking medical care. Limiting close physical contact (<3ft/1 meter) with others as much as possible can help prevent the spread of an infectious illness.

## 4. Help & Training

The following resources provide an overview of AECOM's Organizational Resilience framework and process (titles also available at AECOM University).

- a. [Global Resilience Team Framework](#)
- b. [Organizational Resilience: Redefining What's Possible](#)
- c. [Powering Organizational Resilience through Functional Readiness](#)
- d. [Resilience Coordinator Overview](#)
- e. [Resilience Readiness: Disruptive Event Guidance](#)

## 5. Terms and Definitions

- |    |                              |  |
|----|------------------------------|--|
| a. | Local Resilience Coordinator | A manager designated as the Office or Worksite lead for local level organizational resilience who may or may not be the emergency response coordinator. The LRC is the point of contact with the Region Resilience Team in determining further action, including notifications, following an initial emergency response. |
| b. | Pandemic                     | An epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people as declared by the World Health Organization   |

- c. Resilience Team (RT) Interdependent networks of necessary and essential business functions collaborating at the enterprise, region and/or local levels to achieve organizational resiliency. Functions include but are not limited to communications, facilities, finance, human resources (HR), information technology, legal, procurement, safety, health, and environment, and security. Refer to the [Organizational Resilience Standard - AECOM Global](#)

## 6. References

This procedure forms a sub-set of AECOM's overall Organizational Resilience framework and should be read and executed as such. This procedure is to be applied in conjunction with the following Procedures and Instructions.

- a. [Organizational Resilience Standard - AECOM Global – SR1-003-PR1](#)
- b. [Disruptive Event Response Instruction - AECOM Global – SR1-003-WI2](#)
- c. [Infectious Disease and Pandemic Cleaning Instruction – AECOM Global - SR1-003-WI4](#)
- d. [S2-001-ATT6 Potential Coronavirus Exposure Management and Reporting](#)

## 7. Appendices

The following appendices are designed to assist business leads, people managers, HR partners, SH&E representatives and Resilience Coordinators assess processes to follow when presented with potentially symptomatic employees, visitors, locations and provide useful resources for communicating prevention methods in the workplace.

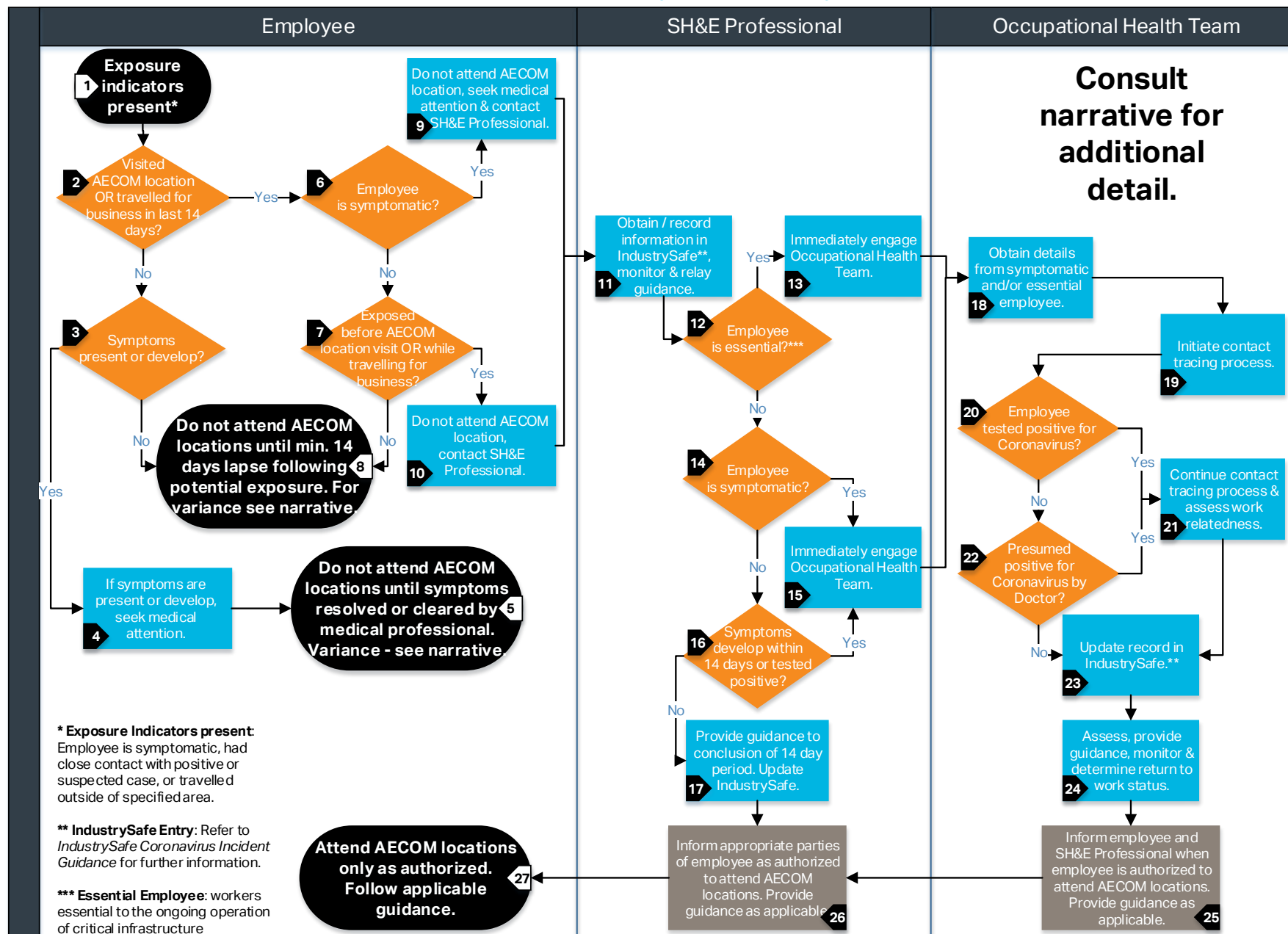
- a. Appendix 1 – Potential Coronavirus Exposure Management and Reporting
- b. Appendix 2 – Virus Prevention Posters and Flyers

## 8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	March 11, 2020	Initial Release as SR1-003-PR2	
1	March 20, 2020	Former Appendix 1 (Manager Resilience Checklist) removed. Pandemic Response Flowchart revised and inserted as Appendix 1.	Appendix 1
2	July 30, 2020	Replaced Pandemic Response Flowchart with Potential Coronavirus Exposure Management and Reporting. Added reference S2-001-ATT6 Potential Coronavirus Exposure Management and Reporting	Appendix 1 AND 6.d.

## Appendix 1 Potential Coronavirus Exposure Management and Reporting

Consult [S2-001-ATT6 Potential Coronavirus Exposure Management and Reporting](#) for additional detail.



## Appendix 2 Virus Prevention Posters & Flyers



# Wash your hands

Wash your hands with  
soap and running water  
when **hands are visibly  
dirty**



If your **hands are not  
visibly dirty**,  
frequently clean them  
by using alcohol-based  
hand rub or soap and  
water





# Protect yourself and others from getting sick

## Wash your hands



- after coughing or sneezing
- when caring for the sick
- before, during and after you prepare food
- before eating
- after toilet use
- when hands are visibly dirty
- after handling animals or animal waste



# STAY HEALTHY WHILE TRAVELLING

**If you become sick  
while travelling,  
inform crew and  
seek medical care  
early**



**If you seek medical  
attention, share travel  
history with your health  
care provider**



World Health  
Organization

# STAY HEALTHY WHILE TRAVELLING

**Avoid travel if you have  
a fever and cough**



**If you have a fever, cough and  
difficulty breathing seek medical  
care early and share previous  
travel history with your health  
care provider**



World Health  
Organization



# Bloodborne Pathogens

S3AM-111-PR1

## 1.0 Purpose and Scope

- 1.1 Define the AECOM procedures for eliminating and/or controlling occupational exposure to Bloodborne Pathogens on AECOM projects and activities.
- 1.2 A written Exposure Control Plan shall be developed and implemented during all AECOM operations where there is a reasonable potential for occupational exposure of AECOM employees and/or subcontractors to bloodborne pathogens as a regulated waste.
- 1.3 This procedure's requirements apply to all AECOM Americas employees and operations and any other entity and its personnel contractually required to comply with this document's content. Any jurisdictional requirements exceeding those identified in this procedure shall be met when conducting work in the given jurisdiction.

## 2.0 Terms and Definitions

- 2.1 **Blood** – Human whole blood; human blood components such as plasma or platelets; and human blood products such as clotting factors.
- 2.2 **Bloodborne Pathogens (BBP)** – Pathogenic microorganisms that are present in human blood and that can infect and cause disease in persons who are exposed to blood containing these pathogens including but not limited to hepatitis B virus (HBV), human immunodeficiency virus (HIV), hepatitis C, malaria, syphilis, babesiosis, brucellosis, leptospirosis, arboviral infections, relapsing fever, human T-lymphotropic virus Type I, and viral haemorrhagic fever (Ebola).
- 2.3 **Exposure Control Plan (S3AM-111-ATT1)** – A plan that addresses the requirements applicable to specific AECOM projects and activities designed to eliminate or minimize employee exposure. The Exposure Control Plan shall be incorporated into the location specific SH&E Plan and shall be accessible to all employees. The Exposure Control Plan shall include:
  - Exposure determination.
  - The schedule and method of implementation for:
    - Methods of compliance;
    - Hepatitis B Vaccination;
    - Post exposure Evaluation;
    - Communications of Hazards to employees; and
    - Record Keeping.
  - Documentation methods for exposure incidents, to include:
    - Routes of exposure; and
    - The circumstances for which and exposure incident occurred.

*Note: In the State of California this plan shall also address exposures to airborne pathogens.*
- 2.4 **SH&E Plan** – A document prepared for a specific project or program that details the hazards, precautions, emergency planning, medical, and training requirements for that project or program.
- 2.5 **Occupational Exposure (Exposed)** – Reasonably anticipated skin, eye mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. Employees will be considered to be potentially exposed, even though they are using the universal precautions specified for the project or program.

- 2.6 **Other Potentially Infectious Materials (OPIM)** – Body fluids and tissues including: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, saliva, and any other body fluid that is visibly contaminated with blood. When it is difficult or impossible to differentiate between body fluids, all body fluids should be treated as if they are potentially infectious.
- Note: In the State of California airborne pathogens are also considered infectious materials.*
- 2.7 **Regulated Waste** – (1) liquid or semi-liquid blood or other potentially infectious materials; (2) contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; (3) items that are caked with dried blood or other potentially infectious materials and are capable of being released during handling; (4) objects contaminated with blood that can pierce the skin; and (5) pathological and microbiological wastes containing blood or other potentially infectious materials.
- 2.8 **Source Individual** – An individual, typically one who has been injured, whose blood or saliva has come in contact with another individual, typically one who has rendered first aid or Cardio Pulmonary Resuscitation (CPR) to the injured party.
- 2.9 **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 clean up or decontamination activities. All employees coming in contact with another person's body fluids shall assume that the fluids are infectious and shall wear prescribed Personal Protective Equipment.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.3 S3AM-017-PR1 Injury & Illness Recordkeeping
- 3.4 S3AM-128-PR1 Medical Screening & Surveillance
- 3.5 S3AM-208-PR1 Personal Protective Equipment
- 3.6 S3AM-209-PR1 Risk Assessment & Management

### 4.0 Procedure

#### 4.1 Roles and Responsibilities

##### 4.1.1 Occupational Health Manager

- Will review and maintain all medical records generated as a result of post-exposure follow-up and maintain all medical records related to the follow-up.
- Will, where appropriate, consult with AECOM's local medical providers about follow-up recommendations.

##### 4.1.2 SH&E Manager

- Will review project / program-specific Exposure Control Plans (normally part of the SH&E Plan) prior to the initial mobilization, at least annually for continuing projects or programs, and whenever necessary to reflect modified tasks or procedures that affect occupational exposure to bloodborne pathogens.
- Will consult with the Occupational Health Manager regarding all bloodborne pathogens exposure incidents.
- Will maintain training records and post-exposure follow-up information.
- Will confirm that site-specific training is conducted for all employees working at sites where regulated wastes were disposed or for employees who may be occupationally exposed while working at a facility that handles regulated wastes.

- Will confirm the Hepatitis B vaccine is made available to all employees with a potential occupational exposure (e.g. paramedic, medical laboratory employee, etc.).
- Will review all incident reports and arrange for post-exposure follow-up with AECOM's local medical provider.
- Will offer recommendations on how to prevent an incident from recurring.

#### 4.1.3 **Manager**

- See that all recommendations made by the SH&E Manager are implemented.
- Support the SH&E Manager in their efforts to prevent occupational and non-occupational exposures to bloodborne pathogens.

#### 4.1.4 **Employee**

- Use all PPE and universal precautions required to prevent exposure to infectious materials.
- Follow the exposure control methods outlined in their Exposure Control Plan.
- Report potential exposure incidents to their Supervisor or Manager immediately.

### 4.2 Potential Exposure Situations

4.2.1 There are a few activities within AECOM where potential occupational exposures to blood or other potentially infectious materials are of concern. These activities may include:

- Investigations of properties that received regulated wastes.
- Site visits or audits at Treatment Storage and Disposal facilities where medical waste is handled.
- Site visits or audits at medical or health care facilities.
- The provision of first-aid or cardiopulmonary resuscitation (CPR) to AECOM, subcontractor, or client personnel (if the action is part of the employee's occupations duties [e.g. paramedic] and not provided as a voluntary action).

4.2.2 Although AECOM does offer first-aid and CPR training to its employees on a regular basis, providing such aid 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. Site-specific Exposure Control Plans shall differentiate voluntary first-aid duties from occupational exposures as a component of the exposure determination. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

### 4.3 Unforeseen Exposure Situations

4.3.1 Occasionally, potentially infectious material is encountered during a activity where none was expected; when this happens, the work shall be stopped, employee training conducted, and an exposure control plan prepared prior to resuming activities with potential exposures.

### 4.4 Employee Training

4.4.1 All personnel who will work on projects or programs which involve potential contact with regulated wastes will be required to attend a training class prior to the start of the project or program and annually for continuing projects or programs. Refer to *S3AM-003-PR1 SH&E Training*. The specific requirements and provisions of the written Exposure Control Plan shall be provided to each AECOM Employee and subcontractor assigned to work at the program / project.

4.4.2 Either of the following two sources of employee training will be used by AECOM to educate Employees on the hazards of exposure to bloodborne pathogens:

- The local chapter of the American Red Cross or other recognized training provider.
- AECOM's in-house training program.

#### 4.4.3 Training sessions will review the following:

- Requirements of OSHA's Bloodborne Pathogens Standard or equivalent, applicable jurisdictional requirements.
- Review of AECOM's Bloodborne Pathogen Procedure (this document).
- Situations within AECOM that may involve exposure to bloodborne pathogens.
- Bloodborne diseases and symptoms of disease.
- Means of transmission.
- Work practice controls to reduce risk.
- Use of personal protective equipment to reduce risk.
- Incident reporting.
- AECOM's Post-Exposure Medical Follow-Up Procedures:

4.4.4 When contracting for CPR and first-aid training sessions, AECOM will request that each session include a section on the hazards associated with exposure to bloodborne pathogens and protective measures that shall be followed when administering first aid, CPR, or other emergency medical care. At the end of the session, Employees will be provided with a copy of this procedure. This procedure will be reviewed and a question-and-answer session will be conducted at the end of the presentation.

4.4.5 If the training provider cannot provide such training, AECOM will conduct a Blood Borne Pathogen training session prior to the start of the first aid or CPR class.

4.4.6 AECOM has and will have little control over employees who have not received AECOM provided first aid or CPR training, but who choose to perform Good Samaritan acts. Any Employee who does perform a Good Samaritan act that results in exposure to blood or other potentially infectious materials will, however, be provided with post-exposure medical follow-up as described in this procedure.

#### 4.5 Personal Protective Equipment

4.5.1 All body fluids and materials potentially contaminated by body fluids will be considered to be infectious. All Employees coming in contact with another person's body fluids shall assume that the fluids are infectious and shall wear prescribed personal protective equipment (PPE), refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.5.2 The use of PPE to prevent exposure is more appropriate for the types of occupational and non-occupational exposures Employees might encounter than is the use of engineering or work practice controls that are more effectively instituted in medical care or laboratory facilities where employees are actually handling blood and other potentially infectious materials.

4.5.3 PPE such as Tyvek coveralls, shoe covers, and gloves will be provided to all field team members involved in site activities where regulated wastes may be present. Site-specific PPE requirements will be identified in the written Exposure Control Plan. The same type of PPE will also be available, if it is deemed necessary, for Employees involved with activities at TSD facilities that handle regulated wastes.

4.5.4 PPE will be provided to affected Employees at no cost.

#### 4.6 Universal Precautions Kits

4.6.1 In those work areas where there is the potential for exposure to infectious materials, a universal precaution kit shall be readily available. The kit shall permit the clean-up, neutralization, transportation, and disposal of up to 1 litre of blood or body fluids. The kit shall contain the following items at a minimum:

- Safety shield/mask combination
- Liquid proof apron
- Medical-grade vinyl/nitrile gloves
- Liquid solidifier/deodorizer
- Pickup scoop with scraper
- Red biohazard waste bag with tie
- Germicidal solution with dry wipe
- Antimicrobial hand wipe
- ID tag
- Instructions for use

#### 4.7 Personal Hygiene

- 4.7.1 Special provisions will be made so that hand washing facilities are available on-site for sites that are known to be contaminated with regulated wastes. Alcohol wipes will be available in the event that hand washing facilities are not immediately available.
- 4.7.2 To reduce the potential for infection, if skin contact with blood or other potentially infectious materials occurs, the exposed area should be washed with non-abrasive soap and water as soon as possible. Hand washing will also help to prevent the transfer of contamination from the hands to other areas of the body or other surfaces that may be contacted later. Even when protective gloves are worn, hands should be washed with non-abrasive soap and running water as soon as possible after the gloves are removed.
- 4.7.3 The use of an alcohol wipes should not be relied upon as the primary means of personal hygiene. Hands should be thoroughly washed with soap and running water as soon as possible.
- 4.7.4 If mucous membranes, such as the eyes, come in direct contact with blood or other potentially infectious materials, the area should be washed or flushed with water as soon as possible and reported immediately.

#### 4.8 Reporting Exposure Incidents

- 4.8.1 All incidents in which an employee has been exposed to blood or other potentially infectious materials shall be reported to the employee's Supervisor and to the SH&E Manager immediately. An IndustrySafe on-line report shall be completed in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*. After reviewing the report, the SH&E Manager will provide recommendations, when appropriate, for preventing recurrence of the incident.

#### 4.9 Medical Follow-Up to Exposure Incidents

- 4.9.1 Once notified, the SH&E Manager will in turn discuss the incident with AECOM's Occupational Health Manager and/or medical provider and make arrangements for an evaluation, refer to *S3AM-128-PR1 Medical Screening & Surveillance*. Prompt medical attention is important in the event of an exposure incident. If the incident occurs in the field, the Employee will either be asked to visit the local hospital or, if he/she chooses, return immediately to the office to visit AECOM's local medical provider.
- 4.9.2 An attempt will be made to test the affected employee, and if applicable, the source individual's blood, for bloodborne pathogens. No testing will be performed without the written consent of the exposed Employee or the source individual. If initially, the exposed Employee or the source individual does not consent to HIV serological testing, but does consent to HBV serological testing, AECOM will make provisions with the local medical provider to preserve the blood sample for at least 90 days in the event that after counselling efforts, the Employee voluntarily consents to HIV testing.

- 4.9.3 AECOM will rely on the professional judgment of its Occupational Health Manager and/or local medical providers in the event of an exposure incident. Evaluations and follow-up procedures will be provided according to the recommendations of the United States Public Health Service (USPHS), World Health Organization, or other Public Health organization in Canada and other countries in the Americas current at the time these evaluations and procedures take place. Minimally, a post-exposure evaluation and follow-up will include the following elements:
- Documentation of the route(s) of exposure
  - Circumstances under which the exposure incident occurred
  - Identification and documentation of the source individual in the case of first aid or emergency medical treatments
  - Collection and testing of source individuals and exposed employee's blood for HBV and HIV serological status as soon as feasible and upon consent
  - Post-exposure vaccination when medically indicated, as recommended by the USPHS
  - Counselling, if necessary
  - Evaluation of reported illnesses
- 4.9.4 Any and all follow-up recommendations offered by the physician will be immediately instituted by the SH&E Manager with the guidance of the Occupational Health Manager and/or the local medical provider and at no cost to the affected Employee. Repeat testing, counselling, and follow-up, if recommended, will also be provided at no cost to the Employee. AECOM will rely on the Occupational Health Manager and/or the local medical provider to provide counselling to Employees concerning infection status, including results of and interpretation of medical tests and advising the Employee about the protection of personal contacts.
- 4.9.5 All medical providers shall submit to AECOM's Occupational Health Manager and the affected Employee a written opinion of the post-exposure evaluation within 15 days of the completion of the evaluation.
- 4.9.6 All medical records generated as a result of the post-exposure evaluation will be retained in the office of the Occupational Health Manager, and as applicable AECOM's medical services provider, under lock and key and will be maintained with the strictest confidentiality. Refer to *S3AM-017-PR1 Injury & Illness Recordkeeping*.
- 4.10 Hepatitis Vaccination
- 4.10.1 Prior to performing site visits or field investigations where regulated wastes are stored, processed, or known to have been disposed of, AECOM will consult with the Occupational Health Manager and/or the local medical providers to determine if a hepatitis A or B vaccination is appropriate given the site conditions and the proposed scope of work. Where possible the first Hepatitis B vaccinations will be given prior to working at sites with known, potential occupational exposures.
- 4.10.2 Although AECOM does offer first-aid and CPR training to its Employees on a regular basis, providing such aid is often voluntary and not as a specified job duty of an Employee. As such, potential exposures may not be considered occupational within the context of the government Bloodborne Pathogens Standard. Pre-exposure hepatitis vaccinations will not typically be offered for voluntary roles.
- 4.10.3 Post-exposure hepatitis vaccination will be offered to Employees involved in an exposure incident within 24 hours of possible exposure.
- 4.10.4 The vaccinations discussed above shall be provided to Employees at no cost if required by the exposure determination.

#### 4.11 Housekeeping

- 4.11.1 Other than through the provision of first aid or CPR, there is no potential for occupational exposure to blood or other potentially infectious materials within any of the AECOM offices. Therefore, the housekeeping requirements and requirements for warning signs and labels contained in the OSHA Bloodborne Pathogens standard are not applicable to our office operations.
- 4.11.2 When working at a site where regulated wastes have been disposed of, the specific housekeeping and warning sign requirements will be prescribed by the client and/or in the site-specific HASP.
- 4.11.3 When working at a client's facility, AECOM will review the facilities plan for compliance with all the requirements of the Bloodborne Pathogens Standard and will observe all housekeeping requirements, wear required PPE, and acknowledge all warning signs and labels as specified in the client's plan. If the client does not have an effective plan, AECOM will prepare a plan as part of the written Exposure Control Plan.

#### 4.12 Regulated Waste Generated by AECOM

- 4.12.1 Any regulated waste generated by AECOM as a result of first aid activities or clean-up of potentially infectious material will be collected in sealed, watertight containers and disposed of according to the Host Employer's BBP program or disposed of through a permitted regulated waste facility.
- 4.12.2 Disposal manifests shall be maintained in accordance with local or governmental regulations.

#### 4.13 Material Decontamination

- 4.13.1 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, gloves, etc.). Refer to *S3AM-208-PR1 Personal Protective Equipment*.

#### 4.14 Procedure and Plan Review

- 4.14.1 All Exposure Control Plans for projects or programs extending over one year shall be reviewed annually by the SH&E Manager and affected Employees.

### 5.0 Records

- 5.1 Each SH&E Manager will maintain records and provide copies of the records to the Occupational Health Manager, related to bloodborne pathogens in accordance with the provisions of the standard and *S3AM-017-PR1 Injury & Illness Recordkeeping*.
- 5.2 Records maintained in accordance will include bloodborne pathogens exposure incidents, post-exposure follow-up, vaccination status, and training for all Employees with potential occupational exposure.
- 5.3 Employee medical and training records required by this procedure shall be provided upon request for examination and copying to the Employee, to anyone having written consent of the subject employee, or to State, Province, or Federal Occupational Safety and Health regulatory agencies.

### 6.0 Attachments

- 6.1 [S3AM-111-ATT1 Bloodborne Pathogens Exposure Control Plan](#)
- 6.2 [S3AM-111-FM1 Hepatitis B Vaccination Declination](#)

# Bloodborne Pathogens Exposure Control Plan

S3AM-111-ATT1

## 1.0 Introduction

Employees are at risk for exposure to and possible transmission of infectious diseases each time they are in contact with blood or body fluids. Bloodborne pathogens are microorganisms present in human blood and other body fluids that can cause serious disease in humans and include, but are not limited to Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV). Therefore, this exposure control plan (ECP) has been established to ensure that employees are effectively informed concerning potential workplace health hazards, and that protective measures necessary to eliminate or minimize bloodborne exposure incidents are used whenever possible.

## 2.0 Exposure Determination

2.1 The Medical Screening Evaluation form will be used to evaluate which employees may incur occupational exposure to blood or other potentially infectious materials when performing routine tasks and procedures. Refer to *S3AM- 128-PR1 Medical Screening & Surveillance*. These exposure determinations will be made without regard to the use of personal protective equipment, and regardless of exposure frequency.

2.1.1 The employees in the following job classifications may have occupational exposure to bloodborne pathogens, and are covered by this program:

- Occupational health nurse
- Paramedics
- Registered nurses
- Designated first aid providers (providing first aid identified as part of the employee's occupational duties and not a voluntary action)
- Medical laboratory employees
- Janitorial workers in medical facilities and clinics.

2.1.2 Tasks and procedures that may expose the above employees to bloodborne pathogens include:

- Treating cuts, abrasions, and burns
- Cleaning contaminated environmental surfaces
- Administering cardiopulmonary resuscitation (CPR).

## 3.0 Exposure Control

3.1 "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 HIV, HBV, HCV, and other bloodborne pathogens, regardless of the perceived risk status of another individual. Universal precautions apply to blood, other body fluids containing visible blood, semen, and vaginal fluids. Universal precautions do not apply to feces, nasal secretions, saliva, sweat, tears, sputum, urine, and vomitus unless they contain visible blood. Although these fluids have an extremely low or nonexistent risk for bloodborne pathogens, they are a potential source for other infectious diseases, and precautions shall also be followed when these body fluids are present.

3.2 Engineering and Work Practice Controls

3.2.1 The following engineering controls will be in place in all areas of occupational exposure:

- Containers for disposable contaminated sharps shall be puncture-resistant, labeled a biohazard, leak-proof, and have a closable top.



- Containers for storage, transport, or shipment of blood or other potentially infectious materials, regulated waste, and contaminated laundry will be labeled with the biohazard symbol and site address, and have a securely closing lid.
- Engineering controls will be reviewed and maintained on a regular basis to ensure effectiveness.

3.2.2 The following work practice controls (administrative and personal protective equipment) shall be strictly followed to minimize exposure, and isolate or remove bloodborne pathogens from the workplace:

- Accessible handwashing facilities. 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 shall wash their hands with soap and running water as soon as feasible.
- 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 will be used. PPE shall be readily accessible and will be removed prior to leaving the work area.
- Disposable single-use gloves shall 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 will not be washed or disinfected for reuse, and will 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.
- 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, shall be worn whenever splashing, spraying, or spattering of blood droplets or body fluids can be reasonably anticipated.
- Disposable pocket mask ventilation devices shall be provided in all first aid kits and used to avoid mouth-to-mouth contact during emergency cardiopulmonary resuscitation.
- Examples of Recommended PPE (depending on task, more PPE may be needed).

<b><u>Task</u></b>	<b><u>Gloves</u></b>	<b><u>Gown</u></b>	<b><u>Mask</u></b>	<b><u>Goggles</u></b>
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/clean-up	Yes	No	No	No
Medical laboratory activities	Yes	Yes	Yes	Yes

3.2.3 Eating, drinking, smoking, applying cosmetics, and handling of contact lenses is prohibited in work areas where there is a reasonable likelihood of occupational exposure. Food and drink cannot be kept in refrigerators, freezers, shelves, cabinets, or on counter tops where blood or body fluids are present.

3.2.4 Contaminated needles and other sharps shall not be bent or recapped unless a one-handed technique is used. They shall be disposed of in an appropriate sharps container.

3.2.5 All regulated biohazardous waste will be placed in a waste receptacle that has designated red biohazard bags and a closable top controlled by a foot peddle. When full, the bags shall be removed with gloved hands, tied off, and placed in a biohazard shipping carton, to be held for pick-

up. If any biohazard bag appears to be leaking, it shall be double-bagged. The waste will be incinerated per federal, provincial/territorial/state regulations.

### 3.3 Housekeeping

- 3.3.1 Universal precautions shall be used when cleaning or decontaminating any surface or equipment that may be contaminated. Appropriate PPE shall be used for protection during decontamination.
- 3.3.2 All contaminated environmental work surfaces such as countertops or floors will be cleaned according to regulatory requirements or with a household bleach solution diluted 1:10 with water directly following contamination with blood or body fluids.
- 3.3.3 Instruments such as tweezers, bandage scissors, and thermometers shall be disposable rather than reusable equipment, and shall be disposed of in an appropriate manner.
- 3.3.4 Broken, contaminated glassware shall not be picked up directly with the hands. It shall be cleaned up using a mechanical means such as a brush and dustpan or tongs.

## 4.0 Hepatitis B Vaccination

- 4.1 Within 10 working days of placement, all employees assigned to tasks with potential occupational exposure to bloodborne pathogens shall be offered the Hepatitis B vaccination at no cost to the employee, unless the employee has had a previous Hepatitis B vaccination series, antibody testing reveals the employee is immune, or the vaccine is contraindicated for medical reasons. Further, this vaccination series shall be made immediately available to employees who have an occupational exposure, whether as a result of their assigned tasks, or occurring from an incidental contact.
- 4.2 The local occupational medical facility used for routine medical surveillance will administer the vaccinations.
- 4.3 Employees who decline the Hepatitis B vaccine shall sign a copy of the waiver form located at the end of this Work Instruction. The signed waiver will be stored in the employee's medical record with the Occupational Health Manager. Employees may initially decline the vaccination, but may decide to take them at a later date, while still covered under this plan. The vaccinations will be made available to the employee at that time.
- 4.4 Employees choosing to take the vaccination series will sign a consent form at the occupational clinic prior to receiving the injections, and are advised to read the package insert regarding the efficacy, safety, method of administration, and benefits of the vaccine. Employees may also ask questions directly of the Medical Service Provider or local occupational physician. Employees are not required to participate in a prescreening program (to determine immunity) before receiving the vaccinations. If a routine booster of Hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) will be made available to affected employees.

## 5.0 Post-Exposure Incident Evaluation And Follow-Up

- 5.1 All occupational bloodborne pathogen exposures shall be reported to the HSE representative and Occupational Health Manager immediately after initial decontamination first aid is accomplished. Following the report of an exposure incident, a confidential medical evaluation with an occupational physician will be arranged as soon as possible, ideally no later than 1 to 2 hours after the incident has occurred. In some jurisdictions, depending on applicable workers' compensation law, employees may choose treatment from their personal physician. A copy of the OSHA Bloodborne Pathogen Standard, if applicable to the jurisdiction, will be provided if the physician does not have a copy. A written incident report shall be completed as soon as possible, fully describing the incident.
- 5.2 First aid protocol for treatment immediately after an exposure incident:
  - 5.2.1 Lacerations, punctures, and abrasions should be washed under cool running water for at least 5 minutes, allowing free bleeding. Cleanse area well with soap or iodine solution. Apply sterile dressing as needed. Give tetanus booster if indicated (7 to 10 years since last booster).

- 5.2.2 Ocular exposure requires irrigation of the eye with water or sterile normal saline solution for 15 minutes.
- 5.2.3 Mucous membrane exposure requires rinsing mouth with ½ strength 3 percent hydrogen peroxide for 30 seconds, four separate and consecutive times.
- 5.3 Confidential Medical Evaluation
  - 5.3.1 The treating occupational physician will receive documentation of the routes of exposure, the circumstances surrounding the incident, and identification of the source individual (the individual the employee was exposed to). The blood of the source individual will be tested if possible, and after consent is obtained. When legally permissible, results of the source individual's tests will be made available to the exposed employee, with the exposed employee informed about the applicable laws and regulations concerning the disclosure of the identity and infectivity of the source individual.
  - 5.3.2 Testing of the exposed employee's blood, if consented to (the employee may consent to baseline blood collection, but may request that the sample not be tested for HIV for up to 90 days, if at all), is recommended.
  - 5.3.3 Post-exposure medical treatment will be offered in accordance with the current recommendations of the U.S. Public Health Services. This may include, but is not limited to:
    - A series of HIV post-exposure blood tests
    - Hepatitis B vaccination and/or Hepatitis B immune globulin
    - HIV post-exposure prophylactic medications
    - Evaluation of acute febrile illnesses following exposure
    - Employee counseling concerning precautions to take during the period after the exposure incident, and information on signs and symptoms of potential illnesses.
- 5.4 Healthcare Professional's Written Opinion
  - 5.4.1 The Occupational Health Manager shall obtain and provide the employee with a copy of the evaluating physician's written opinion within 15 days of the completion of the medical evaluation. A copy will be maintained in the employee's confidential medical record. The written opinion shall be in accordance with the requirements of the OSHA Bloodborne Pathogens Standard indicating that the employee has been informed of any medical conditions resulting from exposure that require further evaluation or treatment. All other findings or diagnoses shall remain confidential and will not be included in the report.

## **6.0 Hazard Communication**

- 6.1 Fluorescent red or orange-red warning labels bearing the universal biohazard symbol and the legend BIOHAZARD shall 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.
- 6.2 All employees designated to perform tasks involving occupational exposure shall receive bloodborne pathogens training at the time of initial assignment to the job. This training will be given during working hours and at no cost to employees. Refresher courses will be provided annually (within 1 year of previous training), and if new tasks or procedures are implemented. Material appropriate in content and vocabulary to education level, literacy, and language of the employees shall be used for all required training.
- 6.3 Training will include: making accessible a copy of the regulatory text of the standard and explanation of its contents, general discussion on bloodborne diseases and their transmission, exposure control plan, engineering and work practice controls, personal protective equipment, Hepatitis B vaccine, response to emergencies involving blood, how to handle exposure incidents, the post-exposure evaluation and follow-up program, signs/labels/color-coding, and question and answer time with the trainer.

## **7.0 Exposure Incident Investigation**

- 7.1 The SH&E Manager will review the circumstances of any exposure incident to determine corrective actions. The incident report will include:
- 7.1.1 Engineering controls in use at the time
  - 7.1.2 Work practices followed
  - 7.1.3 A description of any equipment being used
  - 7.1.4 A description of the work being performed
  - 7.1.5 PPE that was used at the time of the incident
  - 7.1.6 Date, time, and location of the incident
  - 7.1.7 Employee's training.
- 7.2 An incident report shall be completed within four hours of the incident and entered into AECOM's on-line incident reporting system (e.g., IndustrySafe) in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigations*. A copy of this incident report will be forwarded to the Occupational Health Manager, who will evaluate what follow-up actions should be addressed, including if revisions need to be made to the Exposure Control Plan.

## **8.0 Recordkeeping**

- 8.1 The Occupational Health Manager will be responsible for establishing and maintaining accurate, confidential workers' compensation medical records for each employee with occupational exposure for the duration of employment plus 30 years, in accordance with OSHA 29 CFR 1910.1020 – Access to Employee Exposure and Medical Records.
- 8.2 The SH&E Manager will be responsible for maintaining the bloodborne pathogens training class records 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.
- 8.3 Employee medical records shall be made available to employees (or their designated representative) with written consent by the employee within 15 working days of request.
- 8.4 An exposure incident will be evaluated by the Occupational Health Manager and SH&E Manager to determine if the case meets OSHA's Recordkeeping Requirements (29 CFR 1904).

Americas

**Hepatitis B Vaccination Declination****S3AM-111-FM1**

I understand that due to my occupational exposure to blood or other potentially infectious materials, I may be at risk of acquiring Hepatitis B virus (HBV) infection.

I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself; however, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If, in the future, I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive the vaccine series at no cost to me.

Name:

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Date:

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Witness:

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Date:

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## Cold Stress

S3AM-112-PR1

### 1.0 Purpose and Scope

- 1.1 To protect employees from the severest effects of cold stress (hypothermia) and cold injury and to identify exposures to cold working conditions under which it is believed nearly all employees can be repeatedly exposed without adverse health effects.
- 1.2 This procedure applies to all AECOM Americas based employees and operations, and any other entity and its personnel contractually required to comply with this document's content, working outdoors in damp and cool (below 50 degrees Fahrenheit [°F] or 10 degrees Celsius [°C]) conditions or anytime temperatures are below 32°F or 0°C.

### 2.0 Terms and Definitions

- 2.1 **Cold Stress** – The production of physiological effects due to cold temperatures and/or wind chill.
- 2.2 **Equivalent Chill Temperature (ECT)** – Also known as Wind Chill (see below).
- 2.3 **Frostnip** – Superficial cooling of tissues without cellular destruction.
- 2.4 **Frostbite** – Freezing of tissue, resulting in tissue destruction.
- 2.5 **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.
- 2.6 **Wind Chill** – The combined effect of air temperature and wind. Also expressed as "equivalent chill temperature" (ECT), wind chill is defined as heat loss resulting from the effects of air temperature and wind velocity upon exposed skin.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-128-PR1 Medical Screening & Surveillance Program
- 3.3 S3AM-208-PR1 Personal Protective Equipment
- 3.4 S3AM-314-PR1 Working Alone
- 3.5 S3AM-315-PR1 Working On or Near Water
- 3.6 S3AM-333-PR1 Marine Safety & Vessel Operations

### 4.0 Procedure

#### 4.1 Roles and Responsibilities

##### 4.1.1 Manager

- Ensuring the safety of employees on their project sites, consistent with regulatory standards.
- Implement cold stress prevention measures as applicable at each work site.
- Develop/coordinate a work-warning regimen, as applicable.
- Confirm cold stress hazard assessments/evaluations were completed for the planned activities.
- Assign employees physically capable of performing the assigned tasks. Consider acclimation to cold weather when evaluating employee capability.

- Confirm employees are properly trained to recognize the symptoms of cold stress.

#### 4.1.2 **Safety, Health and Environment (SH&E) Manager**

- Conduct/support cold stress assessments/evaluations.
- Conduct/support incident investigations related to potential cold stress-related illnesses.
- Assist project teams develop appropriate work-warming regimens.
- Provide cold stress awareness training.

#### 4.1.3 **Supervisor**

- Identify the tasks that may be most impacted by cold stress and communicate the hazard to the assigned employees.
- Confirm that employees have been trained on the recognition of cold stress-related illnesses.
- Confirm that adequate supplies of warm fluids/drinks are readily available to employees.
- Confirm that a warm/sheltered rest area is available, as applicable.
- Conduct cold stress monitoring, as applicable.
- Implement the work-warming regimen.
- Confirm that first aid measures are implemented once cold stress symptoms are identified.
- Confirm that employees are physically capable of performing the assigned tasks and are not in a physically compromised condition.

#### 4.1.4 **Employee**

- Observe each other for the early symptoms of cold stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Report to work in a properly rested condition.
- Report all suspected cold stress-related illnesses.

### 4.2 **Requirements**

- 4.2.1 Carefully plan work anticipated to be performed in cool or cold conditions. If possible, heavy work should be scheduled during the warmer parts of the day or when the wind is most calm. Include costs in project budgets for specialized equipment and supplies needed to complete the field activities.
- 4.2.2 Staff working in extreme cold (wind chill or ECT below 10°F or -12°C) shall not work alone. The Buddy System shall be utilized to keep an eye on each other and to watch for signs of cold stress. Refer to *S3AM-314-PR1 Working Alone*. Watch for symptoms and signs of hypothermia
- 4.2.3 Monitor weather forecasts and weather conditions such as ambient temperature, wind speed, and precipitation. Use observations prior to entering and while in the field to ensure appropriate protections are in place:
- If possible, move the work to a warm location.
  - If possible and as applicable, erect shelters or screens around the work area.
  - If possible, heat the work area.
  - If possible, adjust schedule according to the cold conditions, work level and worker acclimatization.
  - Implement a work-warming regimen by taking breaks out of the cold. As applicable, consult *S3AM-112 ATT1 Temperature Thresholds* to determine wind chill and work-warming schedule.
  - Take frequent short breaks in warm dry shelters to allow your body to warm up. Limit time of exposure to the cold. If shelter is not readily available, consider supplying temporary shelters.



- Provide assistance to prevent body heat loss, such as:
  - Providing appropriate sources of heat (e.g. warm packs, portable heaters, etc.).
  - Use of insulating materials on equipment handles when temperatures drop below 30°F (-1°C).

4.2.4 All staff working in extreme cold or snow conditions should understand the following guidelines for preventing and detecting hypothermia and frostbite; refer to *S3AM-112-ATT2 Symptoms & Treatment*:

- Ensure appropriate PPE requirements are established and adhered to.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Because prolonged exposure to cold air or to immersion in cold water at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection shall be used.
- Eat high calorie snacks to help maintain body metabolism.
- Confirm extra blankets or sleeping bags are on-site.
- Drink plenty of warm liquids. It is easy to become dehydrated in cold weather.
- Avoid caffeine and alcohol, which can act as diuretics. Alcohol consumption, depending upon quantity, can dilate blood vessels enhancing body heat loss or constrict blood vessels decreasing heat delivery to extremities.
- NEVER IGNORE SHIVERING. Persistent or violent shivering is a clear warning that you are on the verge of hypothermia.
- If you experience frost bite or hypothermia, find shelter and warmth and contact a medical practitioner if symptoms persist, refer to *S3AM-128-PR1 Medical Screening & Surveillance*.

### 4.3 Training

Before they begin work in a cold environment, employees that might be exposed to cold stress will be informed of the potential for cold stress and how to prevent cold stress. Employees that have not had the training within the twelve prior months shall repeat the training before exposure to cold stress, refer to *S3AM-003-PR1 SH&E Training*. Employees potentially exposed to cold stress will receive training including, but not limited to:

- 4.3.1 Sources of cold stress, the influence of protective clothing, and the importance of acclimatization.
- 4.3.2 How the body loses heat.
- 4.3.3 Recognition of cold-related illness symptoms.
- 4.3.4 Cold stress preventative/corrective measures including, but not limited to:
  - Weather monitoring.
  - Proper eating and drinking practices.
  - Work-warming schedules and proper re-warming techniques.
  - Buddy system.
  - Safe cold work practices appropriate to the work that is to be performed.
  - Proper use of cold environment personal protective clothing.
- 4.3.5 The harmful effects of excessive alcohol consumption in a cold stress environment.
- 4.3.6 The hazards associated with unstable snow or ice build ups.
- 4.3.7 First aid procedures for symptoms related to cold stress.

#### 4.4 Personal Protective Equipment (PPE)

Wearing the right clothing is crucial to avoiding cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, on the other hand, retains its insulation even when wet. Adequate insulating dry clothing will be required in air or wind chill temperatures below 40 °F (4.4°C)

All PPE will comply with the requirements of *S3AM-208-PR1 Personal Protective Equipment* and consider the following requirements:

- 4.4.1 Wear at least 3 layers of clothing to help prevent cold stress. It is important to preserve the air space between the body and the outer layer of clothing to retain body heat.
  - Wear a middle layer of down, wool, or similar materials to provide insulation.
  - Avoid cotton, especially blue jeans.
  - Wear an outer layer to break the wind and allow some ventilation (e.g., Gortex® or nylon)
  - Do not wear tight clothing. Loose clothing allows better ventilation.
- 4.4.2 Wear proper clothing, including head coverings and gloves or mittens for cold, wet, and windy conditions.
- 4.4.3 Wear a hat or hardhat liner. Up to 40 percent of body heat can be lost when the head is left exposed.
- 4.4.4 Use insulated footwear with adequate traction to prevent slips and falls.
- 4.4.5 Wear insulated boots or other insulated footwear, and insulated gloves to help reduce the chance of frostbite.
- 4.4.6 Keep a change of dry clothing available in case work clothes become wet.
- 4.4.7 Eye and face protection for employees employed outdoors in a snow and/or ice-covered terrain should be supplied.
  - Sunglasses (with UVA and UVB protection) and sunscreen should be used when there is a persistent combination of snow and direct sun.
  - Special safety goggles to protect against blowing ice crystals and ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.
  - Ensure face guards are used to protect skin in cold, windy conditions, including riding on an unshielded vehicle.

#### 4.5 General Cold Stress Prevention Measures

- 4.5.1 In order to prevent hypothermia:
  - Wear appropriate clothing and PPE as determined by the weather conditions.
  - When active, ventilate excess heat by opening or removing outer layers of clothing to avoid sweating.
    - Start with the mitten or gloves, unless protection from ice, snow, or cold metal surfaces is needed.
    - Next remove head gear and neck wrappings.
    - Then coats/parkas should be opened at the waist and sleeves.
    - Finally, layers of clothing should be taken off.
    - When resting or tired, or colder conditions are encountered, add additional layers of clothing/ close outer layers in the reverse of the above order, or get out of the cold. Have a sweet drink but do not indulge in heavy eating.

- Garments worn to keep out rain and spray should also allow water vapor to escape.
- Take advantage of heat from the sun and stay out of the wind as much as possible.
- Have available emergency shelter providing protection from wind and rain and insulation from the ground.
- Replace wet clothing. If wet clothing cannot be replaced, then cover it with a layer of non-breathing material to prevent evaporation. Place an insulation layer over this non-breathing material.
- Get adequate rest; conserve energy.
- Get adequate nutrition to replenish energy stores; rest after meals.
- Drink adequate fluids to avoid dehydration.
- If any project / location staff member shows signs of hypothermia, stop and treat him/her.

4.5.2 In order to prevent frost bite:

- Dress to prevent hypothermia and protect the feet and hands.
- Avoid obstruction of circulation by, for example, tight boots or tightly fitting clothing.
- Avoid nicotine (particularly cigarettes) and do not consume alcohol.
- Keep ears and nose covered and out of the wind.
- Frostbite of the corneas of the eyes can be prevented by protective goggles.
- Adopt a "buddy system" of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).
- Practice constant personal vigilance for signs of trouble in one's own fingers and toes; when in doubt, investigate thoroughly before it is too late.

4.5.3 Adequate, insulating dry clothing that will help maintain core temperatures above 96.8°F (37°C) shall be provided to employees if work is performed in air temperatures below 40°F (4.4°C). Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.

4.5.4 An Equivalent Chill Temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in *S3AM-112-ATT1 Temperature Thresholds*. Unless unusual or extenuating circumstances exist, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F (0°C) regardless of wind speed. However, older employees, those with circulatory problems and those with previous cold injuries require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions that should be considered.

4.5.5 Continuous exposure of skin should not be permitted when the air speed and temperature results in an ECT of -25°F (-32°C) or below.

4.5.6 At air temperatures of 40°F (4.4°C) or less, it is imperative that employees who become immersed in water or whose clothing becomes wet be immediately removed from the cold environment, provided a change of clothing, and be treated for hypothermia.

4.5.7 If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.

4.5.8 Adequate protection, such as general ventilation, shall be incorporated into any warming shelter design to prevent carbon monoxide poisoning.

- 4.5.9 Operation of internal combustion or similar devices within warming shelters is prohibited.
- 4.5.10 If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.
- 4.5.11 Walking and working surfaces shall be cleared of ice and snow to prevent slips and falls.
- 4.5.12 Confirm that employees carry fire starter materials if working in remote areas.
- 4.5.13 Supplies such as PPE, fuels, enclosures, de-icing, traction aids, warm drinks, and batteries will be specified by the SH&E Manager and/or the Manager and made available. These supplies will be inspected at least weekly during cold weather projects and replaced when necessary.
- 4.6 Cold Stress Prevention Measures for the Hands
  - 4.6.1 Special protection of the hands is required to maintain manual dexterity for the prevention of accidents including, but not limited to the following:
    - If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60°F (15°C), special provisions should be established for keeping the employees' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30°F (-1° C).
    - If the air temperature falls below 60°F (15°C) for sedentary work, 40°F (4.4° C) for light work, or 20°F (-6°C) for moderate work, and fine manual dexterity is not required, employees should use gloves.
  - 4.6.2 To prevent contact frostbite, employees should wear anti-contact gloves:
    - When cold surfaces below 20°F (-6°C) are within reach, each employee should be warned to prevent inadvertent contact by bare skin.
    - If the air temperature is 0°F (-18°C) or less, employees should protect their hands with mittens or appropriate gloves. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens or gloves.
    - Ensure an adequate supply of dry gloves is available to replace wet gloves.
  - 4.6.3 Provisions for additional total body protection are required if work is performed in an environment at or below 40°F (4.4°C). The employees should wear cold protective clothing appropriate for the level of cold and physical activity.
  - 4.6.4 Additional Cold Stress Prevention Measures:
 

For work practices at or below 10°F (-12°C) ECT, the following will apply:

    - The employee should be under constant protective observation (buddy system or supervision).
    - The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work is being performed, rest periods should be taken in heated shelters and opportunities to change into dry clothing should be provided.
    - New employees should not be required to work full time in the cold during the first days of employment until they become acclimated to the working conditions and required protective clothing. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.
    - The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the employee.
    - The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The employee should be protected from drafts to the greatest extent possible.

- 4.6.5 Employees handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 40°F should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of “cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.
- 4.6.6 Trauma sustained in freezing or subzero conditions requires special attention, because an injured employee is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

#### 4.7 Hypothermia in Water

- 4.7.1 Loss of body heat to the water is a major cause of deaths in boating and working near water incidents. Often the cause of death is listed as drowning; however, the primary cause is often hypothermia. It should also be noted that alcohol lowers the body temperature around 2 to 3 degrees by dilating the blood vessels. Do not drink alcohol around cold water. The following table shows the effects of hypothermia in water:

WATER TEMPERATURE	EXHAUSTION	SURVIVAL TIME
32.5°F (0°C)	Under 15 minutes	Under 15 to 45 minutes
32.5 to 40°F (0 to 4°C)	15 to 30 minutes	30 to 90 minutes
40 to 50°F (4 to 10°C)	30 to 60 minutes	1 to 3 hours
50 to 60°F (10 to 16°C)	1 to 2 hours	1 to 6 hours
60 to 70°F (16 to 21°C)	2 to 7 hours	2 to 40 hours
70 to 80°F (21 to 27°C)	3 to 12 hours	3 hours to indefinite
Over 80°F (27°C)	Indefinite	Indefinite

- 4.7.2 Some points to remember when water is a potential hazard:

- Wear a personal flotation device when drowning is a potential hazard. Refer to *S3AM-315-PR1 Working On or Near Water*, and *S3AM-333-PR1 Marine Safety & Vessel Operations*.
- If the water is less than 50°F (10°C), wear a wet suit or dry suit for work in water (e.g., wading, or if a significant potential to fall in water exists).
- While in the water, do not attempt to swim unless to reach nearby safety. Unnecessary swimming increases the rate of body heat loss. Keep the head out of the water. This will increase survival time.
- Keep a positive attitude about rescue. This will increase chances of survival.
- If there is more than one person in the water, huddling is recommended to conserve body heat.

- 4.7.3 If an employee or equipment is to work on ice and the water beneath the ice is or may be more than 3¼ feet (1m) deep at any point:

- Test the ice prior to commencing to ensure it will support the load to be placed on it. Ongoing testing may be necessary.
- If there is any risk of falling through the ice employees must wear personal protective equipment that will ensure buoyancy and protect against hypothermia at all times while on the ice.

#### 4.8 Work-Warming Regimen

- 4.8.1 If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below 19°F (−7°C), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The employees should be encouraged to use these shelters at regular intervals; the frequency will depend on the severity of the environmental exposure. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.

- 4.8.2 The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter.
- 4.8.3 When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing should be loosened to permit sweat evaporation or a change of dry work clothing provided.
- 4.8.4 A change of dry work clothing should be provided as necessary to prevent employees from returning to the cold environment with wet clothing.

## **5.0 Records**

- 5.1 Exposure assessments will be documented in the location's files.

## **6.0 Attachments**

- 6.1 [S3AM-112-ATT1 Temperature Thresholds](#)
- 6.2 [S3AM-112-ATT2 Symptoms & Treatment](#)

## Americas

## Temperature Thresholds

S3AM-112-ATT1

## 1.0 Purpose and Scope

- 1.1 The following Tables 1 and 2 give apparent temperatures (wind chill or equivalent chill temperature [ECT]) for various combinations of wind and air temperature, as well as guidelines to the danger of skin exposure.

Table 1. Wind Chill Chart (C)

Actual Temp (°C)	Wind Speed in km/hour									
	8	16	24	32	40	48	56	64	72	80
	Ambient Temperature (°C)									
0	-2	-8	-11	-14	-16	-17	-18	-19	-19	-20
-5	-7	-14	-18	-21	-23	-25	-26	-27	-28	-28
-10	-12	-20	-25	-28	-31	-33	-34	-35	-36	-36
-15	-18	-26	-32	-35	-38	-40	-42	-43	-43	-44
-20	-23	-32	-38	-43	-46	-48	-50	-51	-52	-52
-25	-28	-38	-45	-50	-53	-56	-57	-59	-59	-60
-30	-33	-45	-52	-57	-61	-63	-65	-67	-67	-68
-35	-39	-51	-59	-64	-68	-71	-73	-75	-75	-76
-40	-44	-57	-65	-71	-75	-79	-81	-83	-83	-84
-45	-49	-63	-72	-78	-83	-86	-89	-90	-91	-92
-50	-54	-69	-79	-85	-90	-94	-96	-98	-99	-100

Note: A. Little Danger: if less than one hour of exposure to dry skin.

B. Danger: Exposed flesh freezes within one minute.

C. Great Danger: Flesh may freeze within 30 seconds.

Source: \*2014 Threshold Limit Values (TLV™) and Biological Exposure Indices (BEI™) booklet; published by ACGIH, Cincinnati, Ohio.

Table 2. Equivalent Chill Temperature Chart (F)

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
	Equivalent Chill Temperature (°F)									
Calm	50	40	30	20	10	0	-10	-20	-30	-20
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-75	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Wind speeds >40 mph have little additional effect	LITTLE DANGER				INCREASING DANGER			GREAT DANGER		
	Trenchfoot and immersion foot may occur at any point on this chart.									

- 1.2 How fast a person's body cools in cold weather depends on: air temperature, wind speed, heat of the sun, and work being done.
- 1.2.1 The following Table 3 provides guidelines for establishing periods of work to warming break periods based on ambient temperature and wind speed for workers wearing dry clothing.
- 1.2.2 Notes following the Table take into account additional factor such as physical exertion, whether workers are acclimatized, etc.

**Table 3. Work-Warming Schedule Guidelines**

Air Temp. (Sunny Sky) °F	No Noticeable Wind		5 mph Wind (8 km/h)		10 mph Wind (16 km/h)		15 mph Wind (24 km/h)		20 mph Wind (32 km/h)		25 mph Wind (40 km/h)		Air Temp. (Sunny Sky) °C
	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	
above 5°	Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		above -15°
5° to -1°											100 min	2	-15° to -17°
0° to -4°									100 min	2	75 min	2	-18° to -20°
-5° to -9°							100 min	2	75 min	2	55 min	3	-21° to -22°
-10° to -14°					100 min	2	75 min	2	55 min	3	40 min	4	-23° to -25°
-15° to -19°					100 min	2	75 min	2	55 min	3	40 min	4	30 min
-20° to -24°	100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work	-29° to -31°	
-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work	Cease Work		-32° to -34°	
-30° to -34°	55 min	3	40 min	4	30 min	5	Cease Work	Cease Work				-35° to -37°	
-35° to -39°	40 min	4	30 min	5	Cease Work	Cease Work						-38° to -39°	
-40° to -44°	30 min	5	Cease Work	Cease Work								-40° to -42°	
-44° & below	Cease Work											-43° & below	

Modified from ACGIH 2014 Threshold Limit Values for Chemical Substances and Physical Agents.

- Note 1: Schedule describes the maximum continuous duration of work and number of 10-15 minute breaks to be observed during any 4-hour work period and assumes that period will be followed by an extended warm-up period (e.g., lunch). Allowed breaks should be taken in a warm environment.
- Note 2: Schedule applies to moderate to heavy work performed by acclimated workers wearing appropriate layered clothing. For light to moderate work apply the schedule for conditions one step lower. For unacclimated workers apply the schedule for conditions two steps lower. These modifications are additive.
- Note 3: For work under 25%–50% overcast/clouds, apply the schedule for conditions one step lower. For work at night or under greater than 50% overcast/clouds, apply the schedule for conditions two steps lower. These modifications are additive with any applicable modifications from Note 2.



Note 4: For wind speeds in excess of 25 mph (40 km/h), cease all nonemergency work when temperatures fall below 5°F (-21°C).

Note 5: When the work involves riding on an unshielded vehicle or some other activity that generates wind, the number of breaks should be increased appropriately.

Note 6: If effective protection against the wind can be provided by shields or screens, work modifications or measures, then the work warm-up schedule for "No Noticeable Wind" would apply.

Note 7: If reliable weather reports are not available, use the following as a guide to estimate wind velocity:

- A 5 mph (8 km/h) wind will move a light flag
- A 10 mph (16 km/h) wind will fully extend the flag
- A 15 mph (24 km/h) wind will raise a newspaper sheet
- A 20 mph (32 km/h) wind will produce blowing and drifting snow.

## Symptoms & Treatment

S3AM-112-ATT2

### 1.0 Cold Stress-related Illnesses

#### 1.1 Frostbite

- 1.1.1 Frostbite is a localized cold injury characterized by freezing of the tissues with ice crystal formation. There are several degrees of damage. Frostbite can be categorized into:
- **Frost Nip or Initial Frostbite:** (1st degree frostbite) Characterized by blanching or whitening of skin.
  - **Superficial Frostbite:** (2nd degree frostbite) Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient. Blistering and peeling of the frozen skin will follow exposure.
  - **Deep Frostbite:** (3rd degree frostbite) Tissues are cold, pale, and solid; extremely serious injury with possible amputation of affected area.
- 1.1.2 Frostbite injury is almost always limited to the upper and lower extremities (finger and toes) or to such appendages as the ears, nose or cheeks.
- 1.1.3 Conditions conducive to frostbite include sub-zero temperatures, hypothermia, dehydration, obstruction of the blood supply to the extremities (by constricting clothing, especially on the feet or at the wrists or ankles), contact with cold metal, contact with organic liquids (such as gasoline or solvents that have been left outdoors in sub-zero temperatures), use of substances that cause vasoconstriction (such as smoking tobacco), or other injury or shock.
- 1.1.4 Frostbite can occur without hypothermia when the extremities do not receive sufficient heat. Frostbite occurs when there is freezing of the fluids around the cells of the affected tissues.
- 1.1.5 Contact by the skin with tools or other metal objects below 20°F (-7°C) may result in contact frostbite.
- 1.1.6 The first symptom of frostbite is an uncomfortable sensation of coldness and pain, followed by numbness. There may be tingling, stinging, or cramping. Ongoing symptoms of frostbite include:
- Sudden and complete cessation of cold or discomfort in affected fingers or toes, often followed by a pleasant feeling of warmth;
  - Subsequently the only symptom may be the absence of any sensation in the frozen part;
  - Paleness in the affected tissues;
  - Firm or hard tissues; and
  - Purple tissue, if a large area, such as an entire hand or foot, is frostbitten.
- 1.1.7 If exposure occurs in temperatures that are below freezing (32°F or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Symptoms due to frostbite may include, but is not limited to:
- Superficial redness of the skin;
  - Slight numbness;
  - Blisters;
  - Obstruction of blood flow (ischemia);
  - Blood clots (thrombosis); and
  - Skin discoloration due to insufficient oxygen in the blood (cyanosis).

- 1.1.8 Frostbite may occur if the skin comes into contact with objects with a surface temperature below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death, and ulceration.
- 1.1.9 Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet) and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

## 1.2 Hypothermia

- 1.2.1 Hypothermia is a lower than normal body temperature that occurs when outer cold cools the body faster than the body can produce heat to stay warm. When this situation first occurs, blood vessels in the skin constrict in an attempt to conserve vital internal heat. Hands and feet are the first affected.
- If the body continues to lose heat, involuntary shivers begin. This is the body's way of attempting to produce more heat, and it is usually the first real warning sign of hypothermia.
  - Further heat loss produces speech difficulty, confusion, loss of manual dexterity, collapse, and finally death.
- 1.2.2 Hypothermia can be caused by exposure to wind, cold, and/or moisture. The combination of wind, cold, and moisture can be deadly. Wet clothes or immersion in cold water greatly increases the hypothermia risk. The progressive clinical presentation of hypothermia is described in the table below.

Condition	Core Body Temp.	Signs/Symptoms	Treatment
Mild Hypothermia	99 – 97 F 37 – 36 C	Normal, shivering may begin	Seek dry shelter; replace wet clothing, insulate whole body and head, avoid sweating, use external warmth (bath, fire) only if core above 95 degrees F, give warm sweet drinks and food.
	97 – 95 F 36 – 35 C	Cold sensation, goose bumps, unable to perform complex tasks with hands, shiver can be mild to severe, hands numb.	
Moderate Hypothermia	95 – 93 F 35 – 34 C	Intense shivering, muscle in-coordination becomes apparent, movements slow and labored, stumbling pace, mild confusion may appear alert.	Avoid exercise and external warmth, gently rest; give warm sweet drinks and calories, internal warming via warm moist air, monitor pulse and breathing.
	93 – 90 F 34 – 32 C	Violent shivering persist, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, stumbles frequently, signs of depression, withdrawn.	
Severe Hypothermia	90 – 86 F 32 – 30 C	Shivering stops, exposed skin blue or puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness.	Medical emergency, give nothing by mouth, wrap in an insulated blanket, avoid rapid rewarming, transfer to hospital immediately.
	86 – 82 F 30 – 28 C	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation.	
	82 – 78 F 28 – 25.5 C	Unconscious, heart beat and respiration erratic, pulse may not be palpable.	
	78 – 75 F 25.5 – 24 C	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.	

- 1.2.3 Early warning signs of hypothermia:
  - Feeling of being cold and tired;
  - Heavier breathing and increased pulse rate;
  - Tendency to keep moving (e.g., stamping feet, rubbing hands, continued walking/pacing);
  - Goose bumps, holding arms tightly wrapped around the body, hunching of shoulders, and
  - Shivering.
- 1.2.4 Hypothermia damages both the body's internal temperature mechanisms (hypothalamus) and the peripheral mechanisms to prevent heat loss (vasoconstriction and perspiration.) These effects may last up to three years after the initial hypothermia episode. Symptoms of hypothermia may include, but are not limited to:
  - Pain in the extremities;
  - Severe shivering and numbness;
  - Low core body temperature;
  - Drowsiness and muscular weakness;
  - Apathy;
  - Mental confusion;
  - Loss of consciousness;
  - Shock, and
  - Decreasing pulse and breathing rate.

## **2.0 Recommended Treatment for Cold Stress-related Illnesses**

### **2.1 Frostbite**

- 2.1.1 Wrap the victim in woollen blanket and keep dry until he or she can be brought inside.
- 2.1.2 Remove the victim from the cold environment.
- 2.1.3 Do not rub, chafe, or manipulate frozen parts.
- 2.1.4 Place the victim in warm water (102°F to 105°F) and make sure the water remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected body parts if the victim has to go back out into the cold; refreezing can cause significant tissue damage.
- 2.1.5 Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.
- 2.1.6 Do not allow the victim to walk if his or her feet are affected.
- 2.1.7 Have the victim gently exercise the affected parts once they are thawed.
- 2.1.8 Seek immediate medical attention for thawing of serious frostbite.

### **2.2 Hypothermia**

- 2.2.1 Bring the victim into a warm room or shelter as quickly as possible.
- 2.2.2 Give artificial respiration and stop any bleeding, if necessary.
- 2.2.3 If the victim cannot be moved (spinal injury, etc.), carefully place newspapers, blankets, or some other insulation between the victim and the ground.
- 2.2.4 Remove all wet clothing.
- 2.2.5 Provide an external heat source, because the body cannot generate its own heat. Wrap the victim in prewarmed blankets, place him or her in the liner of a portable hypothermia treatment unit, put the torso (not the extremities) into a tub of warm water, or use body-to-body contact to rewarm the body core. These measures will slowly reopen the peripheral circulation, minimizing the possibility

of after-shock or after-drop (the flowing of cooled, stagnated blood from the limbs to the heart), which may cause ventricular fibrillation, cardiac arrest, or death.

- 2.2.6 Do not allow the victim to sleep.
- 2.2.7 Give warm, sweet drinks. Do not give alcohol or pain relievers.
- 2.2.8 Keep the victim still. Do not try to walk.
- 2.2.9 Do not rub numb skin.
- 2.2.10 Get medical attention as soon as possible.

## Heat Stress

S3AM-113-PR1

### 1.0 Purpose and Scope

- 1.1 Establishes a Heat Illness Prevention Program to guide employees in preventing heat illness, recognition of the symptoms of heat stress-related illnesses and in taking the appropriate corrective action.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

### 2.0 Terms and Definitions

- 2.1 **Acclimated** – Employees who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.
- 2.2 **Chemical Protective Clothing (CPC)** – Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the Employee with potentially hazardous materials in the workplace. Such materials include Tyvek® coveralls (all types) and polyvinyl chloride coveralls and rain suits.
- 2.3 **Heat Cramps** – A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.
- 2.4 **Heat Exhaustion** – A form of heat stress brought about by the pooling of blood in the vessels of the skin and in the extremities.
- 2.5 **Heat Rash** – A heat-induced condition characterized by a red, bumpy rash with severe itching.
- 2.6 **Heat Stress** – The combination of environmental and physical work factors that constitute the total heat load imposed on the body.
- 2.7 **Heat Stroke** – The most serious form of heat stress, which involves a profound disturbance of the body's heat-regulating mechanism.
- 2.8 **Sunburn** – Caused by unprotected exposure to ultraviolet radiation present in sunlight that is damaging to the skin (Refer to *S3AM-121-PR1 Non-Ionizing Radiation*). The injury is characterized by red painful skin, blisters, and/or peeling.
- 2.9 **Unacclimated** – Employees who have not been exposed to hot work conditions for one week or more or who have become heat-intolerant due to illness or other reasons.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.3 S3AM-010-PR1 Emergency Response Planning
- 3.4 S3AM-121-PR1 Non-Ionizing Radiation
- 3.5 S3AM-208-PR1 Personal Protective Equipment
- 3.6 S3AM-209-PR1 Risk Assessment & Management

## 4.0 Procedures

### 4.1 Roles and Responsibilities

#### 4.1.1 Managers

- Evaluate the need for heat illness prevention measures and incorporate as appropriate into the Safe Work Plan or Task Hazard Analysis.
- Allocate sufficient resources for the management of heat illness in the field including the provision of water, a shaded break area, and sufficient schedule to allow for breaks.

#### 4.1.2 Safety, Health and Environment (SH&E) Manager

- Provide heat illness awareness training.
- Assist in developing appropriate work-rest schedules.
- Conduct/support incident investigations related to potential heat stress-related illnesses.

#### 4.1.3 Supervisor

- Identify those tasks that may be most impacted by heat stress and communicate the hazard to the assigned Employees.
- Confirm that Employees have been trained on the recognition of heat illness.
- Confirm that this procedure, along with any applicable Safe Work Plan and/or Task Hazard Analysis (and heat exposure control plan that may be contained therein) are made available to affected Employees.
- Confirm that adequate supplies of appropriate fluids are readily available to Employees.
- Confirm that a proper rest area is available.
- Conduct heat illness monitoring, as applicable.
- Implement the work-rest schedule.
- Confirm that first aid measures are implemented once heat stress symptoms are identified.
- Confirm personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.
- Report all suspected heat illnesses.

#### 4.1.4 Employee

- Observe each other for the early symptoms of heat illnesses.
- Maintain an adequate intake of available fluids.
- Be familiar with heat stress hazards, predisposing factors, and preventative measures.
- Report to work in a properly vested and hydrated condition.
- Report all suspected heat stress-related illnesses.

### 4.2 Restrictions

4.2.1 The Buddy System is required when working in high heat conditions; Employees shall not work alone.

4.2.2 Employees shall not be exposed to levels exceeding those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Temperature Thresholds*.

4.2.3 Clothing corrections shall be applied in accordance with the tables provided in *S3AM-113-ATT1 Temperature Thresholds*.

### 4.3 Exposure Controls

4.3.1 It shall be determined whether Employees are or may be exposed to hazardous heat levels. The Supervisor shall:

- Conduct a heat stress assessment to determine the potential for hazardous exposure of Employees. Assessment shall include, but not limited to:
  - Ambient temperature.
  - Amount of sunshine (cloudy, clear). Refer to *S3AM-121-PR1 Non-Ionizing Radiation* additional direction concerning ultraviolet radiation exposures.
  - Other radiant heat sources (e.g. motor, fire, etc.).
  - Humidity.
  - Air flow.
  - Amount or type of physical labor being performed,
  - Physical condition of the Employees (e.g., acclimated/not)
  - Protective clothing in use.
  - Referral to *S3AM-113-ATT1 Temperature Thresholds* to assist in determining whether hazardous heat exposures may exist.
- If potential for hazardous exposure is identified, the Supervisor shall develop and implement a heat stress exposure control plan within the Safe Work Plan and/or Task Hazard Analysis. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.3.2 If Employees are or may be exposed, the Supervisor shall implement engineering controls (e.g., shelters, cooling devices, etc.) to reduce the exposure of Employees to levels below those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Temperature Thresholds*.

4.3.3 If engineering controls are not practicable, the Supervisor shall reduce the exposure of Employees to levels below those listed in *S3AM-113-ATT1 Temperature Thresholds* by providing administrative controls, including a work-rest cycle or personal protective equipment, if the equipment provides protection equally effective as administrative controls.

4.3.4 If Employees are or may be exposed, the Supervisor shall provide and maintain an adequate supply of cool, fresh, potable water close to the work area for the use of a heat exposed Employee. Water shall be provided (paid) by the project or program; if Employees purchase their own drinking water because water is not otherwise available on site, they shall be reimbursed.

4.3.5 If an Employee shows signs or reports symptoms of heat stress or strain, they shall be removed from the hot environment and treated by an appropriate first aid attendant on site, if available, or by a physician, refer to *S3AM-113-ATT2 Symptoms & Treatment* for more specifics.

### 4.4 Heat Stress Planning

4.4.1 Heat stress can be a significant site hazard, especially for Employees wearing CPC. To prepare for emergency response planning, refer to *S3AM-010-PR1 Emergency Response Planning* procedure.

4.4.2 The project and site specific risks need to be planned using the SH&E Plan and the Task Hazard Assessments (THA). Refer to the *S3AM-209-PR1 Risk Assessment & Management* procedure.

4.4.3 The heat a worker is exposed to may be a combination of air temperature, radiant heat, and humidity. The WBGT (wet-bulb globe thermometer) is a useful index of the environmental contribution to heat stress. Because WBGT is only an index of the environment, the contributions of



work demands, clothing, and state of acclimatization shall also be accounted for, as described in the following steps.

- Monitor ambient temperatures and conduct heat stress monitoring in accordance with the location specific SH&E Plan. Revise the heat stress monitoring and controls if there are any reports of discomfort due to heat stress.
- Monitor temperatures in each unique environment in which workers perform work (e.g., take WBGT measurements inside truck cabs for truck drivers, and take separate WBGT measurements in the outdoor area where field employees work, etc.). Follow manufacturer's instructions on proper use of the WBGT.
- Determine if individual workers are acclimatized or un-acclimatized. Full heat acclimatization requires up to 3 weeks of continued physical activity under heat-stress conditions similar to those anticipated for the work. Its loss begins when the activity under those heat-stress conditions is discontinued, or when there is a sustained increase in temperatures of 10 °F (5.6 °C) or more, and a noticeable loss occurs after 4 days. A worker can be considered acclimatized for the purpose of this procedure when they have been exposed to the site conditions (including level of activity) for 5 of the last 7 days.
- Determine the approximate workload of each worker or group of workers. The following examples (Table 1) can be used for comparison:

Table 1  
Examples of Activities within Workload Categories

Categories	Example Activities
Resting	Sitting quietly
	Sitting with moderate arm movements
Light	Sitting with moderate arm and leg movements
	Standing with light work at machine or bench while using mostly arms
	Using a table saw
	Standing with light or moderate work at machine or bench and some walking about
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on level at 3.5 miles/hr (6 km/hr) while carrying 6.6 lbs (3kg) weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a non-continuous basis
	Intermittent heavy lifting with pushing or pulling (e.g., pick-and-shovel work)
Very Heavy	Shoveling wet sand

- Determine the approximate proportion of work within an hour during a typical shift. Typically, the initial work schedule will be 60 minutes of work per hour (100 percent work) with a small break in the morning and afternoon, as appropriate, and a 30-minute lunch break mid-day.
- For workers wearing cloth coveralls (e.g., Nomex fire resistant clothing), add 3 to the measured WBGT. For impermeable clothing, such as Tyvek or Saranex, the WBGT procedures cannot be used. For these situations, workers should begin physiological monitoring as soon as the temperature in the work area exceeds 70°F (21°C).
- Use the collected information to develop appropriate work to rest schedules as detailed in *S3AM-113-ATT1 Temperature Threshold*.

4.4.4 Given the work demands (light, moderate, heavy or very heavy), heat of the work environment, and such aspects as PPE in use, workload will be adjusted appropriately to allow for proper acclimation.

- This is the process by which the body "gets used to" hot work environments. This is achieved by slowly increasing workloads.
- New and returning Employees (absent one week or more) who have not had time to acclimatize may be more susceptible to heat related illnesses, even in seemingly low risk heat exposures.
- All Employees shall be allowed time to acclimatize in the event of a heat wave. All Employees assigned to a new process with additional heat exposures shall be allowed to acclimatize.
- Minimize workload and gradually increase as tolerance is built up. Allow for more frequent breaks.
- While acclimatization normally takes approximately 5 to 7 days, heightened monitoring of these Employees will be maintained for the first 14 days.

4.4.5 Employees shall be instructed in the recognition of heat stress symptoms, the first aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Employees shall be encouraged to immediately report any heat stress that they may experience or observe in fellow Employees. Supervisors shall use such information to adjust the work-rest schedule to accommodate such problems.

4.4.6 Wherever possible, a designated break area should be established in an air conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow Employees to loosen or remove protective clothing, and sufficient seating should be available for all Employees. During breaks, Employees shall be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

#### 4.5 Symptoms and Treatment

4.5.1 Refer to *S3AM-113-ATT2 Symptoms & Treatment*.

4.5.2 Employees who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin) shall be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water.

4.5.3 Anyone exhibiting symptoms of heat stroke (red dry skin, or unconsciousness) shall be taken immediately to the nearest medical facility. Steps shall be taken to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.).

4.5.4 Severe heat stress (heat stroke) is a life-threatening condition that shall be treated by a competent medical authority.

#### 4.6 Prevention

4.6.1 Requirements for working in extreme heat may be triggered by a regulatory established criteria (e.g. CAL/OSHA requires high heat procedures when temperature equals or exceeds 95°F) or as a result of a hazard analysis assessing various contributory factors (refer to *S3AM-113-ATT1 Temperature Thresholds*). Employees working in extreme heat or sun should understand and apply the following guidelines for preventing and detecting heat exhaustion and heat stroke.

- When possible, begin hydrating at least three days prior to working in high heat conditions.
- Review the heat stress exposure control plan within the Safe Work Plan and/or Task Hazard Analysis.
- If the supervisor is not immediately available confirm a reliable method of communication is in place to allow for contact with supervision. In the absence of cellular reception a satellite phone or similar device may be required.

- Take frequent short breaks in areas sheltered from direct sunlight; eat and drink small amounts frequently.
- Try to schedule work for the coolest part of the day, early morning and evening.
- Avoid strenuous physical activity outdoors during the hottest part of the day.
- Avoid sudden changes of temperature. Refer to *S3AM-113-ATT1 Temperature Thresholds*.
- Air out a hot vehicle before getting into it.
- Obtain medical direction if taking diuretics during hot weather (a lower dose may be necessary).
- When working in heat, drink 1 quart of water per hour of work.
- Avoid caffeine and alcohol as they increase dehydration.
- Monitor urine frequency and color to detect dehydration. Refer to the *S3AM-113-ATT3 Dehydration Chart*.
- The Buddy System is required when working in high heat conditions to enable effective communication and cross-observation for indications of heat stress.
- Initiate emergency response procedures when necessary, including contacting emergency medical services as appropriate and in accordance with the Emergency Response Plan.

#### 4.6.2 Personal Protective Equipment

- Review the *S3AM-208-PR1 Personal Protective Equipment* procedure.
- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Apply sunscreen to exposed skin (SPF 30 or greater, follow directions on label).
- Wear sunglasses with UV protection.
- Pack extra water to avoid dehydration (try freezing water in bottles overnight to help keep the water cooler for longer during the day).

#### 4.7 Work-Rest Schedule Practices

- 4.7.1 Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.
- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 ounces (1 quart) per hour during the work shift; fluid replacement at frequent intervals is most effective.
  - The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration and may increase loss of water.
  - If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.
- 4.7.2 Additional salt is usually not needed and salt tablets should not be taken.
- 4.7.3 Replacement fluids should be cool and fresh, but not cold.
- 4.7.4 Breaks will be taken in a cool, shaded location, and any impermeable clothing should be opened or removed.
- A relatively cool, shaded area shall be provided for breaks when working in hot environments. For hazardous waste sites, the rest area should be located in the support zone adjacent to the contamination reduction zone, situated so that part of it is in the decontamination area so workers can take breaks without going through full decontamination.

- If shade is not available, shaded areas shall be constructed. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.
- Cooling measures other than shade (e.g., misting, air conditioned break areas, air conditioned vehicles, etc.) can be used in lieu of shade provided it can be demonstrated that they are at least as effective in cooling employees.
- 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.

4.7.5 Dry clothing or towels will be available to minimize chills when taking breaks.

4.7.6 Manual labor will not be performed during breaks, other than paperwork or similar light tasks.

4.7.7 Other controls that may be used include:

- Scheduling work at night or during the cooler parts of the day (6 am–10 am, 3 pm–7 pm).
- Erecting a cover or partition to shade the work area.
- Auxiliary cooling - wearing cooling devices beneath protective garments, but over any underclothing.
  - If cooling devices are worn, only physiological monitoring will be used to determine work activity.
  - These vests typically provide cooling via one of two methods: the use of ice or other frozen media, or the use of a vortex cooler. Each method has its advantages and disadvantages.
  - The frozen media vest requires a means for freezing the media, and the media (usually water or "blue ice") will melt, requiring replacement.
  - The vortex cooler tends to cool more uniformly. Instead of frozen media, this vest uses the expansion of compressed air to cool the wearer. The drawback is the compressed air requirement, but this is negated when the wearer is already using an airline respirator supplied by a compressor. A vortex cooler should not be supplied from air cylinders, as this will draw down the cylinders rapidly.
- Auxiliary cooling should be considered when the following conditions exist:
  - Ambient temperature over 80°F (26°C).
  - Workers are wearing impermeable garments (i.e., Tyvek, Saranex, Chemrel, etc.).
  - It is desirable to have long work shifts with minimum interruption.

#### 4.8 Evaluating the Work-Rest Schedule's Effectiveness

4.8.1 Once a work-rest schedule is established, the Supervisor shall continually evaluate its effectiveness through observation of Employees for signs/symptoms of heat stress. Have workers assess themselves and their body's reaction to the heat and work conditions (self-assessment), and report any signs or symptoms of heat illness. These can include nausea or dizziness, heat cramps, extreme thirst, or very dark urine.

4.8.2 Measurement or physiological monitoring of each Employee's vitals (e.g., pulse, blood pressure, and temperature) can provide additional information in determining if the schedule is adequate. Refer to *S3AM-113-ATT1 Temperature Thresholds* for additional guidance on when physiological monitoring should be conducted.

4.8.3 Frequency of physiological monitoring is increased or decreased depending upon such factors as worker fitness, acclimatization, temperature of the work environment, type of PPE, etc.

Based on the results of the physiological monitoring and on the workers' self-assessments, the work period may be adjusted as follows:

- The work period may be increased (generally, by 5- to 10-minutes intervals, up to a maximum of 4 hours) if the results of the first 2 hours of the physiological monitoring and the workers' self-assessments indicate that workers are recovering adequately (see below), and on the judgment of the SH&E Manager.
  - The work period shall be decreased if the results of the physiological monitoring and the workers' self-assessment indicate that workers are NOT recovering adequately (see below).
- 4.8.4 If physiological monitoring is conducted, the Employee and/or the SH&E Manager (or appropriate designate) shall measure and record body temperature and pulse rate as described below.
- 4.8.5 Monitor body temperature to determine if Employees are adequately dissipating heat build-up. Ear probe thermometers which are adjusted to oral temperature (aural temperature) are convenient and the preferred method of measurement. Determine work/rest regimen as follows:
- Measure oral body temperature at the end of the work period. Oral body temperatures are to be obtained prior to the employee drinking water or other fluids.
  - If temperature exceeds 99.6°F (37.5°C), shorten the following work period by 1/3 without changing the rest period.
  - If, at the next rest period, temperature still exceeds 99.6°F (37.5°C), the worker should not be allowed to continue work until repeated temperature measurements are in the acceptable range (i.e., less than 99.6°F). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
  - Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6°F (38.1°C).
- 4.8.6 At the start of the workday each Employee's baseline pulse rate (in beats per minute [bpm]) is determined by taking a pulse count for 15 seconds and multiplying the result by four or by using an automated pulse count device. Pulse rates can then be measured at the beginning of each break period and two minutes thereafter to determine if the rest period allows for adequate recovery.
- Take the radial (wrist) pulse as early as possible in the rest period and determine the worker's heart rate in beats per minute. The heart rate is determined by counting the pulse for ten seconds and multiplying the number by 6 to get the beats per minute. Record this as P1.
  - Wait 2 minutes and repeat the pulse measurement. Record this as P2.
  - If P1 is greater than or equal to 110 beats per minute (bpm) and if (P1 – P2) is less than or equal to 10 bpm (indicating that workers are not recovering adequately), shorten the next work cycle by 1/3 without changing the rest period.
  - At the next rest period, if P1 is still equal to or greater than 110 bpm, and if (P1 – P2) is still less than or equal to 10 bpm, shorten the following work cycle by 1/3 without changing the rest period.
  - At the third rest period, if P1 is still equal to or greater than 110 bpm and (P1 – P2) is still less than or equal to 10 bpm, the worker should not be allowed to continue work until repeated pulse measurements are in the acceptable range (i.e., P1 is less than 110 bpm and (P1 – P2) is greater than 10 bpm). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
- 4.8.7 Use of an automated or similar blood pressure device will be used to assess each Employee's blood pressure at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:
- If the blood pressure of an Employee is outside of 90/60 to 150/90, then the Employee will not be allowed to begin or resume work; extend the break period by at least five minutes, at the end of which blood pressure rates will be re-measured and the end-of-break criteria again applied.

- 4.8.8 All physiological monitoring of heat stress will be documented using *S3AM-113-FM1 Heat Stress Monitoring Log*.

#### 4.9 Training

- 4.9.1 Employees and their Supervisors that may be exposed to the hazard will be trained and oriented to the hazard and the controls prior to work commencing.
- 4.9.2 Those Employees, including Supervisors, potentially exposed to heat stress will receive training, refer to the *S3AM-003-PR1 SH&E Training* procedure. Training will include, but is not limited to:
- Sources of heat stress (environmental and personal), influence of protective clothing, and importance of acclimatization;
  - How the body handles heat and acclimatization;
  - Recognition of heat-related illness symptoms;
  - Preventative/corrective measures including, but not limited to;
    - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.
    - All Employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
  - First aid procedures for heat stress-related illnesses; and
  - Immediate reporting of any heat-related incident (injury, illness, near-miss), refer to the *S3AM-004-PR1 Incident Reporting, Notifications & Investigation* procedure.

### 5.0 Records

- 5.1 None

### 6.0 Attachments

- 6.1 [S3AM-113-ATT1 Temperature Thresholds](#)
- 6.2 [S3AM-113-ATT2 Symptoms & Treatment](#)
- 6.3 [S3AM-113-ATT3 Dehydration Chart](#)
- 6.4 [S3AM-113-FM1 Heat Stress Monitoring Log](#)

## Temperature Thresholds

S3AM-113-ATT1

### 1.0 Work-Rest Schedule

The prevention of heat stress is best performed through Supervisor observation of Employees and routine heat stress awareness training activities. However, it is also necessary to implement a work routine that incorporates adequate rest periods to allow Employees to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover. The frequency and length of work breaks shall be determined by the Supervisor based upon the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the Employees (e.g., acclimated/not), and protective clothing being used.

#### 1.1 Establishing a Work-Rest Schedule:

1.1.1 AECOM permits the use of either of two techniques to initially determine an appropriate daily work-rest schedule. These methods are:

- Wet Bulb Globe Thermometer (WBGT) Method: This method is preferred if a WBGT meter is available.
- Adjusted Temperature Method: This method should be used only if WBGT data is not available.

1.1.2 Either procedure will provide the Supervisor with a recommended routine; however, adjustments to this routine may be required to accommodate the specific daily conditions at the work site.

#### 1.2 WBGT Work-Rest Schedule Guidelines:

1.2.1 If the measured WBGT is less than the action limit value, there is little risk of excessive exposure to heat stress, and work can continue.

- Continue to monitor ambient conditions with the WBGT. However, if there are reports of the symptoms of heat-related disorders, then the analysis of little risk should be reconsidered.
- If the measured WBGT is greater than the values in the following two tables, institute heat stress controls, including the associated work-rest cycle, and perform physiological monitoring as described in *S3AM-113-PR1 Heat Stress*.
- Because of the physiological strain associated with very heavy work among less fit workers regardless of WBGT, values are not provided in Table 1 or 2 for continuous work or 75% work – 25% rest regimen. Physiological monitoring should always be implemented under these conditions.

1.2.2 Table 1, the Non-CPC Activities WBGT Chart, is intended for use where personnel are not utilizing Chemical Protective Clothing (CPC). Where workers are required to utilize CPC, Table 2, the CPC Activities WBGT Chart, will be used.

1.2.3 WBGT readings are compared directly with the values of the applicable WBGT Chart for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

**Table 1. Non-CPC Activities WBGT Chart**

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	85°F (29.4°C)	81°F (27.2°C)	78°F (25.6°C)	
75% Work – 25% Rest	86°F (30°C)	83°F (28.3°C)	81°F (27.2°C)	
50% Work – 50% Rest	88°F (31.1°C)	85°F (29.4°C)	83°F (28.3°C)	81°F (27.2°C)
25% Work – 75% Rest	90°F (32.2°C)	87°F (30.6°C)	86°F (30°C)	85°F (29.4°C)

Modified from ACGIH's 2014 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers.

Table 2. CPC Activities WBGT Chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	74°F (23.3°C)	70°F (21.1°C)	67°F (19.4°C)	
75% Work – 25% Rest	75°F (23.9°C)	72°F (22.2°C)	70°F (21.1°C)	
50% Work – 50% Rest	77°F (25°C)	74°F (23.3°C)	72°F (22.2°C)	70°F (21.1°C)
25% Work – 75% Rest	79°F (26.1°C)	76°F (24.4°C)	75°F (23.9°C)	74°F (23.3°C)

Modified from ACGIH's 2014 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers.

### 1.3 Humidex Based Work-Rest Schedule Guidelines

1.3.1 The Humidex method is a simplified way of protecting workers from heat stress. It is an equivalent scale intended to express the combined effects of warm temperatures and humidity. Humidex is used as a measure of perceived heat that results from the combined effect of excessive humidity and high temperature.

1.3.2 This method requires only a local air temperature and relative humidity value. Monitoring shall continue throughout the day for changing conditions. Identify a representative location where measurements can be taken. Measurements should be recorded at least hourly when ambient temperatures and 90°F (32°C) for personnel wearing normal permeable work clothes.

- Step 1: On the Humidex table below, look up the temperature on the left (Celsius is located below RH>) and the relative humidity (RH) on the top. Determine the Humidex value.

F	RH>	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%
108	42													55	52	50	48	46
106	41												55	53	51	48	46	44
104	40											55	53	51	49	47	45	43
102	39										55	53	51	49	47	45	43	41
100	38	Step 1 - Determine HUMIDEX VALUE								54	53	51	49	47	45	43	42	40
99	37								54	52	51	49	47	45	44	42	40	38
97	36					57	55	53	52	50	49	47	45	44	42	40	39	37
95	35				56	54	53	51	50	48	47	45	43	42	40	39	37	36
93	34		56	55	53	52	51	49	48	46	45	43	42	40	39	37	36	34
91	33	55	54	53	51	50	48	47	46	44	43	41	40	39	37	36	34	33
90	32	53	51	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32
88	31	50	49	48	47	45	44	43	42	40	39	38	37	35	34	33	32	30
86	30	48	47	46	44	43	42	41	40	39	37	36	35	34	33	31	30	29
84	29	46	45	43	42	41	40	39	38	37	36	35	33	32	31	30	29	28
82	28	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
81	27	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
79	26	39	38	37	36	35	34	33	33	32	31	30	29	28	27	26	25	24
77	25	37	36	35	34	33	33	32	31	30	29	28	27	26	26	25	24	23



- **Step 2:** Place the Humidex value into the Heat Index Adjustment Table below. Determine the applicable adjustments based on the given work or task.

**Heat Index Adjustment Table**

<b>Step 2 - Risk Factor Adjustment</b>		
Write in value	What is the HUMIDEX value from the table in Step 1?	
<b>Radiant Heat</b>		<b>Adjustment</b>
	Working in full-sun	Add 2
	Working in ½ or partial sun or weak radiant heat source	Add 1
	Working near very hot equipment surfaces or processes	Add 2
<b>Clothing: Pick One Only</b>		
	Short/long sleeve shirt and pants – no overalls	None
	Overalls (e.g., Nomex suit)	Add 3
	Double layer overalls	Add 5
<b>Stop</b>	Impermeable clothing	Perform Physiological Monitoring
<b>Acclimatization</b>		
	Have been working at least 5 of last 7 days in heat stress conditions.	Subtract 4
<b>Work Load &amp; Miscellaneous Factors</b>		
	Light Work (Standing, slow walking)	Subtract 2
	Medium Work (Walking about with moderate lifting or pushing)	None
	Heavy Work (Shoveling dry sand, carrying 50 lbs)	Add 2
	Very Heavy Work (Shoveling wet sand)	Add 3
<b>TOTAL – Compare to Heat Index Response Plan</b>		

- **Step 3:** Compare adjusted Heat Index Total to the Heat Index Response Plan table to obtain guidance for work/rest.

**Heat Index Response Plan\***

<b>TOTAL NUMBER</b>	<b>Final Step 3 - HEAT INDEX Response</b>
<b>30-33</b>	alert & information & water
<b>34-37</b>	warning & increase water
<b>38-39</b>	75% work - 25% rest & monitor for signs of heat stress
<b>40-41</b>	50% work - 50% rest & monitor for signs of heat stress
<b>42-44</b>	25% work - 75% rest & monitor for signs of heat stress
<b>45+</b>	Perform Physiological Monitoring

\* Percent work and rest/recovery are on a per hour basis. Adjustments and subsequent work/rest cycle recommendations are rough guidelines only. No heat stress prediction scheme can replace monitoring of symptoms or a health care practitioners advice in the case of individuals with special medical conditions or predisposing circumstances for heat related illness. Always pay attention to the way workers are feeling. Recuperate if fatigued, nauseated, dizzy or thirsty,

1.4 Adjusted Temperature Work-Rest Schedule Guidelines:

This method can be utilized where WBGT data is not available, and requires only that the ambient temperature be known. Adjustment factors are applied to the ambient temperature to account for departures from ideal conditions (sunny conditions, light winds, moderate humidity and a fully acclimated work force). The adjustments will be made by addition or subtraction to the ambient temperature reading, or changes in table position, as indicated in Table 3. Adjustments are independent and cumulative, all applicable adjustments should be applied. The result is the Adjusted Temperature, which can be compared with the values in Table 4 for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest schedule.

**Table 3. Temperature Adjustment Factors**

Time of Day	
Before daily temperature peak <sup>1</sup>	+2°F (+1.11°C)
10 am – 2 pm (peak sunshine)	+2°F (+1.11°C)
Sunshine	
No clouds	+1°F (+0.56°C)
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F (-1.67°C)
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F (-2.78°C)
Cloudy (>7/8 cloud cover)	-7°F (-3.89°C)
Indoor or nighttime work	-7°F (-3.89°C)
Wind ( <i>ignore if indoors or wearing CPC</i> )	
Gusts greater than 5 miles per hour at least once per minute	-1°F (-0.56°C)
Gusts greater than 10 miles per hour at least once per minute	+2°F (+1.11°C)
Sustained greater than 5 miles per hour	-3°F (-1.67°C)
Sustained greater than 10 miles per hour	-5°F (-2.78°C)
Humidity ( <i>ignore if wearing CPC</i> )	
Relative Humidity greater than 90%	+5°F (+2.78°C)
Relative Humidity greater than 80%	+2°F (+1.11°C)
Relative Humidity less than 50%	-4°F (-2.23°C)
Chemical Protective Clothing (CPC)	
Modified Level D (coveralls, no respirator)	+5°F (+2.78°C)
Level C (coveralls w/o hood, full-face respirator)	+8°F (+4.45°C)
Level C (coveralls with hood, full-face respirator)	+10°F (+5°C)
Level B with airline system (hooded chemical resistant clothing)	+9°F (+5.56°C)
Level B with SCBA (hooded chemical resistant clothing)	+9°F (+5.56°C) and right one column <sup>2</sup>
Level A (totally encapsulating chemical protective suit)	+14°F (+7.78°C) and right one column
Other	Specified in the HASP
Miscellaneous	
Unacclimated work force	+5°F (+2.78°C)
Partially acclimated work force	+2°F (+1.11°C)
Working in shade	-3°F (-1.67°C)
Breaks taken in air conditioned space	-3°F (-1.67°C)

**For complete descriptions of Level A through D Protective Clothing refer to  
Unites States 29 CFR 1910.120 Appendix B**

<sup>1</sup> This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

<sup>2</sup> Locate the proper column based on work rate, then move one column to the right (next higher work rate) before locating the corresponding adjusted temperature.

Table 4. Work-Rest Schedule Based on Adjusted Temperature

Work-Rest Regimen	Adjusted Temperature			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
No specified requirements	< 80°F (22.67°C)	< 75 (23.88°C)	< 70 (21.11°C)	< 65 (18.33°C)
15 minute break every 90 minutes of work	80°F – 90°F (22.67°C) - (32.22°C)	75 – 85 (23.88°C) - (29.44°C)	70 – 80 (21.11°C) - (22.67°C)	65 – 75 (37.77°C) - (23.88°C)
15 minute break every 60 minutes of work	>90 – 100 (32.22°C) - (37.77°C)	> 85 – 95 (23.88°C) - (35°C)	>80 – 85 (22.67°C) - (23.88°C)	>75 – 80 (23.88°C) - (22.67°C)
15 minute break every 45 minutes of work	>100 – 110 (37.77°C) - (43.33°C)	>95 – 100 (35°C) - (37.77°C)	>85 – 90 (23.88°C) - (32.22°C)	>80 – 85 (22.67°C) - (23.88°C)
15 minute break every 30 minutes of work	>110 – 115 (43.33°C) - (46.11°C)	>100 – 105 (37.77°C) – (40.55°C)	>90 – 95 (32.22°C) - (35°C)	>85 – 90 (23.88°C) - (32.22°C)
15 minute break every 15 minutes of work	>115 – 120 (46.11°C) - (48.88°C)	>105 – 110 (40.55°C) - (43.33°C)	>95 -100 (35°C) - (37.77°C)	>90 – 95 (32.22°C) - (35°C)
<b>Stop Work</b>	<b>&gt;120</b> (48.88°C)	<b>&gt;110</b> (43.33°C)	<b>&gt;100</b> (37.77°C)	<b>&gt;95</b> (35°C)

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths.

## Symptoms & Treatment

### 1.0 Heat Illness Symptoms

#### 1.1 The following are four stages of heat-related illness:

##### 1.1.1 Heat Rash

Heat rash (prickly heat) may result from continuous exposure to heat or humid air. It appears as red papules (elevated skin lesion), usually in areas where the clothing is restrictive, and gives rise to a prickly sensation, particularly as sweating increases. It occurs in skin that is persistently wetted by un-evaporated sweat. The papules may become infected unless treated.

##### 1.1.2 Heat Cramps

Heat cramps are painful muscle cramps caused by heavy sweating and inadequate electrolyte replacement due to over-exertion in extreme heat. Symptoms include:

- Muscle spasms; and
- Pain in the hands, feet, and abdomen.

##### 1.1.3 Heat Exhaustion

Heat exhaustion is the next stage. Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Symptoms include:

- Cool, moist, pale, flushed or red skin;
- Heavy sweating;
- Headache;
- Nausea or vomiting;
- Dizziness;
- Exhaustion;
- Mood changes (irritable, or confused/can't think straight), and
- Fainting

The key here is that the victim is still sweating, so the cooling system is still working; it's just under severe stress. The body core temperature may be elevated, but not higher than 104°F (40°C). It is important to recognize and treat these symptoms as soon as possible, as the transition from heat exhaustion to the very hazardous heat stroke can be quite rapid.

##### 1.1.4 Heat Stroke

Heat exhaustion can sometimes lead to heat stroke, the most serious form of heat stress, which can be fatal and requires emergency treatment. Heat stroke happens when body temperature regulation fails and body temperature continues to rise to critical levels, often to 105 degrees Fahrenheit (°F) (40.5 degrees Celsius [°C]) or higher. Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Symptoms of heat stroke:

- Vomiting;
- Decreased alertness level or complete loss of consciousness;
- High body temperature (sometimes as high as 105°F [40.5°C] );
- Red, hot, usually dry skin;
- Lack of or reduced perspiration;
- Skin may still be moist or the victim may stop sweating and the skin may be red, hot, and dry;

- Rapid, weak pulse or rapid, strong pulse;
- Rapid, shallow breathing;
- Nausea;
- Dizziness and confusion; and
- Coma.

## **2.0 Recommended Treatment for Heat Stress-related Illnesses**

### **2.1 Heat Rash**

#### **2.1.1 Treatment for heat rash includes:**

- Shower after work, dry off thoroughly, and put on clean, dry underwear and clothes;
- Try to stay in a cool place after work;
- If, in spite of this, you develop heat rash, contact WorkCare.

### **2.2 Heat Cramps**

#### **2.2.1 Treatment for heat cramps includes:**

- Gently stretch the cramped muscle and hold the stretch for about 20 seconds, then gently massage the muscle. Repeat these steps if necessary;
- Take more frequent breaks and drink more water;
- Move victim to a cool place;
- Administer drinks of cool water;
- Apply manual pressure to cramped muscles;
- Once spasms disappear, you may return to work;
- Seek medical attention if symptoms are not alleviated or if more serious problems are indicated.

### **2.3 Heat Exhaustion**

#### **2.3.1 Treatment of heat exhaustion includes:**

- Get out of the sun to a cool location and drink cool water, a little at a time;
- Remove or loosen tight clothing and elevate the feet;
- If you are nauseated or dizzy, lie down;
- Move the victim to a cool place, administer drinks of cool water and fan to cool;
- Seek medical attention immediately.

### **2.4 Heat Stroke**

#### **2.4.1 Treatment of heat stroke, or if a person's temperature exceeds 102°F (38.9 °C) includes:**

- Call for immediate medical help and then try to lower the temperature as quickly as possible:
  - Apply cool (not cold) water the person's whole body, then fan the person;
  - Wrap in wet sheet;
  - If available, use cold packs under arms, neck, and ankles;
  - Body temperature is measured frequently, often constantly. To avoid overcooling, cooling is stopped when the body temperature is reduced to about 102°F (38°C);
- Do not give aspirin or acetaminophen to reduce the temperature;
- Treat as a true medical emergency. Seek medical help immediately;
- Protect from injury during convulsion;
- Ensure that the person's airway is open;
- Transfer to a medical facility immediately.

## GUIDANCE TOOL FOR MONITORING DEHYDRATION

### URINE COLORATION CHART

1	2	3	4	5	6
<b>Target</b>		<b>Dehydration</b>		<b>Severe Dehydration</b>	
CONTINUE DRINKING WATER TO MAINTAIN CURRENT HYDRATION LEVELS.		INCREASE WATER CONSUMPTION TO IMPROVE HYDRATION LEVELS, INCREASE BREAKS FREQUENCY, TAKE BREAKS IN A COOL SHADED AREA.		<b>STOP WORK!</b> FIND A SHADED AREA AND BEGIN TO DRINK COOL TO ROOM TEMPERATURE WATER SLOWLY AND STEADILY.	

### PREVENTING DEHYDRATION

- Start hydrating at least 3 days prior to working in high heat conditions
- Always bring enough water to maintain hydration. CalOSHA requires consuming 1 quart per hour of your work shift - more may be needed

Note: This information is guidance only and should not supersede the recommendation or instruction of a personal physician or medical professional. Contact your physician or medical professional if you have a personal medical condition or take medication for a personal condition which may be adversely affected by dehydration. Urine color can be affected by medications, vitamins and or other personal health conditions.

Americas

# Heat Stress Monitoring Log

S3AM-113-FM1

The purpose of this form is to monitor employees for heat illness when applicable. It is the responsibility of the Foreman or Supervisor-in-Charge to ensure that each person completes the required information.

<b>Project Name:</b>			<b>Foreman/Supervisor:</b>						<b>Work/Rest Schedule<sup>1</sup>:</b> IN (min) OUT (min)							
<b>Date:</b>	<b>Water Provided<sup>1</sup></b>		<b>Acclimated<sup>2</sup></b>		<b>Initial Vitals<sup>3</sup></b>	<b>Vital Signs and Time In/Out<sup>3</sup></b>			<b>Celcius <input type="checkbox"/> / Farenheit <input type="checkbox"/> (select one)</b>							
Employee Name	Yes	No	Yes	No	<b>Vitals</b>	In (P <sub>1</sub> )	Out (P <sub>1</sub> )	<b>Vitals</b>	In (P <sub>1</sub> )	Out (P <sub>1</sub> )	<b>Vitals</b>	In (P <sub>1</sub> )	Out (P <sub>1</sub> )	<b>Vitals</b>	In (P <sub>1</sub> )	Out (P <sub>1</sub> )
					P			P			P			P		
					BP			BP			BP			BP		
					Temp			Temp			Temp			Temp		
					P			P			P			P		
					BP			BP			BP			BP		
					Temp			Temp			Temp			Temp		
					P			P			P			P		
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					P			P			P			P		
					BP			BP			BP			BP		
					Temp			Temp			Temp			Temp		

- 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.
- 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 "Min In" by 50 percent for that Employee until the 5 - 7 -day period is reached.
- "Vitals" refers to Employee vital signs (e.g., pulse [P], blood pressure [BP], body temperature [Temp], etc.). Initial vitals must be taken and recorded before the start of work and at each break period, or as specified in the Heat Stress Exposure Control Plan.

Heat Stress Monitoring Log (S3AM-113-FM1)

Revision 1 December 15, 2016

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## Compressed Gases

S3AM-114-PR1

### 1.0 Purpose and Scope

- 1.1 This procedure provides the requirements for using, handling, storing, transporting, disposition and/or decommissioning compressed gas cylinders.
- 1.2 This procedure applies to all AECOM Americas based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

### 2.0 Terms and Definitions

- 2.1 **Compressed Air (Non-Breathable)** – Air that is at a pressure greater than that of the atmosphere. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment. Utilized for tools, equipment, and mechanical machinery and cleaning purposes as described in this procedure.
- 2.2 **Compressed Gas** – Any material or mixture in a pressure vessel having:
  - An absolute pressure exceeding 40 pounds per square inch (PSI) at 70°F (25 pounds per square inch gauge); or
  - An absolute pressure exceeding 104 Psia at 130°F, regardless of the pressure at 70°F.
- 2.3 **Cylinder** – Pressure vessel designed for pressures higher than 40 Psia and having a circular cross section.
- 2.4 **Decommission** – The removal of a compressed gas cylinder from service by rendering it permanently unusable.
- 2.5 **Disposition** – Recycling, treatment, or disposal of a compressed gas cylinder and/or its contents.
- 2.6 **Pneumatics** – The use of pressurized air to affect mechanical motion for machinery, equipment and tools.
- 2.7 **Psi** – Pounds per square inch.
- 2.8 **Psia** – Pounds per square inch absolute (i.e., pressure in a container that would appear on an ordinary gauge plus the local atmospheric pressure [14.696 psi at sea level]), psig- pounds per square inch gauge.
- 2.9 **Psig** – Pounds per square inch gauge. The pressure in a vessel or container as registered on a gauge attached to the container. This reading does not include the pressure of the atmosphere outside the container.
- 2.10 **Pressure Relief Valve** – A device installed on most cylinders to prevent the rupture of a normally pressurized cylinder when it is inadvertently exposed to fire or high temperatures.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-116-PR1 Hazardous Materials Shipping
- 3.3 S3AM-127-PR1 Exposure Monitoring
- 3.4 S3AM-208-PR1 Personal Protective Equipment
- 3.5 S3AM-209-PR1 Risk Assessment & Management
- 3.6 S3AM-332-PR1 Hot Work



## 4.0 Procedure

### 4.1 Roles and Responsibilities

#### 4.1.1 Manager

- Ensuring the safety of employees on their project sites.
- Implement these procedures during all activities involving compressed gases.
- Seek consultation with the SH&E Manager when unknown compressed gas cylinders are encountered.
- Confirm employees have received the appropriate training as it relates to compressed gases/compressed gas cylinders.
- Confirm a hazard assessment/evaluation of the activities involving compressed gases has been completed.
- Contact the SH&E Manager prior to any compressed gas cylinder operation.
- Immediately report any leaking/suspected leaking compressed gas cylinder(s) to the SH&E Manager and implement the appropriate emergency action(s).
- Immediately report the discovery of any unknown compressed gas cylinder(s) to the SH&E Manager and cordon off the area in all directions a minimum of 50 feet (15.24 meters).
- Confirm that all compressed gas cylinders are properly inspected, stored, and, secured.
- Confirm that all compressed gas cylinders are handled in a safe manner, protecting both the person and cylinder.
- Confirm that all compressed gas cylinder manifolds and connections are properly made and inspected.
- Confirm an appropriate emergency response plan is established prior to the start of any compressed gas cylinder operation.

#### 4.1.2 SH&E Manager

- Review and authorize all compressed gas cylinder operations.
- Conduct/support compressed gas hazard assessments/evaluations.
- Provide awareness training to project teams regarding hazards of encountered compressed gases.
- Support the identification/disposition of unknown compressed gas cylinders.
- Support the development of a site-specific cylinder plan.

#### 4.1.3 Employee

- Immediately report any leaking/suspected leaking compressed gas cylinder(s) to a Manager.
- Immediately report the discovery of any unknown compressed gas cylinders to Project Manager.
- Properly handle all compressed gas cylinders.
- Shall be supervised by employees experienced in the operation of compressed gas tools and equipment.

### 4.2 Training

- 4.2.1 On-site orientation to the hazards of the equipment and the proper use, handling, and storage shall be completed for all employees handling or coming into contact with compressed air tools and equipment or compressed gas cylinders. Refer to *S3AM-003-PR1 SH&E Training* and *S3AM-114-ATT1 Compressor Safety*.

- 4.2.2 Employees shall be instructed on the PPE requirements for the applicable tasks. Refer to *S3AM-208-PR1 Personal Protective Equipment*.
- 4.3 General Use of Compressed Air or Gas
  - 4.3.1 Compressed air or other compressed gases are not to be used to blow dirt, chips, or dust from clothing while it is being worn. Compressed air used for other types of cleaning (other than clothing/persons) is to be limited to 30 psig.
  - 4.3.2 The use of blown compressed air is to be controlled, and proper personal protective equipment or safeguards utilized, to protect against the possibility of eye injury to the operator or other persons.
  - 4.3.3 Compressed air or gases are not to be used to empty containers of liquids.
  - 4.3.4 Compressed gases are not to be used to elevate or otherwise transfer any hazardous substance from one container to another unless the containers are designed to withstand the operating gas pressure with a safety factor of at least four.
  - 4.3.5 Compressed cylinders of unknown content will not be opened, but will be returned to the supplier, manufacturer or equivalent.
- 4.4 Air Compressor Operations
  - 4.4.1 Air compressor equipment should be operated only by authorized and trained employees.
  - 4.4.2 The air intake should be from a clean, outside, fresh air source. Screens or filters can be used to clean the air.
  - 4.4.3 Air compressors should never be operated at speeds faster than the manufacturer's recommendation.
  - 4.4.4 Equipment should not become overheated.
  - 4.4.5 Moving parts, such as compressor flywheels, pulleys, and belts that could be hazardous should be effectively guarded.
  - 4.4.6 Keep the air supplied tools clean and dry. Dust, moisture, and corrosive fumes can damage tools.
  - 4.4.7 Keep tools clean, lubricated, and maintained according to manufacturer's instructions.
  - 4.4.8 Only use attachments and accessories recommended by the manufacturer.
  - 4.4.9 Review the manufacturer's instruction before using a tool.
  - 4.4.10 Post warning signs where pneumatic tools are used.
  - 4.4.11 Set up screens or shields in areas where nearby workers may be exposed to flying fragments, chips, dust, and excessive noise.
  - 4.4.12 Be aware of proper handling and ergonomics while using the tool.
  - 4.4.13 Reduce physical fatigue by supporting heavy tools with a counter-balance wherever possible.
  - 4.4.14 Refer to *S3AM-114-ATT1 Compressor Safety* for additional information.
- 4.5 Air Hoses
  - 4.5.1 Use the proper hose and fittings of the correct diameter.
  - 4.5.2 Use hoses specifically designed to resist abrasion, cutting, crushing and failure from continuous flexing.
  - 4.5.3 Choose air-supply hoses that have a minimum working pressure rating of 1035 kPa (150 psig) or 150% of the maximum pressure produced in the system, whichever is higher.
  - 4.5.4 Check hoses regularly for cuts, bulges and abrasions. Tag and replace, if defective.
  - 4.5.5 Blow out the air line before connecting a tool. Hold hose firmly and blow away from yourself and others.

- 4.5.6 Make sure that hose connections fit properly and are equipped with a mechanical means of securing the connection (e.g., chain, wire, or positive locking device).
- 4.5.7 Install quick disconnects of a pressure-release type rather than a disengagement type. Attach the male end of the connector to the tool, NOT the hose.
- 4.5.8 Do not operate the tool at a pressure above the manufacturer's rating.
- 4.5.9 Turn off the air pressure to hose when not in use or when changing power tools.
- 4.5.10 Do not carry a pneumatic tool by its hose.
- 4.5.11 Do not use compressed air to blow debris or to clean dirt from clothes.
- 4.5.12 All pipes, hoses, and fittings shall have a rating of the maximum pressure of the compressor. Compressed air pipelines should be identified (psi) as to maximum working pressure.
- 4.5.13 Air supply shutoff valves should be located (as near as possible) at the point-of-operation.
- 4.5.14 Air hoses should be kept free of grease and oil to reduce the possibility of deterioration.
- 4.5.15 Avoid trip hazards. Hoses should not be strung across floors or aisles where they are liable to cause employees to trip and fall. When possible, air supply hoses should be suspended overhead, or otherwise located to afford efficient access and protection against damage.
- 4.5.16 Hose ends shall be secured to prevent whipping if an accidental cut or break occurs.
- 4.5.17 Pneumatic impact tools, such as riveting guns, should never be pointed at a person.
- 4.5.18 Before a pneumatic tool is disconnected (unless it has quick disconnect plugs), the air supply shall be turned off at the control valve and the tool bled.
- 4.5.19 Shop air used for cleaning should be regulated to 15 psi unless equipped with diffuser nozzles to provide lesser pressure.
- 4.5.20 Goggles, face shields or other eye protection shall be worn by employees using compressed air for cleaning equipment.
- 4.5.21 Static electricity can be generated through the use of pneumatic tools. This type of equipment shall be grounded or bonded if it is used where fuel, flammable vapors or explosive atmospheres are present.
- 4.5.22 The following are hazards associated with the use of compressed air tools and equipment:
  - Poorly designed tool (wrist strain);
  - Vibration (vibration-induced white finger);
  - Noise (hearing loss); and
  - Dust (respiratory problems).
- 4.5.23 The following hazards have the potential to cause serious bodily injury when working with compressed air:
  - Incorrect tool selection;
  - Use of damaged tool;
  - Improper, inadequate, or no guards;
  - Rotating shaft (entanglement);
  - Wheel breakage (grinder);
  - Flying chips;
  - Whipping of the hose;
  - Accidental start up;

- Air embolism (compressed air injected into the body);
- Dropped tool; and
- Tripping over hose.

#### 4.6 Compressed Air Equipment Maintenance

- 4.6.1 Only authorized and trained employees should service and maintain air compressor equipment.
- 4.6.2 Exposed, non-current-carrying, metal parts of compressor should be effectively grounded.
- 4.6.3 Low Flash Point lubricants should not be used on compressors because of its high operating temperatures that could cause a fire or explosion.
- 4.6.4 Equipment should not be over lubricated.
- 4.6.5 Gasoline or diesel fuel powered compressors shall not be used indoors.
- 4.6.6 Equipment placed outside but near buildings should have the exhausts directed away from doors, windows and fresh air intakes.
- 4.6.7 Soapy water or lye solutions can be used to clean compressor parts of carbon deposits, but kerosene or other flammable substances should not be used. Frequent cleaning is necessary to keep compressors in good working condition.
- 4.6.8 The air systems should be completely purged after each cleaning.
- 4.6.9 During maintenance work, the switches of electrically operated compressors should be locked open and tagged to prevent accidental starting.
- 4.6.10 Portable electric compressors should be disconnected from the power supply before performing maintenance.

#### 4.7 Compressed Gas Cylinder Requirements

- 4.7.1 Cylinders are not to be used unless they bear Department of Transportation (DOT) or Transportation of Dangerous Goods (TDG) markings showing that they have been tested as required by DOT or TDG regulations.
- 4.7.2 Cylinders shall never be dropped, struck, or permitted to strike each other violently. Cylinders may be moved by tilting and rolling them on their bottom edges.
- 4.7.3 Valve protection caps shall always be kept on cylinders when they are being moved or stored, and until ready for use. Caution should be exercised as insects such as spiders, wasps, and bees may be encountered in cylinder caps.
- 4.7.4 Do not lift cylinders by the valve protection cap.
- 4.7.5 Cylinder valves are to be kept closed except when gas is being used or when connected to a permanent manifold. Valves of empty cylinders shall be closed.
- 4.7.6 Cylinders shall never be used as rollers or supports, or for any purpose other than carrying gas.
- 4.7.7 Valves and regulators shall be 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.
- 4.7.8 Threads on regulator connections or other auxiliary equipment shall be the same as those on the cylinder valve outlet.
- 4.7.9 Regulators shall be specific to the gas being used and no adapters may be used to connect regulators to cylinders.
- 4.7.10 When withdrawing cylinder content, open the cylinder valve slowly using the appropriate tool (e.g., manufacturer supplied, non-sparking, etc.). Point the valve opening away from yourself and other persons.

- 4.7.11 Before a regulator is removed from a cylinder, close the cylinder valve and release all pressure from the regulator. This procedure also serves as a check to confirm that the main cylinder valve is completely closed.
- 4.7.12 Never hammer the valve wheel in attempting to open or close the valve.
- 4.7.13 No person, except the owner of the cylinder or person authorized by the owner, shall refill a cylinder (Exceptions to this includes the filling of self-contained breathing apparatus cylinders with Grade D breathing air, or the filling of the [Foxboro] Organic Vapor Analyzer (OVA) hydrogen cylinders). Disposable cylinders shall not be refilled with any material after use of the original contents.
- 4.7.14 Cylinders of compressed gas shall be stored in areas where they are protected from external heat sources such as flame impingement, intense radiant heat, electric arc, or high-temperature steam lines.
- 4.7.15 Cylinders are to be stored in an assigned, well-ventilated area, with full and empty cylinders stored separately. Empty cylinders shall be marked 'empty'.
- 4.7.16 Stored fuel gases and oxygen cylinders are to be separated by at least 20 feet, or by a fire wall at least 5 feet high that has a fire-resistance rating of at least ½ hour.
- 4.7.17 Oxygen, nitrogen, helium, or freon cylinders shall only be stored or transported in an upright or horizontal position. Acetylene cylinders shall always be kept in an upright position. All horizontally-placed cylinders are to be secured by chocks or ties to prevent rolling.
- 4.7.18 Cylinders are to be secured to a fixed object by chain or equivalent fastening device whenever they are placed in an upright position. The protective cap is not to be removed or the cylinder valve opened until the cylinder is secured.
- 4.7.19 Repair of leaks shall never be attempted on a pressurized system. System pressure should be reduced to atmospheric pressure as rapidly as possible, and the Manager notified immediately.
- 4.7.20 Compressed gas cylinders shall be legibly marked for the purpose of identifying the gas content with either the chemical or the trade name of the gas. Such marking is to be done by means of stenciling, stamping or labelling, and shall not be readily removable. Whenever practical, the marking is to be located on the shoulder of the cylinder. Positive identification of the gas in any cylinder is required before connecting cylinders for use.
- 4.7.21 Gas cylinders moved by hoist shall be handled in suitable cradles or job-made "skip" (materials) boxes. Any slings used for this purpose shall be specifically designed for that cylinder handling.
- 4.7.22 Cylinders shall not be placed where they might form part of an electrical circuit.
- 4.7.23 Transfer of compressed gases (including acetylene) from one cylinder to another, or mixing of gases in a cylinder, is prohibited.
- 4.7.24 Oxygen cylinders are never to be stored near:
  - Highly combustible materials, especially oil and grease;
  - Reserve stocks of acetylene or other fuel gas cylinders; and
  - Any other substance likely to cause or accelerate fire.
- 4.7.25 Compressed oxygen is never to be used:
  - As breathing air;
  - To purge pipelines, tanks, or any confined area;
  - To supply a head-pressure tank;
  - In pneumatic tools;
  - In oil preheating burners;

- To start internal combustion engines;
- For ventilation;
- For cleaning clothing; and
- In any other way as a substitute for compressed air.

4.7.26 Use of a cylinder's contents for purposes other than those intended by the supplier is prohibited.

4.7.27 Cylinders of compressed natural gas or propane equipped with a pressure relief device shall always be positioned in a manner that this device remains above the liquid level (e.g., if stored or installed horizontally on a forklift, relief device is positioned at the top).

4.7.28 Storage of liquefied petroleum gas (LPG) within buildings is prohibited, and outdoor storage of LPG shall meet applicable building and fire codes.

#### 4.8 Special Precautions for Compressed Gas Cylinders Containing Hydrogen

4.8.1 Inside buildings, cylinders of hydrogen should be separated from oxygen cylinders by a minimum distance of 20 feet (6.1 meters) or by a barrier of non-combustible material at least 5 feet (1.5 meters) high having a fire resistance rating of at least one half hour.

4.8.2 Conspicuous signs should be posted in hydrogen storage areas forbidding smoking, open flames or the use of lights or lighting not approved for use in flammable areas.

4.8.3 Hydrogen storage areas shall be labeled, "Hydrogen-Flammable Gas-No Smoking-No Open Flame" or equivalent.

#### 4.9 Inspection of Compressed Gas Cylinders

4.9.1 Prior to formally accepting any delivered compressed gas cylinders, a visual inspection of each cylinder will be documented as specified below. In addition, all compressed gas cylinders stored at an AECOM facility will be inspected monthly.

- Visually inspect cylinders, refer to *S3AM-114-FM1 Compressed Gas Cylinder Inspection*.
- Verify that all the required markings are on the cylinders.
- If required, determine when the cylinder was last hydrostatically-tested.
- Inspect the safety relief devices, if required.
- If any defects are noted during the inspection, the cylinder should be refused on delivery and a new delivery requested (notify the Manager).

4.9.2 Where compressed gas cylinders are stored at an AECOM facility, a qualified person will be designated to confirm cylinder activities comply with the requirements in this procedure. Inspection entails the evaluation of the integrity of the cylinder as well as the serviceability of any attached manifold and valve fittings. Inspection activities of cylinders beyond visual inspection are recommended to be conducted in isolation or a remote location for worker and public safety. The inspection of any cylinder will be conducted by a qualified person, refer to *S3AM-114-FM1 Compressed Gas Cylinder Inspection*.

#### 4.10 Cylinder Inspection Procedures

4.10.1 All cylinder inspection procedures will adhere to the applicable regulatory requirement. At a minimum, the inspection process will include the following procedures:

- Observe the cylinder from a safe distance to identify any visual markings or other information.
- Inspect the cylinder size, shape, and general condition (if visible, include the valve system/stem in the inspection process).
- If the cylinder or valve system appears to be in poor condition or has lost structural integrity, do not approach the cylinder. Observations indicating a cylinder is in poor condition may include:

- Leaking,
  - Hissing sound,
  - Odor in vicinity of the cylinder,
  - Rusty components,
  - Bulging side wall or end, and/or
  - Corroded valve system.
- 4.10.2 If the cylinder is determined to be in poor condition, cordon the area off and limit access to necessary employees only.
- 4.10.3 Wear applicable PPE and approach the cylinder with the appropriate direct reading air monitoring instrument (do not approach from the ends of the cylinder), then determine the airborne contaminant concentrations in the immediate area.
- 4.10.4 Document cylinder information (e.g., visible markings, labels, placards, etc.).
- 4.10.5 Cylinders presenting potential deficiencies (e.g., dent, missing labels, valve protection cap cannot be removed by hand, corrosion, etc.) shall be tagged 'Do Not Use', removed from use, and returned to the supplier.
- 4.11 Ground Transport of Compressed Gas Cylinders
  - 4.11.1 AECOM will transport (drive/haul) quantities of compressed gases which do not exceed Materials of Trade (MOT) quantities, whereas the transport of placardable quantities is prohibited without the proper DOT / TDG licenses/credentials and consultation with the SH&E Manager.
  - 4.11.2 Compressed gas cylinders in portable service are to be conveyed by suitable trucks, to which they are securely fastened. All gas cylinders in service shall be securely held in substantial racks or secured to other rigid structures so that they will not fall or be knocked over.
- 4.12 Air/Common Carrier Transport
  - 4.12.1 All shipping of compressed gases via air/common carrier including instrument gases, regardless of quantity, shall be conducted by a qualified and trained HazMat Shipper (Level 1-2 Shipper) or jurisdictional equivalent, and shall be conducted under the oversight of a designated DOT/International Air Transport Association (IATA) shipping specialist, or jurisdictional equivalent. Refer to *S3AM-116-PR1 Hazardous Materials Shipping*.
  - 4.12.2 No compressed gas cylinder, regardless of contents or quantity, will be shipped via an external carrier vendor (i.e., UPS, FedEx, etc.) without the authorization of:
    - SH&E Manager, and
    - DOT/IATA shipping specialist.
  - 4.12.3
- 4.13 Cylinder Color Coding Determination
  - 4.13.1 The color coding of compressed gas cylinders is established by the Compressed Gas Association, which has assigned specific colors to categories or classes of chemicals/substances. It is important to note there is currently not requirement to adhere to this color coding scheme.
  - 4.13.2 While recently manufactured cylinders reflect the color coding guidance established by the CGA, older cylinders may not reflect this nomenclature. It is also possible for cylinders to have been repainted a different color from their original.
  - 4.13.3 Cylinder contents should never be determined by the color of the cylinder alone. Colors are not uniform throughout the compressed gas industry.
  - 4.13.4 Cylinder contents shall be identified by a decal, label, tag, or stenciling. If an identifying label is lacking or not legible, return the container to the supplier, unused.

#### 4.14 Air Monitoring Requirements

4.14.1 Air monitoring requirements are dependent upon the specific substances contained within the cylinders and will be specified within the site-specific safety plan prepared prior to commencement of field activities. Air monitoring parameters, refer to *S3AM-127-PR1 Exposure Monitoring*, may include, but are not limited to:

- Explosivity (i.e., lower explosive limit [LEL]), and
- Chemical-specific substance (e.g., chlorine, ammonia, arsine, etc.).

4.14.2 Action levels will be identified in the site-specific safety plan.

#### 4.15 Cylinder Staging

4.15.1 Staging involves the organization, and sometimes consolidation, of cylinders that have similar contents or characteristics.

4.15.2 The staging of cylinders will occur in a remote location at the site in order to minimize the potential injury or property damage from an accidental release or emergency decompression (if the integrity of the cylinder is in question, it should not be moved).

4.15.3 Safe distances will be based on the evacuation distances provided in DOT's Emergency Response Guidebook (most current edition).

4.15.4 When multiple cylinders containing different substances are present, the distance should be based on the greatest evacuation distance required by the substances present.

#### 4.16 Cylinder Disposition & Decommissioning Activities

4.16.1 Disposition refers to the recycling, treatment, or disposal of a compressed gas cylinder and/or its contents.

4.16.2 Recovery and recycling of materials are preferred over any other method of disposition. Cylinder disposition activities shall be approved by the SH&E Manager.

4.16.3 An effort should be made to recover and recycle the contents of a cylinder; however, if recovering or recycling the contents is not possible, then other options include:

- Venting to the Atmosphere,
- Flaring,
- Neutralization, and
- Detonation.

4.16.4 Under no circumstances will poisonous, toxic, or ozone-depleting substances be vented to the atmosphere. Only cylinders containing flammable gases should be detonated, as the flammable contents will be consumed in the subsequent explosion.

4.16.5 If the cylinder valve has been determined to be inoperable, then the available options for disposition are limited to having an outside vendor perform the remote opening and sampling of the cylinder, or detonation of the cylinder where the cylinder contents are consumed in the subsequent explosion (flammable gases only).

4.16.6 All cylinders shall be inventoried, staged, and inspected.

4.16.7 Prior to the commencement of cylinder disposition and decommissioning activities, local emergency response agencies (i.e., Fire Department, Medical, and Emergency Response, if separate) shall be confirmed and, as applicable, activities coordinated with the local agencies.

4.16.8 Air monitoring is mandatory during cylinder disposition and decommissioning operations.

4.16.9 A SH&E Manager shall be contacted during the planning stages of a cylinder disposition and decommissioning effort in order to determine whether a site-specific cylinder plan is required.



#### 4.17 Venting to the Atmosphere

4.17.1 Cylinders that contain non-flammable, non-toxic materials can be vented to the atmosphere. All venting activities will be performed in accordance with the following procedures:

- Atmospheric venting will be accomplished at a remote location and in compliance with all applicable environmental air regulatory requirements.
- Atmospheric venting activities will be completed in a Level B Ensemble (unless otherwise specified in the site-specific safety plan and cylinder plan).
- Venting activities will be dependent upon a wind direction that does not carry the outgas plume in the direction of an adjacent public structure.
- The cylinder will be properly grounded to confirm a static charge is not generated, potentially resulting in ignition of a flammable gas.
- All tools used on the cylinder will be non-sparking.
- Low-pressure discharging will not exceed 15 pounds per square inch gauge (psig).
- Once discharging has started, all workers will retreat to the exclusion zone (minimum 100 feet) around the remote location until the discharging process is complete.

#### 4.18 Flaring

4.18.1 Flaring activities involve the combustion of the cylinder contents through the discharge of a low-intensity flame. Flaring activities will be performed in accordance with the following procedures:

- Flaring will be accomplished at a remote location and in compliance with all applicable environmental air regulatory requirements.
- All personnel involved with flaring activities shall be appropriately trained and wear PPE appropriate to the hazards (e.g. Nomex fire-retardant forearm-length gloves, other fire-retardant clothing, self-contained breathing apparatus, etc.).
- Flaring activities will be dependent upon a wind direction that does not carry the combustion plume in the direction of any offsite structure or activity, or into uncontrolled (public access) areas.
- The cylinder will be properly grounded to confirm a static charge is not generated, potentially resulting in ignition of a flammable gas.
- All tools used on the cylinder will be non-sparking.
- Low-pressure discharging will not exceed 15 pounds per square inch gauge (psig).
- A hot work permit shall be completed prior to the start of flaring activities, refer to *S3AM-332-PR1 Hot Work*.
- No other cylinders will be within 50 feet (15.24 meters) of the cylinder being flared.
- Flaring activities will use a low-pressure discharge and maintain a small, low-intensity flame.
- A firewatch will be established, with a worker stationed outside the exclusion zone with a fire extinguisher (20A:100B:C) during flaring activities (i.e., fire watch). During the work the worker assigned to the firewatch will have no other duties.
- The flare will be positioned so that it is not pointing toward any flammable materials, persons, or equipment in the immediate area.

#### 4.19 Neutralization

4.19.1 Neutralization refers to the on-site neutralization of the cylinder contents through a controlled chemical reaction process. Specialized equipment may be necessary based on the chemical involved, as well as reaction by-products, catalysts, or physical conditions (i.e., temperature, acidic, basic, etc.). Neutralization activities will be performed in accordance with the following procedures:

- Neutralization is the required disposition method for cylinders containing acid gases, as well as many alkaline gases.
- The neutralization process shall be approved by a professional engineer (e.g., chemical) or based on a published chemical-specific neutralization methodology.
- Liquid levels in the reaction vessels will be maintained at least 12 inches (30.5 centimeters) below the top of the vessel.
- Based on the specific chemical reaction, the temperature of the reaction vessel and its contents will be monitored continuously and controlled accordingly.
- Pressure levels will be maintained within acceptable limits to prevent the reaction from accelerating, unwanted by-product formation, or the break-through of the chemical intended to be neutralized.
- Employees involved in neutralization activities shall be appropriately trained and wear the PPE identified within the site-specific safety plan and cylinder plan.

#### 4.20 Detonation

4.20.1 Detonation refers to the use of explosives to open and subsequently consume the contents of the cylinder by the heat generated during the explosion. Detonation activities will be performed in accordance with the following procedures:

- All personnel involved with detonation activities shall be appropriately trained and wear PPE appropriate to the hazards (e.g. Nomex fire-retardant forearm-length gloves, other fire-retardant clothing, self-contained breathing apparatus, etc.).
- A detonation plan shall be submitted to and approved by the SH&E Manager prior to the commencement of cylinder detonation activities.
- The detonation of compressed gas cylinders will be completed under the guidance of experienced ordnance and explosives (OE) professional who is licensed in the use of explosives.
- A sufficient amount of explosives will be used to consume the entire contents of the cylinder (flammable gases only).
- A blast pit will be excavated where all detonations will take place.
- The OE professional will determine the blast hazard zone/potential debris impact zone, and this area will be evacuated prior to the detonation.
- The OE professional will sound a warning signal (e.g., horn or equivalent) three times to indicate that a detonation is imminent and confirm all persons have evacuated the blast hazard zone prior to detonation.
- Employees will be on standby outside the blast hazard zone with fire extinguishers (minimum rating of 20A:100B:C).

#### 4.21 Cylinder Decommissioning Operations

- 4.21.1 Decommissioning refers to the removal of a compressed gas cylinder from service by rendering it permanently unusable.
- 4.21.2 Prior to decommissioning, cylinder contents will be verified, removed from the cylinder, and the cylinder purged with an inert gas (e.g., nitrogen, carbon dioxide, etc.).
- 4.21.3 All identifying marks or decals will be removed from the cylinder.
- 4.21.4 The SH&E Manager shall be contacted prior to the decommissioning of compressed gas cylinders that contain or previously contained:
- Ethylene oxide,

- Arsine,
- Diborane,
- Hydrogen selenide,
- Cyanogen chloride,
- Amines,
- Hydrogen sulfide,
- Acetylene, or
- Methyl mercaptan.

4.21.5 Additional safety precautions may be necessary due to highly reactive residues left behind by these substances.

4.21.6 The recommended methods of decommissioning include:

- Burning/torch-cutting an elongated hole into the side of the cylinder, refer to *S3AM-332-PR1 Hot Work*;
- Torch-cutting the cylinder in half; and
- Crushing the cylinder.

## **5.0 Records**

5.1 None

## **6.0 Attachments**

6.1 [S3AM-114-ATT1 Compressor Safety](#)

6.2 [S3AM-114-FM1 Compressed Gas Cylinder Inspection](#)

## Compressor Safety

S3AM-114-ATT1

### 1.0 Objective / Overview

- 1.1 Compressors should be used with extreme caution in order to prevent personal injury.
- 1.2 When using a compressor it's important to follow the manufacturer's instructions to avoid injuring someone or damaging your compressor.
- 1.3 Allow only trained, authorized personnel to operate the compressor. Along with training, other safety measures include: proper maintenance of equipment and personal protective equipment.

### 2.0 Safe Operating Guidelines

- 2.1 Follow manufactures recommended operating instructions, every compressor is not the same. Maintain adequate ventilation.
- 2.2 Gas and diesel powered generators emit carbon monoxide (CO). Never operate a fuel-powered compressor in an enclosed building without proper ventilation.
- 2.3 Turn the compressor off to refuel. Gasoline and its vapors may ignite if they come into contact with hot components or an electrical spark, store fuel in a properly designed container in a secure location.
- 2.4 Operators shall perform a pre-operational check of all air hoses, couplings, and connections to determine if leakage or other damage exists. Tag unsafe equipment and take out of service immediately.
- 2.5 Decompress air from the compressor prior to removing any caps or air equipment attachments such as jackhammers, drills, etc.
- 2.6 Keep oil and flammable material clear of air fittings and joints.
- 2.7 Make sure connections are secure to avoid a hose coming loose during use.
- 2.8 To avoid a shock, make sure that your hands are dry and you're standing in a dry place whenever you operate an electrically powered compressor.
- 2.9 Use only UL-listed, three-prong extension cords. Be sure the extension cord is the proper size (wire-gauge) to handle the electric load that will be plugged into it.
- 2.10 Have a Class A:B:C fire extinguisher readily available at all times.

### 3.0 Potential Hazards

- 3.1 Burns from contact with the hot muffler or engine
- 3.2 Shocks/electrocution
- 3.3 Noise exposure
- 3.4 Inhaling exhaust gases, CO
- 3.5 Contact with pressurized air

### 4.0 Training Requirements

- 4.1 Review of applicable procedures.
- 4.2 Demonstrated knowledge on the use of the compressor.
- 4.3 Review of manufacturers operating guidelines.

## **5.0 Personal Protective Equipment**

- 5.1 Leather Gloves
- 5.2 Hearing Protection
- 5.3 Long Sleeve Shirt (e.g., to shield from burns, etc.)
- 5.4 Refer to *S3AM-208-PR1 Personal Protective Equipment*

Americas

**Compressed Gas Cylinder Inspection**

S3AM-114-FM1

Location Inspected: \_\_\_\_\_ Job No.: \_\_\_\_\_

Date Inspected: \_\_\_\_\_ Name of Inspector: \_\_\_\_\_

1.	DOT / TDG container specification number present on cylinders.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
2.	Proper DOT / TDG shipping name, ID # and hazard class on cylinders.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
3.	Manufacturer's name and appropriate hazard warnings present.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
4.	Serial number of cylinders and inspectors official mark present.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
5.	Most recent hydrostatic test date marked and within 5 years.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
6.	Cylinder valve and neck ring free of oil, grease or other foreign matter.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
7.	Valve threads clean and in good condition.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
8.	Pressure rating of cylinder not exceeded.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
9.	Cylinder surface is free of cracks, and dents, gouges, weld defects, etc.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
10.	Cylinder surface is free of arc burns and fire burns.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
11.	Cylinder cap is present and threaded in place.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
12.	Cylinder surface, particularly bottom, is free of excessive corrosion, and pitting.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
13.	Cylinders must be capped when regulators are removed.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
14.	Oxygen and fuel cylinders are stowed in designated well-ventilated areas.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
15.	Storage areas have temperatures less than 125° F (52° C).	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
16.	Cylinders are stored upright and secured from falling over.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
17.	Cylinders are in segregated groups by gas type and not intermingled with other cylinders.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
18.	Oxygen cylinders are stored at least 20 feet (6.1 meters) away from flammables. (A fire-resistive partition of at least 1-hour fire-resistance rating of at least 5-foot (1.52 meters) height may be used in lieu of 20 foot [6.1 meter] separation.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
19.	Flammable or combustible materials are kept at least 20 feet (6.1 meters) away from stored cylinders.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
20.	Gas cylinder valves are protected from snow and ice during winter months.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
21.	Oxygen cylinders are kept free from oil and grease.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
22.	Welding cylinders are securely fastened to ready-use racks.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
23.	Smoking or open flames are not permitted in areas where cylinders are stored.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
24.	Cylinder storage areas are posted with the following sign: "DANGER – NO SMOKING OR OPEN FLAME".	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
25.	Cylinders are labeled with gas contents and warning statement.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
26.	Empty cylinders are segregated from full cylinders.	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA

## Hearing Conservation

S3AM-118-PR1

### 1.0 Purpose and Scope

- 1.1 Establishes procedures to confirm that personal noise exposure remains within acceptable limits and establishes the requirements of an acceptable hearing conservation program.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

### 2.0 Terms and Definitions

- 2.1 **ABC System** – The system used in Canada to classify hearing protectors on the basis of the attenuation provided by the hearing protection.
- 2.2 **Action Level** – May also be referred to as **Monitoring Level**. An eight-hour, time-weighted average established by the applicable jurisdiction, measured on the A-scale, slow response. Depending upon jurisdiction, this can vary anywhere from 74dBA to 85dBA, and may additionally be defined as 50% of the allowable noise dose. In the absence of a specified jurisdictional action level, 85dBA shall be used as the default action level.
- 2.3 **Attenuation** – The reduction of the sound level at the ears of a person wearing hearing protectors.
- 2.4 **Decibel (dB)** – Logarithmic unit of measurement of sound level.
- 2.5 **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 the given jurisdiction (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.
- 2.6 **Standard Threshold Shift (STS)** – 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).
- 2.7 **Noise Reduction Rating (NRR)** – The measure, in decibels, of how well a hearing protector reduces noise (attenuation), as specified by the United States of America Environmental Protection Agency. It is a requirement in the USA that all hearing protectors have the NRR stamped on their packaging.
- 2.8 **Time-Weighted Average (TWA) Sound Level** – That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-127-PR1 Exposure Monitoring
- 3.3 S3AM-128-PR1 Medical Screening & Surveillance

### 4.0 Procedure

- 4.1 Roles and Responsibilities
  - 4.1.1 **SH&E Manager**
    - Provide access to initial and refresher hearing conservation training.

- Inform employees of noise monitoring results when full-shift noise exposure is at or above the action level.
- Designate areas and tasks where employees' exposure is at or above the action level.
- Conduct noise monitoring and supervise noise surveys, as applicable, and support hazardous noise assessment/evaluation efforts.

#### 4.1.2 **Manager**

- Implement the hearing conservation program.
- Confirm that a hazardous noise assessment/evaluation has been conducted.
- Confirm that a hazardous noise assessment/evaluation is conducted when a change in equipment, procedures, or personnel may increase employee exposure to noise.
- Implement engineering controls to reduce noise levels when such measures are considered feasible and when required by regulation.
- Purchase, monitor, and replenish for employees' use, a supply of hearing protection devices with a minimum Noise Reduction Rating (NRR) of 26 dBA, or of the appropriate classification for the applicable jurisdiction.
- Confirm that individuals included in the program receive training and that the training meets the criteria outlined in this program.
- Investigate and implement corrective action to all reports of non-conformance with this procedure, including reports of standard threshold shifts or employees' failure to wear hearing protectors in designated areas.
- Maintain an awareness of the noise levels in work areas for which he/she is responsible.
- Place warning signs in areas where sound levels would require the use of hearing protectors.
- Request that a hazardous noise assessment/evaluation be conducted when a change in equipment, procedures, or personnel may increase employee exposure to noise above action levels.
- Confirm that all employees are aware of the requirements for hearing protection for any designated area or task.
- Enforce the use of hearing protection by employees in designated areas and for designated tasks.

#### 4.1.3 **Employee**

- Comply with the requirements of the Hearing Conservation program.
- Wear hearing protection devices in designated areas or for designated tasks.
- Inspect and maintain hearing protection devices.
- Report any suspected change in noise levels of work area to supervisor.
- Report any signs or symptoms experienced that could be the result of overexposure to noise to supervisor.
- Participate in audiometric testing and hearing protection training when required.

### 4.2 **General Requirements**

- 4.2.1 The requirements of this procedure apply to all locations/facilities/projects where employee noise exposure may equal or exceed the action level.
- 4.2.2 SH&E Plans and Task Hazard Assessments (THA) shall identify applicable hazards related to noise exposure. Identify established exposure limits and action levels specified by the applicable jurisdiction, or in the absence of specifications, an 8-hour TWA of 85 dBA.



- The below chart is intended to provide basic established exposure limits by jurisdiction. Please consult the applicable jurisdictional legislation to obtain further information and to verify accuracy.

	8hr TWA Established Exposure Limit (dBA)	8hr TWA Action Level (dBA)
OSHA	90	85
Canada - Federal	87	74
Alberta	85	85
British Columbia	85	82
Manitoba	85	80
New Brunswick	85	80
Newfoundland	85	85
Northwest Territories	85	80
Nova Scotia	85	85
Nunavut	85	85
Ontario	85	85
Prince Edward Island	85	85
Quebec	90	85
Saskatchewan	85	80
Yukon	85	80

- Acceptable methods of adjusting this limit to correspond to a different exposure period (e.g. 10 hours) vary by jurisdiction.
- 4.2.3 When processes or areas present noise exposures that are or could be at or above the action level identified for the given jurisdiction, monitoring and interpretation of results shall be undertaken by a trained and competent individual using approved equipment (sound level meters, sound dosimeters) to assess the hazard.
- 4.2.4 Resulting documentation (e.g. noise maps, results of the sound level survey data, etc.) will be posted at the location.
- 4.2.5 Noise assessments shall be repeated when there is any change in processes or equipment that could affect the noise level or the exposure duration.
- 4.2.6 Eliminate noise sources or reduce noise levels to the extent possible prior to implementing hearing protection PPE. Examples of controls that shall be considered include:
- Adding or replacing mufflers on motorized equipment.
  - Adding mufflers to air exhausts on pneumatic equipment.
  - Following equipment maintenance procedures to lubricate dry bearings and replace worn or broken components.
  - Isolating loud equipment with barriers.
  - Replacing loud equipment with newer and quieter models.
  - Using caution signs and Hearing Protection Required signs to designate noisy work areas.
  - Installing hearing protection device-dispensing stations at the entrance to noisy work areas.
- 4.2.7 Where practicable, a clearly visible warning sign shall be posted at every approach to an area in the workplace where the sound level regularly exceeds 85 dBA.

### 4.3 Hearing Protectors

- 4.3.1 Hearing protectors will be used in the event that administrative or engineering controls are either not effective or not feasible.
- 4.3.2 Selection of appropriate hearing protectors shall be based on actual or anticipated exposure levels, the attenuation provided by the device, and the manufacturer's information about the use and limitations of the device.
- 4.3.3 At a minimum, hearing protectors shall provide a level of protection that brings actual or anticipated exposure below the established exposure limit for the applicable jurisdiction. Additional information relative to hearing protector use is as follows:
  - The use of hearing protectors is required in any location where powered or motorized equipment, portable tools or any other noise source could reasonably be expected to exceed noise levels specified by the applicable jurisdiction, or in the absence of specifications, an 8-hour TWA of 85 dBA.
  - Hearing protection will be mandatory for all employees working in any area that has not been evaluated for noise exposure and the ambient noise level in the area is such that a raised voice is necessary to have a normal conversation with someone less than three feet (1 meter) away, and/or when within 25 feet (7.6 meters) of an operating piece of heavy equipment.
  - Hearing protection will be mandatory for all employees who work on or near heavy equipment unless personal dosimetry or other techniques have been used to document actual exposure.
  - Hearing protectors will be made available to all employees at no cost to the employees who may be exposed to noise levels specified by the applicable jurisdiction, or in the absence of specifications, an 8-hour TWA of 85 dBA.
  - Hearing protection will be mandatory for all employees exposed to 85 dBA for any period of time and who have experienced an STS.
  - Whenever information indicates that any employee's exposure may equal or exceed specified levels (or as applicable, an 8-hour TWA of 85 dBA), the manager will be responsible for enforcing the proper use of hearing protectors.
  - At least two types of hearing protectors shall be available to employees free of charge, and the type of hearing protector shall be suitable to the task and approved to the applicable jurisdiction.
  - Hearing protectors shall be used in accordance with manufacturer's specifications to effectively protect hearing. Refer to *S3AM-118-ATT1 Hearing Protection Guidelines*.
- 4.3.4 Evaluate the effectiveness of the hearing protectors chosen.
- 4.3.5 The manufacturer's assigned noise reduction rating (NRR) or attenuation for hearing protection devices can seldom be achieved in workplace conditions; therefore this rating shall be adjusted for real world conditions and use.
  - For devices with an NRR rating, subtract 7 from the NRR of the protector provided by the manufacturer. Divide this result by 2, and then subtract the remained from the observed "A" scale sound level measurement collected in the employee's work area (see Section 4.B). If this number is below 85, the hearing protectors are adequate for use in the work area.
- 4.3.6 Implement a hearing conservation program as applicable and in accordance with jurisdictional requirements

### 4.4 Training

- 4.4.1 All employees with potential exposure above the action levels applicable to their jurisdiction, or who otherwise utilize any type of hearing protector will participate in a hearing conservation training program. Refer to *S3AM-003-PR1 SH&E Training*.

- 4.4.2 The initial and subsequent annual hearing conservation training will address, at a minimum, the following topics:
- The effects of noise on hearing, recognizing hazardous noise, and symptoms of overexposure to hazardous noise.
  - When and/or where hearing protectors are required to be worn.
  - The purpose of hearing protectors.
  - The advantages, disadvantages, and effectiveness of various types of protectors.
  - Instructions on care and use of hearing protectors, including its limitations, proper fitting, inspection and maintenance and, if applicable, the cleaning and disinfection of the protector.
  - The purpose of audiometric testing, including an explanation of the test procedures.
  - Hearing Conservation Program requirements and responsibilities.
- 4.4.3 Hearing protection training is 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.

#### 4.5 Audiometric Testing

- 4.5.1 All AECOM personnel with exposure greater than the action level shall be enrolled in the medical surveillance program and undergo a baseline audiogram within 6 months of the first exposure (consult local jurisdiction for more stringent timelines).
- 4.5.2 Thereafter, annual audiograms will be compared with the baseline exam. Testing to establish a baseline audiogram will be preceded by 14 hours without exposure to noise, including noise exposure away from work. Hearing protectors may be used as a substitute for the requirement that a baseline audiogram will be preceded by 14 hours without exposure to noise.
- 4.5.3 Enrolled employees will receive audiograms during their exit physicals; refer to *S3AM-128-PR1 Medical Screening & Surveillance Program*.
- Audiometric tests will be performed by a person meeting the requirements specified by the applicable jurisdiction.
  - The medical surveillance provider will notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.
  - For multi-year projects, an annual audiogram will be obtained for each employee exposed at or above the level specified by the applicable jurisdiction, or in the absence of specifications, an 8-hour TWA of 85 decibels.
- 4.5.4 Each employee's annual audiogram will be compared to that employee's baseline audiogram to determine if the audiogram is valid, and if there is a standard threshold shift (STS).
- 4.5.5 When a Standard Threshold Shift (STS), as identified by the AECOM Medical Consultant, is noted between the last valid baseline and the annual audiogram, the following steps will be taken:
- A retest will be conducted within 30 days to confirm the STS. The employee will not be exposed to workplace/hobby noise for 14 hours or will be provided with adequate hearing protection prior to testing.
  - If the STS persists, ear protection will be evaluated and refitted, and may be upgraded to one with a greater NRR or classification. The hearing protection will have a minimum NRR of 26 dBA, or be of the appropriate classification for the applicable jurisdiction.
  - The employee will be counselled and AECOM will obtain information regarding the employee's possible noise exposure away from the workplace or existing ear pathology.
  - Qualified medical personnel will review the audiograms. This group will determine the need for a medical referral.

- The employee will be notified in writing by either the **SH&E Manager** or the AECOM Medical Provider of the STS, within 21 days of determination, or as required by the applicable jurisdiction.
  - The employee's supervisor will be notified of the shift in hearing threshold.
- 4.5.6 An employee who has experienced an STS shall comply with any recommendations made by medical personnel as they relate to the employees assigned work duties (e.g. dual hearing protection of earplugs and earmuffs).
- 4.6 Employee Monitoring
- 4.6.1 When information indicates that any employee's exposure may equal or exceed the applicable action level, the SH&E Manager shall develop and implement a site-specific monitoring program to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors. Refer to *S3AM-118-FM1 Site-Specific Hearing Conservation Program* and *S3AM-127-PR1 Exposure Monitoring*.
- 4.6.2 Noise surveys shall be conducted in a manner that reasonably reflects the exposure of the affected employees. Surveys shall be conducted under the supervision of an AECOM SH&E Manager. Refer to *S3AM-118-FM2 Sound Level Survey* and *S3AM-118-FM3 Noise Dosimetry Record*.
- 4.6.3 Sound-level meters and audio dosimeters used to determine employee exposure to noise sources shall be Type II (accurate to within +/- 2 dBA), operated in "slow" response, on the "A" scale, and be calibrated to factory guidelines (including periodic factory recalibration).

## 5.0 Records

- 5.1 Noise exposure measurement records, surveys and Site-Specific Hearing Conservation Plans will be retained at the project/facility for the duration of the project.
- 5.2 Audiogram records will be retained in the employee's medical records as per *S3AM-128-PR1 Medical Screening & Surveillance Program*.
- 5.3 Employee training session documentation will be retained in accordance with *S3AM-003-PR1 SH&E Training*.

## 6.0 Attachments

- 6.1 [S3AM-118-ATT1 Hearing Protection Guidelines](#)
- 6.2 [S3AM-118-FM1 Site-Specific Hearing Conservation Program](#)
- 6.3 [S3AM-118-FM2 Sound Level Survey](#)
- 6.4 [S3AM-118-FM3 Noise Dosimetry Record](#)

## Hearing Protection Guidelines

S3AM-118-ATT1

Comparison of Hearing Protection	
Ear Plugs	Ear Muffs
<b>Advantages:</b> <ul style="list-style-type: none"> <li>• small and easily carried</li> <li>• convenient to use with other personal protection equipment (can be worn with ear muffs)</li> <li>• more comfortable for long-term wear in hot, humid work areas</li> <li>• convenient for use in confined work areas</li> <li>• may be disposable (cleaning not necessary)</li> </ul>	<b>Advantages:</b> <ul style="list-style-type: none"> <li>• less attenuation variability among users</li> <li>• designed so that one size fits most head sizes</li> <li>• easily seen at a distance to assist in the monitoring of their use</li> <li>• not easily misplaced or lost</li> <li>• may be worn with minor ear infections</li> </ul>
<b>Disadvantages:</b> <ul style="list-style-type: none"> <li>• requires more time to fit</li> <li>• more difficult to insert and remove</li> <li>• require good hygiene practices</li> <li>• may irritate the ear canal</li> <li>• easily misplaced</li> <li>• more difficult to see and monitor usage</li> </ul>	<b>Disadvantages:</b> <ul style="list-style-type: none"> <li>• less portable and heavier</li> <li>• more inconvenient for use with other personal protective equipment</li> <li>• more uncomfortable in hot, humid work area</li> <li>• more inconvenient for use in confined work areas</li> <li>• safety or prescription glasses can reduce hearing protection by breaking the seal between the earmuff and the skin.</li> <li>• must be cleaned/decontaminated as necessary</li> </ul>

### 1.0 Care and Use

- 1.1 Follow the manufacturer's instructions.
- 1.2 Inspect the earplugs prior to use. Dirty earplugs and insertion with dirty hands can result in ear infections. Moldable or foam earplugs should be discarded if dirty or the pliability has been lost
- 1.3 To correctly insert earplugs pull the ear up and back with the opposite hand in order to widen and straighten the ear canal. Foam earplugs should be compressed to insert deeply into the canal. Hold the plug in place until the foam expands to ensure optimal blockage. Confirm hair or clothing does not impede the fit.
- 1.4 Ensure the earmuff ear cushion seal around the ear is complete and is not compromised by hair, clothing or glasses. If equipped with a headband, the fit should be snug, but not so tight as to produce discomfort.
- 1.5 Check hearing protection regularly for wear and tear.
- 1.6 Replace ear cushions or plugs that are no longer pliable or cracked.
- 1.7 Hearing protection using head bands shall be replaced when the ear cushions are not kept snugly against the head, or semi-insert earplugs are not adequately held in place.
- 1.8 Disassemble ear muffs to clean.
- 1.9 Wash ear muffs with a mild liquid detergent in warm water, and then rinse in clear warm water. Sound-attenuating material inside the ear cushions must not get wet.
- 1.10 Use a soft brush to remove skin oil and dirt that can harden ear cushions.
- 1.11 Squeeze excess moisture from the plugs or cushions and then place them on a clean surface to air dry.
- 1.12 Store earplugs and earmuffs in a cool, dry and clean place.

Americas

**Site-Specific Hearing Conservation Program**

S3AM-118-FM1

Site (Project): \_\_\_\_\_ Location : \_\_\_\_\_

This program developed by:	Date:
Description of noise monitoring to be conducted (refer to S3AM-118-FM2 Sound Level Survey and S3AM-118-FM3 Noise Dosimetry Report) :	
Such monitoring will consist of (check those that apply): <input type="checkbox"/> Noise Dosimetry <input type="checkbox"/> Sound Level Meter Survey	

**Monitoring**

Specific instrumentation to be used is (make/model):

Make	Model

and will be calibrated at a frequency of \_\_\_\_\_ and documented in the \_\_\_\_\_.

Monitoring strategy is as follows (list all equipment and activities on site that may involve sound pressure levels above 80 dBA and an explanation of the strategy to document actual exposures):

Area/Equipment	Monitoring Strategy

Where areas or equipment are not clearly identified, all monitoring will be documented utilizing an illustrated layout (attach illustration developed for the specific site). Monitoring frequency will be in accordance with the strategy outlined above and when the following changes in site conditions/activities occur:

1.
2.
3.
4.
5.

**Employee Notification**

All site employees exposed above the regulated action level of \_\_\_\_\_ dBA will be notified of the monitoring results by (insert name/title) \_\_\_\_\_ at an interval not to exceed \_\_\_\_\_ after completion of monitoring.

Notification shall be written, with a copy to the SH&E Department. Documentation of employee notifications and corresponding signatures of notified employees will be kept in the site health and safety logbook/files.

### Observation of Monitoring

All employees affected by the monitoring, or a designated employee representative, shall be given the opportunity to observe noise monitoring procedures. This will be achieved by:


### Audiometric Testing Program and Requirements

AECOM employees who perform field activities where noise exposure above action levels is expected are required to participate in an audiometric testing program. Additionally, any subcontractors performing work on AECOM projects where noise levels exceeding action level will be required to provide documentation that they participate in an audiometric testing program that meets the applicable regulations. Documentation of participation in the testing program will be maintained by \_\_\_\_\_ and will be located at \_\_\_\_\_.

### Hearing Protectors and Estimating Attenuation

A selection of suitable hearing protectors will be made available to all employees who are expected to have 8-hour TWA noise exposures above \_\_\_\_\_ dBA. The types anticipated to be available include:

Protection Type	Attenuation

Hearing protector attenuation will be evaluated by *(insert name/title)* for specific noise environments according to the following method prior to determining their suitability for use:

1.
2.
3.

The following employees will be required to wear hearing protectors during specific activities according to the results of site-specific monitoring conducted in accordance with this procedure. (This section can be completed after monitoring, if necessary).

Employee Name	Activity Type	Type of Protection

As applicable, hearing protectors will be properly fitted by \_\_\_\_\_ upon initial distribution to site workers.

Training in the use and care of hearing protectors shall be conducted by \_\_\_\_\_ during the initial site-specific health and safety training. Training contents shall meet the requirements set forth in this procedure and the applicable regulations.

Hearing protectors will be distributed by \_\_\_\_\_ from the storage location at the \_\_\_\_\_.

## **Access to Information and Training Materials**

All information required by regulation to be made available to the employees will be posted by *(insert name / title)* \_\_\_\_\_ at the \_\_\_\_\_.

Local Occupational Health and Safety Regulations will also be kept on site.

## **Recordkeeping**

Records required by AECOM's Hearing Conservation Program and Regulations shall be completed by \_\_\_\_\_ and shall be maintained at the \_\_\_\_\_ and placed on permanent file at the \_\_\_\_\_ for the minimum duration required by the standard. Employees can access their individual records by contacting \_\_\_\_\_.

All records required by this section will be transferred to any employee's successive employer if AECOM ceases to do business.

## **Approvals**

Manager (print):

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

SH&E Manager (print): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_



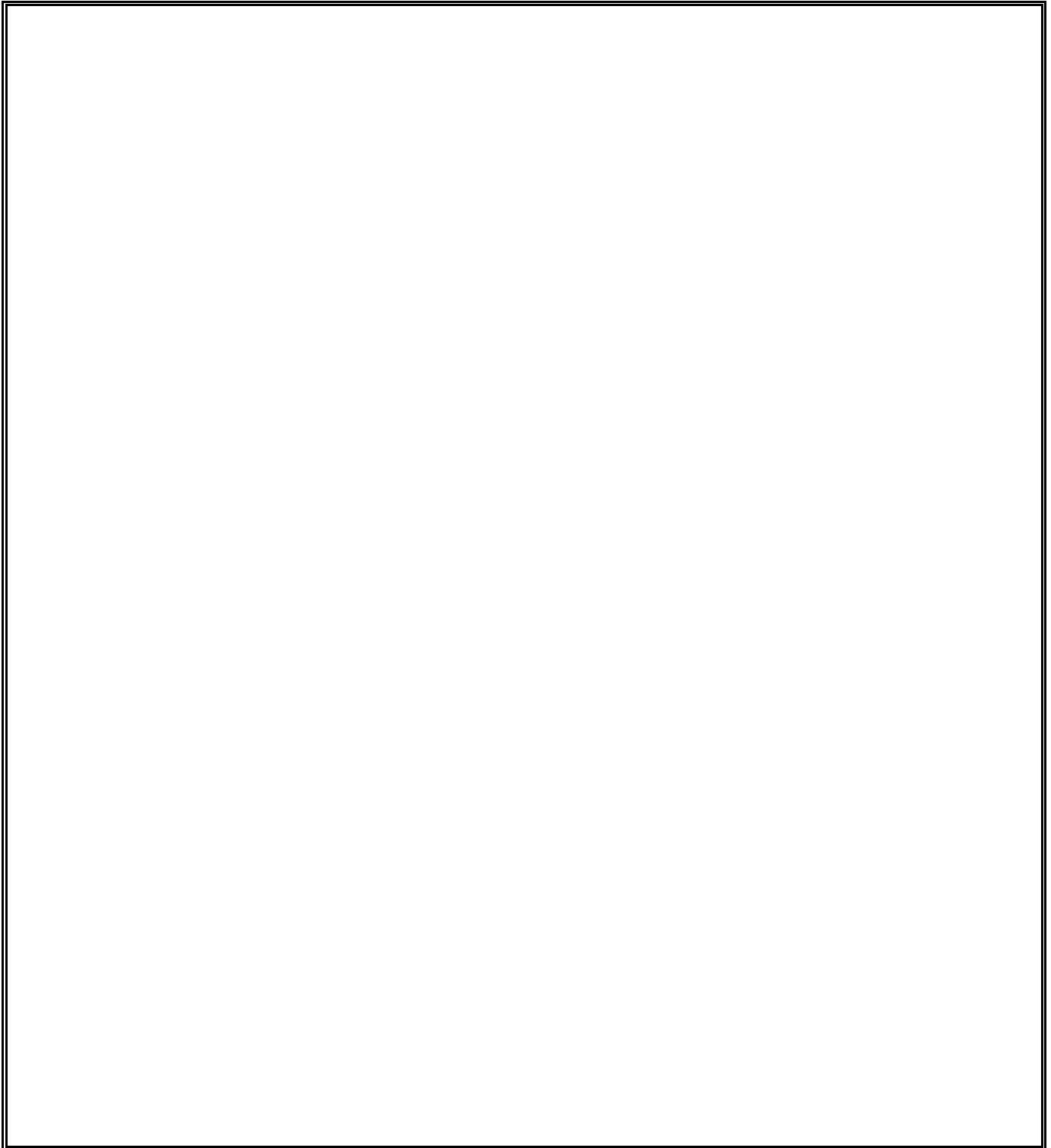
**S3AM-118-FM2**

**Battery Check Completed:** ☐ **Date of Factory Calibration:**

[illegible]

**Drawing of Equipment or Work Layout**

**Reference Numbers refer to the Test Numbers on Page 1**



Americas

# Noise Dosimetry Record

S3AM-118-FM3

## Sample Identification

Sample #: \_\_\_\_\_ Date: \_\_\_\_\_  
Employee Monitored: \_\_\_\_\_ Employee #: \_\_\_\_\_  
Job: \_\_\_\_\_ Location: \_\_\_\_\_

## Dosimeter Information

Model: \_\_\_\_\_ Serial # \_\_\_\_\_  
Criterion Level (in dBA): \_\_\_\_\_ Threshold (in dBA): \_\_\_\_\_ Exchange Rate (in dBA): \_\_\_\_\_  
Calibration (in dBA): \_\_\_\_\_ Initial \_\_\_\_\_ Final \_\_\_\_\_  
Weighting: Fast ☐ Slow ☐

## Calibrator Information

Model: \_\_\_\_\_ Serial #: \_\_\_\_\_ Class ☐ 1 ☐ 2  
Battery Check Completed: ☐ Date of Factory Calibration: \_\_\_\_\_

## Sample Information

Time On: \_\_\_\_\_ Time Off: \_\_\_\_\_ Total Run Time (in min): \_\_\_\_\_  
Time Weighted Average (in dBA): \_\_\_\_\_ %Dose: \_\_\_\_\_ Est. %Dose: \_\_\_\_\_  
Average Sound Level ( $L_{avg}$ ): \_\_\_\_\_ Peak Sound Level ( $L_{pk}$ ): \_\_\_\_\_  
Maximum Sound Level ( $L_{max}$ ): \_\_\_\_\_ Minimum Sound Level ( $L_{min}$ ): \_\_\_\_\_

## Workplace Conditions

Scheduled Hours per Shift: \_\_\_\_\_ Operations: Normal? ☐ Abnormal? ☐  
Explain: \_\_\_\_\_

Hearing Protection: Type \_\_\_\_\_ % of Time Worn \_\_\_\_\_

## Work Description/Comments

Sampled By: \_\_\_\_\_

## Non-Ionizing Radiation

S3AM-121-PR1

### 1.0 Purpose and Scope

- 1.1 Provides the requirements and guidelines to control occupational and public exposure to non-ionizing radiation, including lasers and radiofrequency (RF), infrared (IR), and ultraviolet (UV) radiation.
- 1.2 This procedure applies to all AECOM Americas employees and operations, and any other entity and its personnel contractually required to comply with this document's content, except where local or governmental regulations are more stringent.

### 2.0 Terms and Definitions

- 2.1 **Controlled Environment** – An area where the occupancy and activity of those within is subject to control and supervision for the purpose of protection from radiation hazards.
- 2.2 **Hazard Distance** – Distance from a radiofrequency emitter at which the power density equals the Uncontrolled Environment Maximum Permissible Exposure Limit power density level as established by the latest edition of the ANSI C95.1.
- 2.3 **ANSI Z136.1 Safe Use of Lasers**– American National standard issued applicable to the safe use of lasers and laser systems emitting laser radiation in the wavelength range 180 nanometres to 1 millimetre. The standard defines the classification of lasers (Class 1, 1M, 2, 2M, 3R, 3B and 4) based on Accessible Emission Limit (AEL) and viewing conditions.
- 2.4 **Infrared (IR)** – Electromagnetic radiation having a wavelength just greater than that of the red end of the visible light spectrum but less than that of microwaves. Infrared radiation has a wavelength from about 800 nm to 1 mm, and is emitted particularly by heated objects
- 2.5 **Laser** – An acronym for Light Amplification by Stimulated Emission of Radiation.
- 2.6 **Maximum Permissible Exposure (MPE) Limits** – The level of exposure which is considered as the limit between safe and potentially harmful.
- 2.7 **Non-ionizing Radiation** – Any type of electromagnetic radiation that does not carry enough energy to ionize atoms or molecules. Examples include radiofrequency radiation, microwave radiation, ultraviolet radiation, visible light, infrared radiation, lasers, static electric and magnetic fields, etc.
- 2.8 **Radio frequency (RF)** – Any of the electromagnetic wave frequencies that lie in the range extending from around 3 kHz to 300 GHz, and includes frequencies used for communication signals (e.g. radio, cell-phone, etc.) or radar signals.
- 2.9 **Ultraviolet (UV)** – Electromagnetic radiation having wavelengths between that of ordinary, visible violet light that of x-rays. Ultraviolet radiation is made up of three types of rays; A (UVA), B (UVB), and C (UVC). UV radiation is present in sunlight, and also produced by electric arcs and specialized lights (e.g. mercury-vapor lamps, black lights).
- 2.10 **Uncontrolled Environment** – Locations where there is the exposure of individuals who have no knowledge or control of their exposure.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-120-PR1 Radiation
- 3.3 S3AM-128-PR1 Medical Screening & Surveillance
- 3.4 S3AM-208-PR1 Personal Protective Equipment

- 3.5 S3AM-209-PR1 Risk Assessment & Management
- 3.6 S3AM-325-PR1 Lockout Tagout
- 3.7 S3AM-332-PR1 Hot Work

## 4.0 Procedure

### 4.1 Roles and Responsibilities

#### 4.1.1 Corporate SH&E Management System & Prequalification Manager

The SH&E Department will maintain this procedure and include it in the annual review of the AECOM Americas SH&E procedures.

#### 4.1.2 SH&E Manager (or designee)

The SH&E Manager will provide technical guidance to projects that involve the use/survey of non-ionizing sources as well as identifying the proper controls to mitigate employee exposure to non-ionizing radiation sources, including UV radiation. In addition, SH&E Managers will:

- Review and approve all exposure plans, such as Non-Ionizing Radiation Protection Plans (NIRPP);
- Conduct non-ionizing radiation hazard assessments;
- Confirm applicable awareness training on non-ionizing radiation hazards is available to project teams. Refer to *S3AM-003-PR1 SH&E Training*;
- Authorize the use of a Class 3B and 4 lasers.

#### 4.1.3 Manager

Managers are responsible for the overall safety and planning for a project. Managers are also responsible for:

- Verifying that the presence of non-ionizing radiation sources at project work sites are identified in the applicable SH&E Plan and Task Hazard Assessment (THA) prior to commencing field activities;
- Addressing and controlling potential non-ionizing radiation hazards through consultation with the SH&E Manager, subject matter experts (as appropriate), and/or development of a NIRPP;
- Verifying incident and injury reporting procedures are followed when a suspected overexposure to non-ionizing radiation, an incident of sunburn, or other excessive non-ionizing radiation exposure occurs in the workplace;
- Monitoring employee compliance with the requirements of this policy;
- Confirming employees complete non-ionizing radiation awareness training as directed by the SH&E Manager.

#### 4.1.4 Employee

- Will not disturb or handle any non-ionizing radiation sources or work in any identified non-ionizing radiation hazard area (e.g., Controlled Environment) without appropriate training and safety procedures;
- Will work in accordance with all established manufacturer, client, and NIRPP requirements;
- Will identify both known and suspected non-ionizing radiation sources on the THA and report any change in site conditions related to non-ionizing radiation sources to the Manager;
- Will immediately notify the Manager of the presence or suspected presence of previously unidentified non-ionizing radiation sources in the workplace, and cease all work activities involving potential exposure to non-ionizing radiation until further direction is received;
- Will use suitable personal protective equipment to the non-ionizing radiation hazards.

## 4.2 Hazard Assessment

- 4.2.1 AECOM will identify and assess the hazards associated with work where the potential exists for employees to be exposed to laser radiation or other non-ionizing radiation sources, develop appropriate elimination and control measures, and document this in the location or project specific SH&E Plan.
- If routine exposures to laser radiation or other non-ionizing radiation sources are expected, an appropriate plan, such as a Non-Ionizing Radiation Protection Plan (NIRPP) should be developed. The plan (e.g. NIRPP) may be included in the location or project specific SH&E Plan;
  - Consultation with subject matter experts may be necessary depending upon the extent, number, and type of non-ionizing radiation (e.g., Laser Safety Officer);
  - Task specific hazards and associated controls shall also be identified in the respective THA;
  - Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- 4.2.2 In addition to the SH&E Plan, appropriate personal protective equipment will be identified and documented in the THA or other relevant hazard assessment documentation.
- 4.2.3 AECOM will develop and implement an appropriate NIRPP to control identified hazards where the potential to exceed the applicable Maximum Permissible Exposure (MPE) limits exist.

## 4.3 Laser Protection Requirements

- 4.3.1 Only qualified and trained employees will be assigned to install, adjust, and operate laser equipment for surveys, alignment/grade-checks, tunnel work, etc.
- 4.3.2 Laser equipment will bear a label to indicate maximum power output, ANSI class, and beam spread.
- 4.3.3 Looking into the primary beam is prohibited, and care will be taken to avoid looking at specular reflections of the beam, including those from lens surface work.
- 4.3.4 Where direct or reflected laser light greater than 0.005 watts (5 milliwatts) for  $\geq \frac{1}{4}$  second exists, employees will be provided with laser safety goggles that will protect them for the specific wavelength of the laser and be of an optical density (OD) adequate for the energy involved. The laser safety goggles will be selected in accordance with the requirements of ANSI Z136.1-2014 (or the most current edition).
- 4.3.5 Operation of an ANSI Class 3B or 4 laser should be assessed for exposure hazards and whether medical surveillance is appropriate. Refer to *S3AM-128-PR1 Medical Screening & Surveillance*.
- 4.3.6 Use of an ANSI Class 4 laser requires the approval of the SH&E Manager.
- 4.3.7 All protective goggles will bear a label identifying the following data:
- The laser wavelength for which use is intended;
  - The optical density of that wavelength;
  - The visible light transmission.
- 4.3.8 Class 1 Lasers
- Safe for the unprotected eye and through optical instruments (prescription lenses, telescopes, beam reducers, etc.);
  - Very low power lasers or enclosed lasers;
  - MPE is never exceeded, even for very long exposure (hours), or with the use of optical instruments;
  - Nominal Hazard Zone: none.

### 4.3.9 Class 1M Lasers

- Safe for the unprotected eye only, but potentially hazardous when optical instruments are used;
- Medium power lasers either collimated with a large beam or highly divergent;
- MPE can be exceeded when using optical instruments;
- Nominal Hazard Zone: none for the unprotected eye.

#### 4.3.10 Class 2 Lasers

- Safe for unintended exposure, (less than 0.25 seconds) but hazardous when looking at for more than 0.25 seconds;
- Visible (wavelength of 400–700 nanometers) low power lasers;
- MPE is not exceeded provided the viewings are accidental only. MPE calculation assumes the blink reflex will stop the light after 0.25 second;
- Nominal Hazard Zone: none for accidental exposure.

#### 4.3.11 Class 2M Lasers

- Safe for the unprotected eye when the exposure is unintended, (less than 0.25 seconds) but hazardous when looking at for more than 0.25 seconds or when optical instruments are used;
- Visible (wavelength of 400–700 nanometers) medium power lasers either collimated with a large beam or highly divergent;
- MPE is not exceeded provided the viewings are accidental only and only with unprotected eyes. MPE calculation assumes the blink reflex will stop the light after 0.25 seconds. Using optical instruments might bring the exposure above the MPE as well;
- Nominal Hazard Zone: none for accidental exposure to the unprotected eye.

#### 4.3.12 Class 2M Lasers and Greater

- Areas where a Class 2M or higher, non-enclosed path laser beam is in use will be posted with standard laser-warning placards;
- Beam shutters or caps will be used, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a period of time (e.g., >5 minutes), such as during the lunch hour, overnight, or at change of shifts, the laser will be turned off;
- Only mechanical or electronic means will be used as a detector for guiding the internal alignment of the laser. Aligning the laser with the unprotected eye is prohibited;
- The laser beam will not be directed at employees. Laser units will be set above or below the heads of employees;
- Employee exposure will be controlled to stay within the MPE limits specified in ANSI Z136.1-2014 (or the most current edition).

#### 4.3.13 Class 3R Lasers

- Unsafe, except when handled carefully by experienced users. Accidental short exposure is considered as a small hazard;
- Low power lasers;
- MPE can be exceeded up to 5 times;
- Nominal Hazard Zone: hazard area for the eye, none for the skin.

#### 4.3.14 Class 3B Lasers

- Unsafe without exception, laser safety goggles shall be worn within the nominal hazard zone. Focused lasers of this class are a potential fire hazard;

- Medium power lasers;
- MPE is exceeded more than 5 times. Skin MPE is not generally exceeded, except at focus;
- Nominal Hazard Zone: hazard area for the eye, none for the skin.

#### 4.3.15 Class 4 Lasers

- Dangerous, Personal Protective Equipment (PPE) for eyes and skin shall be worn within the nominal hazard zone. Class 4 lasers are fire hazards as well. Diffuse reflections may be hazardous;
- High power lasers;
- Ocular and skin MPE are exceeded. Diffuse reflections exceed the MPE;
- Nominal Hazard Zone: hazard area for the eye and for the skin.

### 4.4 Radiofrequency Radiation Protection

4.4.1 Reduction in radiofrequency (RF) exposures can be accomplished through the implementation of appropriate administrative, work practice and engineering controls. Should routine occupational RF exposures be part of a project, a suitable plan shall be developed such as an NIRPP.

4.4.2 Generally, where RF emitters are identified, employees will:

- Remain outside any demarcated area where an RF hazard exists;
- Remain within the General Public exposure region;
- If the preceding requirements cannot be met or determined, AECOM will obtain a hazard assessment from the emitter's operator for controlling entity and provide it to the SH&E Manager for evaluation and determination of the relevant hazard mitigation measures.

4.4.3 If the above information is not available, an RF emitter survey will be required to assess the potential exposure hazards. An RF emitter survey shall be performed by an individual trained to effectively assess RF exposures.

4.4.4 Unless using an RF meter under the direction of an individual trained to effectively assess RF exposures, employees will not enter any area which is located within the RF hazard distance identified by the RF emitter survey. AECOM personnel may enter a controlled area if the emitter has been de-energized and locked-out using standard Lockout/Tagout procedures in accordance with *S3AM-325-PR1 Lockout Tagout*.

### 4.5 Infrared Radiation Protection

4.5.1 Infrared (IR) radiation may be encountered during furnace operations, pouring, casting, hot dipping, laser and high-intensity light sources, curing, annealing and plastic welding.

4.5.2 Performance of welding and oxygen/acetylene cutting operations (torch cutting, brazing, welding) involves the use of an exposed high-temperature flame. This flame produces infrared (IR) radiation and UV radiation at the welding location which can cause cataracts, skin cancer, and thermal burns to the welder or other persons located nearby.

#### 4.5.3 Skin Protection

- Long sleeve, flame-resistant shirts and/or forearm length Nomex gloves will be worn;
- Leather welder's apron or equivalent protection;
- Long pants shall be worn during any hot work task;
- Welding screens shall be utilized where feasible to protect the general public or other unprotected employees.

#### 4.5.4 Eye Protection

- A welder's helmet or goggles with the appropriate lens shade will be worn. Refer to



*S3AM-208-PR1 Personal Protective Equipment.*

4.6 Ultraviolet Radiation Protection

- 4.6.1 Broad-spectrum UV radiation is classified as a known human carcinogen. UV radiation can cause harmful effects from both chronic and acute exposures including reddening of the skin (regardless of skin tone), accelerated skin aging, and damage to the eyes (e.g., cataracts, retinal burns, or welder's flash), and sunburn. Employees may be exposed to UV radiation from natural sunlight or manmade sources such as germicidal lamps (e.g., UV groundwater treatment systems) and welding.
- 4.6.2 While not required, the completion of an exposure or UV risk assessment will assess the risk posed by UV at the site. Such an assessment can be included in the SH&E plan and as part of a Task Hazard Assessment (THA). Special consideration should be given to work activities at higher elevations as the intensity of UV exposures are significantly higher than at lower elevations. Typically, UV exposure can increase 4-5% for every 1000 feet ascended. Also, some medications (e.g., Tetracycline) can increase sensitivity to UV exposure.
- 4.6.3 Control measures will be implemented at a worksite according to the conditions and work performed.
- 4.6.4 Engineering Controls
- Operations producing IR or UV radiation may be segregated or separated from other operations (e.g. use of automated systems, walls, screens, etc.);
  - Employees will be encouraged to maximize use of the shade provided by trees, buildings, and other structures;
  - Where there is limited access to natural shade, fixed or portable shade structures will be provided where practical;
  - It is acknowledged that the provision of shade does not provide total protection from UV; therefore, it is recommended that outdoor workers adopt personal protection strategies such as protective clothing, sunscreen, and the wearing of hats in addition to using shade.
- 4.6.5 Administrative Controls
- Consideration will be given to the reorganization of outdoor work programs to reduce UV exposure including, but not limited to:
- Use of the UV Index to assess UV hazards;
  - Rescheduling work hours to enable workers to start earlier during May-September;
- The UV Index, shown in Table 1, can help employees be aware of the expected level of UV radiation exposure on any given day.

**Table 1. UV Index**

Exposure Category	Index Number	Sun Protection Messages
Low	< 2	Wear sunglasses on bright days. In winter, reflections off of snow can nearly double UV strength. If you burn easily, cover up and use sunscreen.
Moderate	3-5	Take precautions, such as covering up and using sunscreen.
High	6-7	Protection against sunburn is needed.
Very High	8-10	Take extra precautions. Unprotected skin will be damaged and can burn quickly.
Extreme	11+	Take all precautions. Unprotected skin can burn in minutes.

#### 4.6.6 Personal Protective Equipment

Employees who work outdoors shall provide and utilize personal outer clothing (e.g. shirt and trousers) that meets the established general clothing requirements per *S3AM-208-PR1 Personal Protective Equipment*. For those circumstances where the outer clothing requirements exceed the general clothing requirements, AECOM will provide the necessary clothing. The selection of appropriate protective clothing will take into account both the need to block UV and the need to reduce the effects of heat.

- Protective Clothing
  - Full length trouser pants and shirts that cover shoulders at a minimum (where practical, the fabric will have a close weave);
  - Where possible, clothing will be lightweight, loose fitting and have a collar;
  - Clothing and head wear with a sun (UV) protection factor (SFP) is encouraged but not required.
- Secondary hazards such as fire resistance will be considered.
- Head, Face, and Neck Protection
  - Hats provide shade and the larger the brim the greater the amount of shade that is provided;
  - Full brim hard hats are recommended (for additional protection, neck flaps are recommended);
  - In circumstances where the wearing of a broad-brimmed hard hat causes difficulties due to its size, sunscreen and other protective measures will be used.
- Eye Protection
  - Wrap-around, close-fitting, large safety glasses will reduce the amount of UV and glare that may pass around the edges of the glasses (the color or darkness of the lenses does not indicate the level of UV protection; therefore, verification with the manufacturer should be performed);
  - Safety glasses shall provide the level of protection appropriate to the potential non-ionizing radiation hazard exposures;
  - For hot work activities that may produce ultraviolet radiation, eye protection shall utilize the proper welding shade.
- Sunscreen
  - Sunscreen does not offer complete protection against the sun and should always be used in conjunction with other protective measures;
  - A broad spectrum and water-resistant sunscreen with a SPF of 30+, or a rating of no less than three stars, will be provided;
  - Expiration dates on the sunscreen will be regularly checked to confirm it has not expired per the manufacturer's instructions;
  - Sunscreen should be placed in an easily accessible location and employees instructed on the correct application and use;
  - Sunscreen should be generously applied to all areas of exposed skin at least 20 minutes before going outside and reapplied every two hours, or as needed by the work conditions.

#### 4.7 Non-ionizing Radiation Training Program

- 4.7.1 Employees will receive training where the need for non-ionizing radiation control measures has been identified in the SH&E Plan and if developed, the Non-Ionizing Radiation Protection Plan.

- 4.7.2 Awareness training on the applicable non-ionizing radiation source will be provided to employees prior to the start of work in the area where the hazard exists as well as when employees are required to enter non-ionizing radiation Controlled Environments. Training curricula will be determined by the SH&E Department.

## **5.0 Records**

- 5.1 Training records shall be maintained in accordance with *S3AM-003-PR1 SH&E Training*. RF emitter surveys will be maintained in applicable project files.

## **6.0 Attachments**

- 6.1 None

## Respiratory Protection

S3AM-123-PR1

### 1.0 Purpose and Scope

- 1.1 This procedure establishes a written respiratory protection program with the required elements and work site-specific procedures for respirator selection, use, and maintenance for any workplace where respirators are necessary to protect the health of an Employee.
- 1.2 The primary objective shall be to prevent exposure to atmospheric contaminants as far as feasible by accepted engineering control measures (e.g. enclosure or confinement of the operation, general and local exhaust ventilation [LEV], and substitution of less toxic materials). If respiratory hazards remain, suitable administrative controls and respiratory protective equipment requirements shall be established.
- 1.3 This procedure applies to all AECOM Americas-based employees and operations, and any other entity and its personnel contractually required to comply with this document's content, except where local or governmental regulations are more stringent.

### 2.0 Terms and Definitions

- 2.1 **Action Level (AL)** – An airborne concentration of a potentially toxic or hazardous substance, measured in parts per million by volume (ppm), microgram per cubic meter ( $\mu\text{g}/\text{m}^3$ ) milligram per cubic meter ( $\text{mg}/\text{m}^3$ ) or fibres per cubic centimetre (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.
- 2.2 **Air-purifying respirator** – A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
- 2.3 **Approved** – Equipment tested and listed by the Bureau of Mines, jointly by the Mining Enforcement and Safety Administration (MESA), and the National Institute for Occupational Safety and Health (NIOSH), or jointly by the Mine Safety and Health Administration (MSHA) and NIOSH. Please note Canadian Standards Association (CSA) bases respirator selection on NIOSH criteria for the testing and certification of respirators.
- 2.4 **Assigned protection factor (APF)** – The ratio of the ambient concentration of an airborne substance (outside the respirator) to the concentration of the substance inside the respirator.
- 2.5 **Atmosphere-supplying respirator** – A respirator that supplies the user with breathing air from a source independent of the ambient atmosphere, including supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.
- 2.6 **Breakthrough** – The first perception of an odor, taste or irritation experienced while wearing an air-purifying respirator. Breakthrough is generally an indication that the cartridges are saturated and are no longer filtering out the contaminant. Breakthrough can also be an indication of an improperly functioning respirator.
- 2.7 **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 upon the given jurisdiction (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.
- 2.8 **Filtering facepiece (dust mask)** – A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

- 2.9 **Fit factor** – A quantitative estimate of the fit of a particular respirator to a specific individual, typically estimating the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.
- 2.10 **Fit test** – The use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. (See also Qualitative fit test [QLFT] and Quantitative fit test [QNFT].)
- 2.11 **Hazardous atmosphere** – Any atmosphere, either immediately or not immediately dangerous to life or health, that is oxygen-deficient or that contains a toxic or disease-producing contaminant exceeding the legally established permissible exposure limit or, where applicable, the Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists.
- 2.12 **Immediately dangerous to life or health (IDLH)** – An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.
- 2.13 **Maximum use concentration (MUC)** – The maximum concentration of an airborne contaminant from which an employee is expected to be protected when wearing a respirator, determined by the assigned protection factor of the respirator or class of respirators and the occupational exposure limit for that contaminant. The MUC is usually determined mathematically by multiplying the assigned protection factor (APF) specified for a respirator by the established exposure limit, which can include a short-term exposure limit and a ceiling limit or any other exposure limit used for that chemical agent, as defined by the authority having jurisdiction.
- MUC = APF x established exposure limit
- 2.14 **Negative pressure respirator (tight fitting)** – A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.
- 2.15 **Oxygen-deficient atmosphere** – An atmosphere with oxygen content below 19.5 percent by volume.
- 2.16 **Physician or other licensed health care professional (PLHCP)** – An individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the health care services required by local or governmental respiratory protection standards.
- 2.17 **Positive pressure respirator** – A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.
- 2.18 **Powered air-purifying respirator (PAPR)** – An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.
- 2.19 **Pressure demand respirator** – A positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.
- 2.20 **Qualitative fit test (QLFT)** – A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.
- 2.21 **Quantitative fit test (QNFT)** – An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.
- 2.22 **Self-contained breathing apparatus (SCBA)** – An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.
- 2.23 **Supplied-air respirator (SAR) or airline respirator** – An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.
- 2.24 **Tight-fitting facepiece** – A respiratory inlet covering that forms a complete seal with the face.
- 2.25 **User seal check** – An action conducted by the respirator user to determine if the respirator is properly sealed to the face.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-114-PR1 Compressed Gases
- 3.3 S3AM-128-PR1 Medical Screening & Surveillance

## 4.0 Procedure

### 4.1 Roles and Responsibilities

#### 4.1.1 Respiratory Protection Program Administrator

The Respiratory Protection Program Administrator will be established at each project/location where employees are required to wear respirators. The Respiratory Protection Program Administrator will:

- Verify full compliance with this procedure.
- Assist with the arranging of any required medical evaluations or any other additional medical attention related to the use of a respirator.
- Perform or arrange suitable providers to perform the program evaluations described in this procedure.
- Maintain required inspections and testing/certifications of SCBA units

#### 4.1.2 Manager /Supervisor

- Verify compliance with the respiratory protection program set forth in this procedure.
- Verify that only those employees who are medically qualified, properly trained, and fit tested are assigned to respirator work.
- Verify that respirators are provided, repaired, or replaced as may be required due to wear and deterioration.
- Confirm that the emergency rescue service is available to respond prior to any employees entering the IDLH area.

#### 4.1.3 SH&E Manager (or designee)

- Monitor compliance with the various aspects of this program.
- Provide technical assistance regarding respirator selection and use, evaluate the effectiveness of this program, and support respirator training and fit testing (e.g. determine cartridge change out schedule for negative air respirators).
- Audit company compliance with this procedure.

#### 4.1.4 Employee

- Use respiratory protection in accordance with instructions and training received.
- Maintain the respirator in accordance with this procedure and the manufacturer's instructions.
- Immediately report any malfunction of the respirator to the Supervisor or Manager or other responsible person.
- For employees who wish to wear respirators on a voluntary basis when not required to by AECOM or a regulatory agency, the employee shall complete *S3AM-123-FM2 – Voluntary Use of Respirators* or an equivalent form.

### 4.2 Training

- 4.2.1 Employees who wear respiratory protection shall receive training before they are assigned to a task that requires the use of respiratory protection.

- 4.2.2 Employees that may be exposed to a respiratory hazard will be instructed on the hazard and the controls prior to beginning work.
- 4.2.3 Atmospheric testing will be carried out by qualified personnel trained in the use, calibration, and interpretation of the test equipment.
- 4.2.4 Retraining shall be administered annually, and when the following situations occur:
  - Changes in the workplace or the type of respirator render previous training obsolete;
  - Inadequacies in the Employee's knowledge or use of the respirator indicate that the Employee has not retained the requisite understanding or skill; or
  - Any other situation arises in which retraining appears necessary to verify safe respirator use.

#### 4.2.5 Basic Respirator Training Program

Respirator training classes will include, at a minimum, the following:

- Instruction in the nature of the respiratory hazards, whether acute, chronic, or both, and a description of potential health effects if the respirators are not used;
- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- The limitations and capabilities of the respirator;
- Proper fitting, including demonstrations and practice in wearing, adjusting, determining the fit of, and performing a user seal check each time respirator is donned. Refer to *S3AM-123-ATT1 Fit Testing Protocol*, *S3AM-123-FM1 Respiratory Equipment Fit Test* and *S3AM-123-ATT2 User Seal Check*;
- How to inspect, put on, use and remove the respirator;
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
- The procedures for maintenance and storage of the respirator;
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and
- The general requirements of local or governmental Respiratory Protection Standards.

### 4.3 Medical Surveillance

- 4.3.1 No Employee shall be assigned to a task that requires the use of a respirator unless it has been determined that he/she is physically able to perform the work while using the required respirator.
- 4.3.2 Prior to wearing a respirator and in accordance with the applicable jurisdictional requirements, Employees shall complete medical screening to identify any relevant psychological or physiological impediments to respiratory protection use. Screening may require an initial baseline medical surveillance examination, based on jurisdictional requirements or screening results, performed by a PLHCP in accordance with the requirements of *S3AM-128-PR1 Medical Screening & Surveillance Program*.
- 4.3.3 Additional medical examinations will be provided to employees who wear respirators when:
  - An Employee reports medical signs or symptoms that are related to ability to use a respirator;
  - A PLHCP, Supervisor, or the Respiratory Protection Program Administrator determines that an Employee needs to be reevaluated;
  - Information from the Respiratory Protection Program, including observations made during fit testing and program evaluation, indicates a need for Employee reevaluation; or

- A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature, etc.) that may result in a substantial increase in the physiological burden placed on an Employee.

4.3.4 All medical surveillance examinations shall be at no cost to the employee and occur during normal working hours; shall be convenient, understandable, and confidential; and the Employee will be given the chance to discuss results with examining physician.

#### 4.4 Respirator Selection

4.4.1 The location or project specific SH&E Plan shall identify applicable respiratory hazards and develop appropriate controls, which may include respiratory protection. If respiratory protection is necessary the SH&E Plan shall detail the requirements.

4.4.2 SH&E Managers or his/her designated representative shall select and provide an appropriate respirator based on:

- The respiratory hazard(s) to which the employee may be exposed, including oxygen deficiency. Identify potential contaminants, concentrations, and the physical state of airborne contaminants:
  - Particulates (dust, fibers, micro-organisms, smoke, fumes).
    - Indicate the presence of any oil in particulate hazards. (may be produced by motor vehicles, air compressor systems using oil lubricators) If unknown, oil shall be assumed to be present.
  - Vapor and gases
    - Gases which may produce an oxygen deficiency (i.e. helium, argon, carbon monoxide and nitrogen).
    - Gases which are acids or produce acids when in contact with moisture (i.e. sulphur oxides, carbon dioxide, hydrogen chloride).
    - Gases which are alkaline or produce alkalis in reaction with moisture (i.e. ammonia, amines, phosphine).
    - True gases or vapors from evaporation of organic liquids (i.e. acetone, toluene, benzene).
    - Metal reacted with an organic compound (i.e. tetra-ethyl lead: was used in leaded fuel and still in aviation fuel, organic phosphates).
    - Mercury vapor.
    - Radon.
- The eye and face hazards to which the employee may be exposed (absorption, irritant, impact).
- Workplace or user factors that may affect respirator performance and reliability.

4.4.3 SH&E Managers or his/her designated representative shall identify and evaluate the respiratory hazard(s) in the workplace. Evaluations shall include a reasonable estimate of employee exposures to respiratory hazard(s) and an identification of the contaminant's chemical state and physical form.

4.4.4 Respiratory protection is required for those operations in which engineering controls or work practice controls are not feasible to reduce toxic or hazardous substance exposure at or below the AL (or if applicable, established exposure limit).

4.4.5 Where the employee exposure cannot be identified or reasonably estimated, the atmosphere shall be considered IDLH.



- 4.4.6 Only approved respirators shall be selected and they shall be used in compliance with the conditions of their certification.
- 4.4.7 Respirators shall be selected from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
- 4.5 Fit Testing Procedures
  - 4.5.1 After the medical assessment is complete, employees using a tight-fitting respirator shall pass an appropriate QLFT or QNFT prior to initial use of the respirator, whenever a different respirator facepiece (size, style, model or make) is used, and at least annually (or as required by the applicable jurisdiction) thereafter. Refer to *S3AM-123-ATT1 Fit Testing Protocol*.
  - 4.5.2 Fit testing shall be performed using the same make, model, style and size of respirator the user would be expected to use.
  - 4.5.3 Should the fit test fail, alternative makes, models, styles and sizes shall be tested to find a correct fit for the user.
  - 4.5.4 Respiratory protective equipment shall not be used unless a satisfactory fit test has been achieved for that particular equipment.
  - 4.5.5 Fit testing shall also verify user competency in donning, doffing, inspecting and performing of seal checks.
  - 4.5.6 Additional fit tests will be performed:
    - Whenever there is an indication that changes in the Employee's physical condition might have an effect on respirator fit (such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight);
    - If the Employee notifies his/her Supervisor or SH&E Manager that the fit of his/her respirator is unacceptable.
- 4.6 Interference with Facepiece Seal
  - 4.6.1 AECOM shall not permit respirators with tight-fitting facepieces to be worn by Employees who have:
    - Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or
    - Any condition that interferes with the face-to-facepiece seal or valve function.
  - 4.6.2 If an employee wears corrective glasses or goggles or other personal protective equipment, the Supervisor or Manager shall confirm that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.
  - 4.6.3 Employees shall perform a user seal check each time they don the respirator. Refer to *S3AM-123-ATT2 User Seal Check Procedures*.
- 4.7 Specification of Proper Level of Respiratory Protection
  - 4.7.1 The SH&E Manager or his/her designated and qualified representative shall provide guidance on the proper selection and use of all respiratory protective devices, including half-face and full-face air purifying respirators, airline respirators, and self-contained breathing apparatus. This information is generally specified as part of the written site-specific SH&E plan and Task Hazard Assessment (THA).
  - 4.7.2 Employees engaged in activities not covered by a THA or SH&E plan shall stop work and consult with the SH&E Manager or his/her designated representative to determine the proper equipment to use prior to resuming activities. Whenever appropriate, exposure levels will be measured to verify that the actual use conditions are within the limitations of the approvals specified by NIOSH/MSHA for the selected respirator.

## 4.8 Cartridges

### 4.8.1 NIOSH certifies three classes of filters\*:

Three categories of resistance to filter efficiency degradation:	Three levels of filter efficiency:
N ( <b>N</b> ot resistant to oil)	95% (called "95")
R ( <b>R</b> esistant to oil)	99% (called "99")
P (oil <b>P</b> roof)	99.97% (called "100")

\*Filters are available in any combination of the above.

### 4.8.2 Generally cartridge color denotes the type of contaminant the cartridge was designed to filter:

Olive:	Multi-contaminant
White:	Acid gas
Black:	Organic vapors
Green:	Ammonia gas
Yellow:	Acid gas and organic vapors
Blue:	Carbon Monoxide
Purple (Magenta):	Radioactive material, except tritium & noble gases
Purple:	Any particulates - P100
Orange:	Any particulates - P95, P99, R95, R99, R100
Teal:	Any particulates free of oil - N95, N99, or N100

Please note; this is only a basic listing and should only be used as a reference. Combinations, deviations or additional types may be encountered. To ensure proper cartridge selection consult the cartridge supplier to ensure applicability to the contaminant(s) anticipated

- 4.8.3 Filter cartridges shall be changed out whenever an increase in breathing resistance is detected by the user.
- 4.8.4 When available, chemical cartridges that are equipped with end-of-service life indicators (ESLI) shall be utilized. In those cases, cartridges should be changed when indicated by the ESLI. A buddy system should be used so coworkers can monitor each other's cartridge color condition.
- 4.8.5 In the absence of cartridges equipped with an ESLI, employees shall change chemical cartridges on the following schedule:
- Immediately if breakthrough is perceived or if resistance to breathing is detected by the user; and
  - In accordance with the change out schedule based upon the anticipated contaminant concentration, environmental conditions, employee work rate, and the specific data provided by manufacturer.
- 4.8.6 When PAPRs are worn, the same rules apply with the exception that filter cartridges should be changed when airflow through the filter elements decreases to an unacceptable level, as indicated by the manufacturer's test device.

#### 4.9 Air-Supplying Respirator Use

4.9.1 Air-supplying respirators will be specified for use when it has been determined that any of the following conditions exist:

- The oxygen concentration is less than 19.5 percent;
- The contaminant is unknown or its concentration cannot be quantified;
- The airborne contaminant concentration is above its IDLH;
- An air-purifying respirator canister or cartridge that removes the contaminant is not available;
- The contaminant concentration is above the concentration for which an air-purifying canister or cartridge is approved; or
- The contaminant concentration is above the MUC of a full-face air-purifying respirator.

4.9.2 No Employee may engage in an operation requiring the use of an air-supplied respirator unless the SH&E Manager or his/her designated representative has reviewed the operation and approved its use.

4.9.3 The determination of the type of air-supplying respirator (i.e., SCBA, airline, demand, pressure demand, etc.) appropriate for the job, outside standby persons, communication, proper training and equipment, notification procedures, and necessary action should be part of the THA or SH&E Plan. Mandatory equipment including SCBA or SAR with auxiliary air supply and emergency appropriate retrieval equipment or equivalent rescue means shall be made by the SH&E Manager or his/her designated representative at the time of the THA or SH&E Plan review. The need for any additional precautions (i.e., equipment specific training, on-site health and safety support, etc.) shall also be determined by the SH&E Manager or his/her designated representative.

#### 4.10 Minimum Procedures for IDLH Atmospheres

4.10.1 One Employee or, when needed, more than one Employee shall be located outside the IDLH atmosphere. This employee shall be responsible for communicating with the Employees in the IDLH atmosphere, alerting rescue services if needed, and restricting entrance to the IDLH area by untrained and unapproved persons.

4.10.2 Visual, voice, or signal line communication shall be maintained between the Employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.

4.10.3 The Employee(s) located outside the IDLH atmosphere shall be trained and equipped to provide effective emergency rescue or to initiate on-site rescue services.

4.10.4 If on-site rescue services are to be used, the Manager or Supervisor shall confirm that the service is available to respond prior to any employees entering the IDLH area.

4.10.5 Employee(s) located outside the IDLH area and/or on-site rescue services shall be equipped with:

- Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either
- Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or
- Equivalent means for rescue where retrieval equipment would create a hazard to the Employees in the IDLH area.

#### 4.11 Breathing Air

4.11.1 Compressed air used for respiration shall be of high purity and shall meet, as a minimum, the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Specification G-7.1 (ANSI Z86.1).

4.11.2 Oxygen shall NOT be used as a source of breathing air at any time in open-circuit SCBAs or airline respirators.

4.11.3 Compressor Supplied Breathing Air

- All compressors used for filling SCBA air cylinders or for supplying airline respirators shall be equipped with the following safety and standby devices:
  - The compressor intake shall be located to verify that only respirable (uncontaminated) air is admitted. This requires attention to the location of the compressor intake with respect to compressor engine exhaust, chemical storage or use areas, and suitable intake screening or filtration.
  - Alarms to indicate compressor failure (such as low-pressure air horns, etc.) shall be installed in the system.
  - A receiver of sufficient capacity to enable the respirator wearer to exit from a contaminated atmosphere shall be provided.
- If an oil-lubricated compressor is used to supply breathing air, it shall be equipped with both of the following devices:
  - A continuous reading carbon monoxide monitoring system set to alarm should the carbon monoxide concentration exceed 10 parts per million; and,
  - A high temperature alarm which will activate when the discharge air exceeds 110 percent of the normal operating temperature in degrees Fahrenheit.
- An in-line purifying filter assembly to remove oil, condensed water, particulates, odors, and organic vapors shall be used in conjunction with the air compressor.

4.11.4 Compressed Air Cylinder Systems for Airline Respirators

- Compressed air cylinders shall meet the requirements of *S3AM-114-PR1 Compressed Gases*.
- Compressed air cylinder systems used to supply airline respirators shall be equipped with low pressure warning bells (e.g., Scott Pak-Alarm) or similar warning devices to indicate air pressure in the manifold below 500 pounds per square inch (psi). When such systems are used, one employee shall be assigned as safety standby within audible range of the low pressure alarm.
- Airline hose couplings shall be incompatible with outlets for other gas systems to prevent inadvertently supplying airline respirators with non-respirable gases or oxygen.
- The air pressure at the hose connection to airline respiratory equipment shall be within the range specified in the approval of the equipment by the manufacturer.
- Routine inspection and maintenance of the air compressor shall be performed.

4.11.5 Compressed Air Cylinder Systems for Recharging SCBAs

- When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and coupling rated at a capacity of at least 3,000 psi.

4.11.6 Escape/Egress Units

- Escape/egress unit respirators are intended for use in areas where escape with a short-term (minimum 5 minutes) air supply is necessary. It is important that escape bottle size be provided that will allow the employee to get to a safe location considering breathing rate and distance.
- Escape bottles are required on air-line respirators used in IDLH and high hazard work conditions.
- They may be used as adjuncts to airline pressure demand respirators as a backup air supply or as independent emergency devices in areas where respiratory protection is not normally required.

- Appropriate training shall be conducted and documented prior to assigning Employees to tasks or locations subject to the use of these respirators.
- Escape/egress units (minimum 5 minutes) shall never be used to enter a hazardous atmosphere or as primary standby respirators for confined space entry.

#### 4.12 Respirator Inspection, Cleaning, Maintenance, and Storage

When respirator use is required, only properly cleaned and maintained NIOSH/MSHA approved respirators shall be used.

##### 4.12.1 Inspection

- Respirators should be inspected before and after use using *S3AM-123-FM3 Respiratory Equipment Inspection*, or equivalent. The respirator should not be used and removed and marked out of service if any item on the checklist fails inspection.
- Respirators for emergency use should be inspected once per month.
- Defects shall be reported to their Supervisor or Manager. No defective respirator shall be issued or worn.

##### 4.12.2 Cleaning and Maintenance

- Respirator facepiece assemblies shall be cleaned and sanitized minimally after each day of use in accordance with the requirements specified in *S3AM-123-ATT3 Respirator Cleaning*.
- The respirator should also be inspected for any damaged parts (repair should only be done by trained personnel with the proper tools).
- Respiratory equipment shall not be passed from one person to another until it has been cleaned and sanitized.
- Respiratory equipment shall be maintained according to manufacturer's instructions.
- In field situations, a pre-moistened towelette (e.g., baby wipes) can be used. The mask should then be rinsed with clean warm water and dried. Towelettes or wipes shall be compatible with the respirator materials.
- Alcohol should never be used to clean masks as it can damage the facepieces and rubber parts.
- Where respirators are assigned to individual employees, management shall verify compliance with cleaning and maintenance requirements by periodic inspection and field audits of respiratory equipment.

##### 4.12.3 Storage

- Store clean respirators so that they are protected from dust, excessive moisture, damaging chemicals, temperature extremes and direct sunlight or UV light. They should be placed in a sealed plastic bag and stored in the original box or similar container which blocks light.

#### 4.13 Hygiene

- ##### 4.13.1
- Employees shall leave the work area to wash, change cartridges, or if they detect breakthrough or resistance.

#### 4.14 Costs

- ##### 4.14.1
- The costs for training, medical examinations, fit testing, respirators, spectacle kits, and cleaning materials should be considered as operational costs.

#### 4.15 Program Evaluation

- ##### 4.15.1
- The SH&E Manager or his/her designated representative shall conduct evaluations of the workplace as necessary to verify that the provisions of the current written program are being effectively implemented and that it continues to be effective.

- 4.15.2 The SH&E Manager shall regularly (i.e., during annual training) consult Employees required to use respirators to assess their views on program effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected. Factors to be assessed include but are not limited to:
- Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);
  - Appropriate respirator selection for the hazards to which the Employee is exposed;
  - Proper respirator use under the workplace conditions the Employee encounters; and
  - Proper respirator maintenance.

## **5.0 Records**

- 5.1 Medical records under this section shall be maintained at a minimum in accordance with *S3AM-128-PR1 Medical Screening & Surveillance*.
- 5.2 Fit Test Records shall be maintained in the Employee's health and safety records. *S3AM-123-FM1 Respiratory Equipment Fit Test*, or equivalent, will be used to document each fit test.
- 5.3 Training Records shall be maintained in accordance with *S3AM-003-PR1 SH&E Training*.

## **6.0 Attachments**

- 6.1 [S3AM-123-ATT1 Fit Testing Protocol](#)
- 6.2 [S3AM-123-ATT2 User Seal Check](#)
- 6.3 [S3AM-123-ATT3 Respirator Cleaning](#)
- 6.4 [S3AM-123-FM1 Respiratory Equipment Fit Test](#)
- 6.5 [S3AM-123-FM2 Voluntary Use of Respirators](#)
- 6.6 [S3AM-123-FM3 Respiratory Equipment Inspection](#)

## **Fit Testing Protocol**

S3AM-123-ATT1

### **1.0 Selection**

- 1.1 Fit testing shall not be conducted until after the medical screening and any medical examination is concluded, to confirm there are no relevant psychological or physiological impediments or restrictions to respiratory protection use. A medical examination may result in clearance to use any type of respirator, total restriction for respiratory equipment use, or specific respiratory use restrictions (e.g. powered air-purifying respirator (PAPR) only).
- 1.2 Employees are expected to present themselves for a fit test in the same condition as when using the respiratory protective equipment in their job. These conditions include hair style and whether or not make-up, face creams, glasses, contact lenses, and/or dentures would be used.
- 1.3 Employees shall confirm that no jewelry, head-coverings or other items could interfere with the fit and the face is clean shaven where a tight-fitting respirator is required to seal. Any PPE required to be used concurrently with the RPE that could affect the fit of a tight-fitting facepiece shall be utilized during the fit test.
- 1.4 The Employee shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the Employee.
- 1.5 Prior to the selection process, the Employee shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the Employee in evaluating the fit and positioning of the respirator. This instruction may not constitute the Employee's formal training on respirator use, because it is only a review.

### **2.0 Comfort**

- 2.1 The Employee shall be instructed to hold each chosen face piece up to the face and to eliminate those that obviously do not give an acceptable fit.
- 2.2 The more acceptable face pieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least 5 minutes to assess comfort.
- 2.3 If the Employee is not familiar with using a particular respirator, he/she shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
- 2.4 Assessment of comfort shall include a review of the following points with the Employee and allowing he/she adequate time to determine the comfort of the respirator:
  - Position of the mask on the nose;
  - Room for eye protection;
  - Room to talk; and
  - Position of mask on face and cheeks.

### **3.0 Fit Test Criteria**

- 3.1 The following criteria shall be used to help determine the adequacy of the respirator fit:
  - Chin properly placed;
  - Adequate strap tension, not overly tightened;
  - Fit across nose bridge;
  - Respirator of proper size to span distance from nose to chin;

- Tendency of respirator to slip; and
  - Self-observation in mirror to evaluate fit and respirator position.
- 3.2 The test shall not be conducted if there is any hair growth between the skin and the face piece sealing surface, such as stubble beard growth, beard, moustache, or sideburns that cross the respirator sealing surface. Any type of apparel that interferes with a satisfactory fit shall be altered or removed.
- 3.3 Before conducting the negative and positive pressure checks, the Employee shall be told to seat the mask on the face by moving the head from side to side and up and down slowly while taking in a few slow deep breaths. Another face piece shall be selected and retested if the Employee is unable to seat the mask.
- 3.4 The Employee shall conduct a user seal check, either the negative and positive pressure seal checks described in *S3AM-123-ATT2 User Seal Check* or as recommended by the respirator manufacturer that provide equivalent protection to the procedures in *S3AM-123-ATT2 User Seal Check*.
- 3.5 If an Employee exhibits difficulty in breathing or signs of claustrophobia or anxiety during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the Employee can wear a respirator while performing her or his duties.
- 3.6 If the Employee finds the fit of the respirator unacceptable, the Employee shall be given the opportunity to select a different respirator and to be retested.

## 4.0 Test Exercise Regimen

- 4.1 Prior to the commencement of the fit test, the Employee shall be given a description of the fit test and their responsibilities during the test procedure. The description of the process shall include a description of the test exercises that will be performed. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.
- 4.2 The fit test shall be performed while the Employee is wearing any applicable safety equipment that may be worn during actual respirator use and that could interfere with respirator fit.

## 5.0 General Test Exercises

- 5.1 The following test exercises are to be performed for all fit testing methods prescribed in this procedure, except for the Controlled Negative Pressure (CNP REDON) method. A separate fit testing exercise regimen is contained in the CNP protocol. The Employee shall perform exercises, in the test environment, in the following manner:
- 5.1.1 **Normal breathing.** In a normal standing position, without talking, the Employee shall breathe normally.
- 5.1.2 **Deep breathing.** In a normal standing position, the Employee shall breathe slowly and deeply, taking caution so as not to hyperventilate.
- 5.1.3 **Turning head side to side.** Standing in place, the Employee shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the Employee can inhale at each side.
- 5.1.4 **Moving head up and down.** Standing in place, the Employee shall slowly move his/her head up and down. The Employee shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
- 5.1.5 **Talking.** The Employee shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The Employee can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.
- **Rainbow Passage.** "When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch with its path high above and its two ends apparently beyond the



horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.”

- 5.1.6 **Grimace.** The Employee shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)
- 5.1.7 **Bending over.** The Employee shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT or QLFT units that do not permit bending over at the waist.
- 5.1.8 **Normal breathing.** In a normal standing position, without talking, the Employee shall breathe normally (this is the same as the first test).
- 5.2 Each test exercise shall be performed for one minute except for the grimace exercise, which shall be performed for 15 seconds.
- 5.3 The Employee shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.
- 5.4 The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test and the fit test shall be repeated.

## 6.0 Qualitative Fit Test (QLFT) Protocols

### 6.1 General

- 6.1.1 QLFT test methods have been validated only for a fit factor of 100. A tight-fitting respirator operated in air-purifying (negative-pressure) mode can be tested by QLFT methods to validate a maximum APF of 10.
- 6.1.2 The maximum APF that can be applied for all tight-fitting respirators operated in air-purifying (negative-pressure) mode is 10 when fit tested using a QLFT method.
- 6.1.3 AECOM will confirm that persons administering QLFT are able to calibrate equipment and perform tests properly, recognize invalid tests, and confirm that test equipment is in proper working order.
- 6.1.4 AECOM will confirm that that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

### 6.2 Irritant Smoke (Stannic Chloride) Protocol

- 6.2.1 This QLFT uses a person's response to the irritating chemicals released in the “smoke” produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.
- 6.2.2 **General Requirements and Precautions**
  - The test conductor has the option of donning an air purifying respirator to protect himself/herself from the test agent.
  - The respirator to be tested shall be equipped with high-efficiency particulate air (HEPA) or P100 series filter(s).
  - Only stannic chloride smoke tubes shall be used for this protocol.
  - No form of test enclosure or hood for the Employee shall be used.
  - The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the Employee's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the Employee can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the Employee.

- The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

#### **6.2.3 Sensitivity Screening Check**

- The Employee to be tested shall demonstrate his or her ability to detect a weak concentration of the irritant smoke.
- The test operator shall break both ends of a ventilation smoke tube containing stannic chloride and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute or to an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.
- The test operator shall advise the Employee that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the Employee to keep his/her eyes closed while the test is performed.
- The Employee shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the Employee's direction to determine that he/she can detect it.

#### **6.2.4 Irritant Smoke Fit Test Procedure**

- The Employee being fit tested shall don the respirator without assistance, and perform the required user seal check(s).
- The Employee shall be instructed to keep his/her eyes closed.
- The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the Employee, using the low-flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.
- If the Employee being tested has not had an involuntary response and/or has not detected the irritant smoke, proceed with the test exercises.
- The General Test Exercises shall be performed by the Employee while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of 6 inches.
- If the Employee being fit tested reports detecting the irritant smoke at any time, the test is failed. The Employee being retested shall repeat the entire sensitivity check and fit test procedure.
- Each Employee passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.
- If a response is produced during this second sensitivity check, then the fit test is passed.

### **6.3 Isoamyl Acetate (IAA, Banana oil) Protocol**

6.3.1 This protocol is not appropriate to use for the fit testing of particulate respirators. If used to fit test particulate respirators, the respirator shall be equipped with an organic vapor filter.

#### **6.3.2 General Requirements and Precautions**

- As smoke can be irritating to some employees, this test method is preferred to reduce risk of irritation to the employee tested and the person conducting the fit test.

- The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.
- The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.
- The respirator to be tested shall be equipped with a P100 series filter (for organic vapors).

#### 6.3.3 Sensitivity (Odor threshold) Screening Check

- Odor threshold screening, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of IAA at low levels.
- Obtain the following supplies required to complete the screening:
  - Three 1 liter glass jars with metal lids
  - Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions
- The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor-free water in a 1 liter jar, closing the lid and shaking for 30 seconds. A new solution shall be prepared at least weekly.
- The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.
- A test blank shall be prepared in a third jar by adding 500 cc of odor-free water.
- The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.
- The employee shall then be asked to sniff each bottle and indicate which bottle contains an odor.
- If the employee is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

#### 6.3.4 Isoamyl Acetate (IAA, banana oil) Fit Test Procedure

- The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.
- After successfully completing the odor threshold test and the positive and negative pressure checks, the employee shall don their respirator prior to moving to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well-ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.
- A copy of the prepared text from which the subject is to read may be taped to the inside of the test chamber or should be provided to the employee to hold.
- Upon entering the test chamber, the employee shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.
- Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the test exercises; or to demonstrate some of the exercises.

- If at any time during the test, the employee detects the banana-like odor of IAA, the test is failed. The employee shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.
- If the test is failed, the employee shall return to the selection room and remove the respirator. The employee shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure described in (b) (1) through (7) above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the employee shall wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.
- If the employee passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.
- When the employee leaves the chamber, they shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

#### 6.3.5 Other

- Additional Qualitative fit testing methods may be used provided they adequately test breakthrough or leakage of the respirator and testing is conducted according to manufacturer specifications.
- Qualitative fit testing may be conducted using manufacturer supplied hoods or equivalent test enclosures, and nebulizers using suitable fit testing solutions (e.g. sodium saccharin, Bitrex®, etc.).

## 7.0 Quantitative Fit Test (QNFT) Protocols

### 7.1 General

- 7.1.1 A quantitative fit test measures the adequacy of a respirator's fit by numerically measuring the amount of leakage into the respirator. A minimum fit factor of 500, and in some cases 1000, is required for a successful quantitative fit test.
- 7.1.2 AECOM will confirm that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and confirm that test equipment is in proper working order.
- 7.1.3 Quantitative fit testing is applicable to all tight fitting respirators. Quantitative fit tests (QNFT) are required for all full-face masks and SCBA and multi-functional SCBA air-line configurations.
- 7.1.4 AECOM will confirm that QNFT equipment is kept clean and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

### 7.2 Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol

- 7.2.1 The ambient aerosol CNC quantitative fit testing (Portacount™) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for QNFTs. A probed respirator has a special sampling device installed on the respirator to allow the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an Employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator, and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the Employee prior to the conduct of the screening test.

#### 7.2.2 Portacount Fit Test Requirements

- Check the respirator to make sure the sampling probe and line are properly attached to the face piece and that the respirator is fitted with a particulate filter capable of preventing

significant penetration by the ambient particles used for the fit test (e.g., National Institute for Occupational Safety and Health, Title 42 Code of Federal Regulations 84 series 100, series 99, or series 95 particulate filter) according to the manufacturer's instructions.

- Instruct the Employee to be tested to don the respirator for 5 minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable. This Employee shall already have been trained on how to wear the respirator properly.
- Check the following conditions for the adequacy of the respirator fit: chin properly placed; adequate strap tension, not overly tightened; fit across nose bridge; respirator of proper size to span distance from nose to chin; tendency of the respirator to slip; self-observation in a mirror to evaluate fit and respirator position.
- Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting face piece, try another size of the same model respirator, or another model of respirator.
- Follow the manufacturer's instructions for operating the Portacount and proceed with the test.
- The Employee shall be instructed to perform the exercises in General Test Exercises.
- After the test exercises, the Employee shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

#### 7.2.3 **Portacount Test Instrument**

- The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.
- Since the pass or fail criterion of the Portacount is Employee programmable, the test operator shall confirm that the pass or fail criterion meet the requirements for minimum respirator performance.
- A record of the test needs to be kept on file, assuming the fit test was successful. The record shall contain the Employee's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

## User Seal Check

S3AM-123-ATT2

### 1.0 Requirements

- 1.1 The Employee who uses a tight-fitting respirator is to perform a user seal check to confirm that an adequate seal is achieved each time the respirator is put on.
- 1.2 Either the positive and negative pressure checks listed here or the respirator manufacturer's recommended user seal check method shall be used.
- 1.3 User seal checks are not substitutes for qualitative or quantitative fit tests.
- 1.4 If either the positive or negative pressure checks fail, do not use the respirator and mark it as out of service.

### 2.0 Facepiece Positive and/or Negative Pressure Checks

#### 2.1 Positive pressure check

- Close off the exhalation valve and exhale gently into the facepiece.
- If a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal, the face fit is considered satisfactory
- For some respirators, this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

#### 2.2 Negative pressure check

- Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold your breath for 10 seconds.
- The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. If this is the case, the test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove.
- If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

### 3.0 Manufacturer's Recommended User Seal Check Procedures

- 3.1 The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures, provided that the employer demonstrates that the manufacturer's procedures are equally effective.

## Respirator Cleaning

S3AM-123-ATT3

### 1.0 Requirements

- 1.1 These procedures are general in nature. The cleaning recommendations provided by the manufacturer for a respirator may be used, provided such procedures are as effective as those listed here.
- 1.2 Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth (e.g., confirm that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user).

### 2.0 Procedures for Cleaning Respirators

- 2.1 Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- 2.2 Wash components in warm (110 degree Fahrenheit [°F]; 43 degree Celsius [°C] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- 2.3 Rinse components thoroughly in clean, warm (110°F [43°C] maximum), preferably running water. Drain.
- 2.4 When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for 2 minutes in one of the following:
  - Hypochlorite solution (50 parts per million [ppm] of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 110°F (43°C); or,
  - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45 percent alcohol) to one liter of water at 110°F (43°C); or,
  - Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
- 2.5 Rinse components thoroughly in clean, warm (110°F [43°C] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
- 2.6 Components should be hand dried with a clean, lint-free cloth or air dried.
- 2.7 Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
- 2.8 Test the respirator to ensure that all components work properly.
- 2.9 After the fit test, wipe down the respirator with a sanitary swab.
- 2.10 Store the respirator according to manufacturer recommendations (e.g., away from direct sunlight, in a proper container to maintain cleanliness, etc.).

Americas

## Respiratory Equipment Fit Test

S3AM-123-FM1

Date of Testing:		Respirator Type(s):	
Employee Name:		Respirator Model & Size:	
Method & Testing Agent:			
Corrective lenses needed: <input type="checkbox"/> Yes <input type="checkbox"/> No			
Is the employee medically qualified to wear a respirator? <input type="checkbox"/> Yes <input type="checkbox"/> No      Date of last medical exam (if applicable):			
Is the employee trained on the fundamental principles of respiratory protection, use, selection, inspection, cleaning, maintenance, and storage of equipment? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Test Exercise		Test Exercise	
Sensitivity Check	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Normal Breathing	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Deep Breathing	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Turning Head (side to side)	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Moving Head (up/down)	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Rainbow Passage*	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Bending Over	<input type="checkbox"/> Pass <input type="checkbox"/> Fail	Normal Breathing	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Successful Respirator Fit Determined: <input type="checkbox"/> Yes <input type="checkbox"/> No			
I certify that I have been tested with the respirator(s) listed above. I have also had the opportunity to ask questions and those questions have been answered to my satisfaction. I also understand that the above fit test is voided if respirator limitations are not followed or the respirator is not worn or if conditions (e.g., facial hair) prevent a good face seal.			
Employee Signature:		Date:	
Signature of Tester:		Date:	

**\*Rainbow Passage.** "When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch with its path high above and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."



Americas

## Voluntary Use of Respirators

S3AM-123-FM2

**Instructions: An employee that is opting to use a respirator for non-overexposure conditions shall read this page, and then sign on the bottom of the page. A copy shall be maintained in the employee's training file.**

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for employees. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the employee.

Sometimes employees may wear respirators to avoid exposures to hazards, even if the amount of the hazardous substance does not exceed the limits set by regulatory standards. Voluntary masks may be used for nuisance dust, pollen, and sometimes noxious odors. If your employer provides respirators for your own voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not pose a hazard.

1. Read and follow all instructions provided by the manufacture on use, maintenance, cleaning, and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. A label or statement of certification should appear on the respirator or respirator packaging; it will tell you what the respirator is designed for and how it will protect you. "The National Institute for Occupational Safety and Health (NIOSH) certifies respirators in the U.S and Canada."
3. Do not wear your respirator into atmospheres containing contaminants against which your respirator is not designed to protect. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, fumes, smoke, or very small solid particles.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.
5. If you have any health conditions (e.g., asthma; high blood pressure; emphysema; heart disease, etc.) that could be aggravated by using a respirator, you should check with your doctor before using one.

I have read and understand this information:

Date: \_\_\_\_\_

\_\_\_\_\_  
Employee's Name (Please Print):

\_\_\_\_\_  
Employee's Signature:

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# Respiratory Equipment Inspection

S3AM-123-FM3

<b>Date:</b>		<b>Inspected by:</b>		
<b>Serial #:</b>				
<b>Examine Face Piece for:</b>		N/A	Pass	Fail
Excessive dirt		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracks, tears, holes, or distortion from improper storage		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inflexibility (stretch and massage to restore flexibility)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracked or badly scratched lenses in full facepieces		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Incorrectly mounted full facepiece lens or broken or missing mounting clips		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lens sealed properly in receptacle, retaining clamp secured		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracked / broken air-purifying element holder(s), badly worn threads, missing gasket(s)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Examine the Head Straps or Head Harness for:</b>				
Breaks		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Loss of elasticity		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Broken or malfunctioning buckles and attachments		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Excessively worn serrations on head harness that might permit slippage (full facepieces only)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tears in headband at cradle attachment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Examine the Inhalation and Exhalation Valves for:</b>				
Foreign material, such as detergent residue, dust particles, or human hair under the valve seat		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracks, tears, or distortion in the valve material		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper insertion of the valve body in the facepiece		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracks, breaks, or chips in the valve body, particularly in the sealing surface		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper installation of the valve in the valve body		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Missing or defective valve cover		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Examine the Air Purifying Elements for:</b>				
Incorrect cartridge, canister, or filter for the hazard		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Incorrect installation, loose connection, missing / worn gaskets, cross-threading in the holder		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracks or dents on the outside case of the filter, cartridges or canister, indicated by the absence of sealing material, tape, foil, etc. over the inlet		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expired shelf life date on cartridge or canister		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Examine PAPR, SCBA and Escape Bottles for:</b>				
Damage or wear evident on the regulator or hoses		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cylinder pitted, dented or otherwise damaged		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cylinder / tank certified to the standard of applicable jurisdiction, hydrostatic test current		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Defects Noted:				
Unit Deemed Suitable for Use		<input type="checkbox"/> Yes	<input type="checkbox"/> No	

## 1.0 Purpose and Scope

- 1.1 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content where corrosive and/or reactive materials are used or stored.
- 1.2 The purpose of this procedure is to protect employees from the hazards of corrosive and reactive materials. This procedure considers a corrosive material as one that has a pH less than 2.0 (acid), or greater than 12.5 (base). A reactive material is a chemical that may be sensitive to shock, or may react with air or water depending upon its makeup.

## 2.0 Terms and Definitions

- 2.1 None

## 3.0 References

- 3.1 S3AM-115-PR1 Hazardous Materials Communication
- 3.2 S3AM-116-PR1 Hazardous Materials Shipping
- 3.3 S3AM-123-PR1 Respiratory Protection
- 3.4 S3AM-208-PR1 Personal Protective Equipment

## 4.0 Procedure

- 4.1 Implementation of this procedure is the responsibility of the Manager directing activities of the facility, site, or project location.
- 4.2 Appoint a responsible person who will:
- 4.2.1 Inspect storage areas periodically.
  - 4.2.2 Monitor the quantity of corrosive and reactive materials on site, as well as that of incoming materials.
  - 4.2.3 Review work practices that involve corrosive and reactive materials.
- 4.3 Require that all employees working with corrosive or reactive materials, or who may be exposed to such materials, are trained in accordance with *S3AM-115-PR1 – Hazardous Materials Communication*.
- 4.4 Control the use of corrosive and reactive materials by AECOM personnel.
- 4.4.1 Order only those materials and quantities that are needed to complete a job.
  - 4.4.2 Check incoming corrosive and reactive materials for proper labeling in accordance with *S3AM-115-PR1 Hazardous Materials Communication*.
    - Label materials, if needed, as they arrive on site.
    - Mark reactive materials containers with the date of receipt of the chemical.
  - 4.4.3 Check incoming corrosive and reactive materials for safety data sheets (SDS). If SDSs are not provided or are already on file, order them from the manufacturer, distributor, or vendor.
  - 4.4.4 Add incoming corrosive and reactive chemicals to the hazardous materials inventory, if not already present, following procedures set forth in *S3AM-115-PR1 Hazardous Materials Communication*.

- 4.4.5 Do not store any quantity of corrosive or reactive materials in an office (with the exception of limited quantities of consumer products). These materials are to be stored off site, or at an on-site laboratory or storage area.
- 4.5 Store corrosive and reactive materials as indicated in the MSDS:
  - 4.5.1 In a cool, dry environment, free from extremes of temperature and humidity.
  - 4.5.2 In a manner that separates them from other materials (including flammables and oxidizers) and from each other.
    - Separate acids and bases.
    - Separate reactive materials from acids and bases, and protect from contact with water.
  - 4.5.3 On materials that are acid-resistant (Teflon-coated, plastic, etc.) for small containers.
  - 4.5.4 Covered, not stacked on one another, on acid-resistant material for carboys (approximately 5 gallons/22 liters).
  - 4.5.5 On individual racks or securely blocked on skids, with closure (plug) facing upward to prevent leakage from drums.
- 4.6 Require that labeling and signage are in place.
  - 4.6.1 Label containers with the appropriate warning word to indicate the hazard, such as: DANGER; WARNING; CAUTION; CORROSIVE; OXIDIZER.
- 4.7 Use corrosive and reactive materials appropriately.
  - 4.7.1 Prior to use and in accordance with MSDS, safe-handling procedures shall be developed for each operation, and type and concentration of the chemical. In all cases, review the MSDS and product information before use.
  - 4.7.2 Follow *S3AM-208-PR1 Personal Protective Equipment* when working with or around corrosive and reactive materials. Review the MSDS for the chemical used to determine the specific type of PPE needed, to include at a minimum:
    - Chemical-splash goggles
    - Chemical-resistant gloves
    - Chemical-resistant apron
  - 4.7.3 Obtain medical care immediately in the event of:
    - Skin or eye exposure (e.g., splash) to corrosive liquids
    - Inhalation of vapors of corrosive liquids that cause respiratory discomfort.
  - 4.7.4 Require an eyewash station to be located in all areas where acids or bases are used. Safety showers shall be nearby if significant acid or base quantities are involved.
    - Place emergency eyewashes and showers in accessible locations that require no more than 10 seconds to reach, and are in a travel distance no greater than 25 feet (7.5 meters) from the hazard.
    - Keep the areas surrounding eyewashes and safety showers free of stored materials or debris at all times.
    - Mark emergency eyewashes and showers with a highly visible sign.
    - Require the area around emergency eyewashes and showers to be well lighted and visible.
    - Where portable eyewash units are used, a process shall be in place to change the water and clean the unit, as required by the manufacturer's instructions.
    - Require emergency showers and shower/eyewash combinations connected to a self-contained water supply to deliver a minimum 20 gallons (85 liters) per minute for 15 minutes.

- Require emergency showers and shower/eyewash combinations permanently connected to a potable water supply to deliver at least 30 gallons (127.5 liters) per minute continuously.
- Require emergency eyewashes to be capable of delivering to the eyes not less than 0.4 gallon (1.5 liters) per minute for 15 minutes.

- 4.8 Be prepared to clean up spills of corrosive and reactive materials.
- 4.8.1 Have a written spill response plan in place before materials are stored on site.
- 4.8.2 Have commercial spill kits available for cleanup of small quantities of materials. At a minimum, kits should contain appropriate protective clothing (including full-body suits, gloves, and boots) and spill control equipment (including absorbents, pillows, shovels, containers, etc.).
- 4.8.3 Where necessary, confirm that appropriate respiratory protection equipment is provided to spill responders. For additional information, see *S3AM-123-PR1 Respiratory Protection*.
- 4.8.4 Clean up or respond to spills promptly.
- 4.8.5 Confirm that personnel responding to a spill have been trained in the hazards associated with the spilled material, as well as use of the spill control equipment, including PPE required for the task.
- 4.8.6 Do not use combustible organic materials such as sawdust, excelsior, wood chips and shavings, paper, rags, or burlap bags to absorb or clean up spills.
- 4.9 Develop a waste management plan and procedures, including procedures for collection, storage, labeling, pick-up and transport, and final disposal.
- 4.10 Dispose of corrosive and reactive materials appropriately.
- 4.10.1 Segregate organic acids, inorganic acids, and basic wastes.
- 4.10.2 Contract hazardous waste disposal services should be obtained, as necessary, to dispose of waste materials. All waste shall be appropriately packaged for off-site transportation, if applicable.
- 4.10.3 Wastes shall be marked, labeled, and shipped in accordance with regulatory requirements. For additional information, see *S3AM-116-PR1 Hazardous Materials Shipping*.
- 4.11 Inspect corrosive and reactive storage and use areas periodically.
- 4.11.1 Inspect office, laboratory, and project settings quarterly.
- 4.11.2 Use the inspection sheet provided as *S3AM-125-FM1 Corrosive & Reactive Materials Inspection* or equivalent, to inspect sites.

## 5.0 Records

The following information will be maintained in the location or project file:

- 5.1 Completed Corrosive and Reactive Material Inspection Sheets.
- 5.2 Worker Right-to-Know training documentation.
- 5.3 Written Spill Response Plan.
- 5.4 Waste Management Plan.
- 5.5 Documentation of training for spill response personnel.
- 5.6 Documentation of hazard communication training for personnel exposed to corrosive and/or reactive materials.

## 6.0 Attachments

- 6.1 [S3AM-125-FM1 Corrosive & Reactive Materials Inspection](#)

Americas

**Corrosive & Reactive Materials Inspection**

S3NA-125-FM1

Location: \_\_\_\_\_

Name of Inspector: \_\_\_\_\_

Date Inspected: \_\_\_\_\_

**Labeling**

1. Original containers are labeled with: ☐ Yes ☐ No ☐ NA
- Name of chemical
  - Signal word (e.g., DANGER; WARNING; CAUTION, etc.)
  - Manufacturer

**Pre-Job Activities**

2. Corrosives and reactives are stored in a cool, dry environment, free from temperature extremes ☐ Yes ☐ No ☐ NA
3. Corrosives and reactives are stored in their properly labeled original containers, cushioned against shock, and stored to prevent leaks ☐ Yes ☐ No ☐ NA
4. Corrosives are not stored in the vicinity of oxidizers ☐ Yes ☐ No ☐ NA
5. Hydrofluoric acid is stored only in acid-proof polyethylene- or ceresin-lined containers ☐ Yes ☐ No ☐ NA
6. Corrosives are stored on acid-resistant material ☐ Yes ☐ No ☐ NA
7. Chromic acid, nitric acid, perchloric acid, and potassium permanganate (all oxidizers) are stored separately from other corrosives and flammables ☐ Yes ☐ No ☐ NA

**Handling**

8. The following minimum required PPE is used when working with corrosives: ☐ Yes ☐ No ☐ NA
- Chemical splash goggles
  - Chemical resistant gloves
  - Chemical resistant apron
9. Bottles or carboys are opened slowly to guard from splashes. ☐ Yes ☐ No ☐ NA
10. The outside of the container is washed off with water after use to clean off any droplets of material. ☐ Yes ☐ No ☐ NA
11. An eyewash is located in all areas where corrosives are used. ☐ Yes ☐ No ☐ NA
12. An eyewash is: ☐ Yes ☐ No ☐ NA
- Within 25 feet (7.62 meters) or 10 seconds of travel ☐ Yes ☐ No ☐ NA
  - Marked with a highly visible sign ☐ Yes ☐ No ☐ NA
  - Well lit and visible ☐ Yes ☐ No ☐ NA
  - Working and delivering a minimum of 1.5 liters of water per minute for 15 minutes ☐ Yes ☐ No ☐ NA
13. Where substantial quantities of corrosives and/or reactives are stored, access to an emergency shower is available. ☐ Yes ☐ No ☐ NA
14. Spill control materials compatible with chemicals are available for emergency use. ☐ Yes ☐ No ☐ NA

**Waste Disposal**

15. Organic acid, inorganic acid, and basic waste are kept segregated. ☐ Yes ☐ No ☐ NA
16. Corrosive waste is disposed in accordance with regulatory and client requirements. ☐ Yes ☐ No ☐ NA
17. A waste management plan or procedure is in place. ☐ Yes ☐ No ☐ NA
18. Arrangements for waste collection, transport, and disposal are in place. ☐ Yes ☐ No ☐ NA

Comments: \_\_\_\_\_

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## Electrical Safety

S3AM-302-PR1

### 1.0 Purpose and Scope

- 1.1 Outline the safe working requirements for working with and near electric equipment and installations to minimize and control electrical hazards such as electrical shock, arc flash, and electrical fires in the workplace.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.
- 1.3 As a general rule, AECOM employees shall not work on exposed, energized systems with a potential greater than 50 volts. This work should be performed by a qualified electrician.

### 2.0 Terms and Definitions

- 2.1 **Arc Flash** – A dangerous condition associated with the release of energy during an electrical arc.
- 2.2 **Arc Flash Analysis** – A mathematical determination of the energy released by an electric arc and the distance from the source that a flash hazard exists. The process for an Arc Flash Analysis is defined in National Fire Protection Act 70E of the National Electric Code and Canadian Standards Association Z462.
- 2.3 **Arc Rating** – The maximum incident energy resistance demonstrated by a material prior to breakdown or at the onset of a second-degree skin burn (expressed in cal/cm<sup>2</sup>).
- 2.4 **Circuit Protective Device** – A load-rated switch, circuit breaker, or other device specifically designed as a disconnecting means for opening, reversing, or closing of live circuits.
- 2.5 **Energized Electrical Equipment** – Electrically connected to or having a source of voltage.
- 2.6 **Flash Hazard** – A dangerous situation associated with the release of energy caused by an electric arc.
- 2.7 **Ground Fault Circuit Interrupter (GFCI)** – An electrical device that protects the users of all devices connected to it from electrical shock. The GFCI is part of the circuit or device in use and continuously measures the current in that circuit. If a leakage of current is detected, as in the case of an electrical short circuit, the circuit is opened at the GFCI and current cannot flow beyond the GFCI.
- 2.8 **Licensed Electrician** – A person who possesses the local licenses and certifications to work on electrical circuitry, panels or equipment if full compliance with local legislation.
- 2.9 **Portable Electric Equipment** – Cord- and plug-connected equipment and extension cords.
- 2.10 **Qualified Persons** – Individuals who have specific and documented training and has demonstrated skills and knowledge in the construction and operation of electric equipment and installations to avoid the hazards of working on or near energized electrical equipment. Qualified Persons shall have been specifically permitted to near exposed energized and parts. Even an experienced electrician is unqualified unless he or she knows the particular equipment and has received specific safety training on the potential hazards involved.
- 2.11 **Shock Hazard** – A dangerous situation associated with the possible release of energy caused by contact or approach to live parts.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-202-PR1 Competent Person Designation
- 3.3 S3AM-208-PR1 Personal Protective Equipment

- 3.4 S3AM-209-PR1 Risk Assessment & Management
- 3.5 S3AM-218-PR1 Permit to Work
- 3.6 S3AM-305-PR1 Hand & Power Tools
- 3.7 S3AM-322-PR1 Overhead Lines
- 3.8 S3AM-325-PR1 Lockout Tagout
- 3.9 S3AM-410-PR1 Hazardous Energy Control

## 4.0 Procedure

### 4.1 Roles and Responsibilities

#### 4.1.1 Manager / Supervisor

- Approve all Energized Electrical Work Permits.
- Confirm that all projects under their direct control or authority have a written SH&E Plan prepared for the activity.
- Confirm communication with client / owner of hazards presented by the work conducted by AECOM and controls measures in place.
- Provide technical guidance in support of this procedure.
- Confirming employees are informed of and comply with the provisions of this procedure.
- Supporting employees in the reporting of incidents per *S3AM-004-PR1 Incident Reporting, Notifications & Investigations*, including the entry of the incident into the on-line incident management system (e.g. IndustrySafe).

#### 4.1.2 SH&E Manager

- Provide technical guidance and support to the Manager or Supervisor.
- Assist the Manager or Supervisor in compliance with the requirements of this procedure.
- Assist in the incident investigation and review process

#### 4.1.3 Employees

- Comply with requirements of this procedure.
- Stop work if workers, other than Qualified Persons, are exposed to live electrical systems at unknown voltages or potentials greater than 50 volts.
- Only open electrical panels only if they are a Qualified Person.
- Employees designated as a Qualified Person, conduct work on or near energized electrical equipment in accordance with applicable training and jurisdictional requirements.
- Employees designated as a competent person in relation to the Assured Equipment Grounding Conductor Program, administer testing and recording in accordance with jurisdictional requirements.
- Immediately report incidents per *S3AM-004-PR1 Incident Reporting, Notifications & Investigations*, including the entry of the incident into the on-line incident management system (e.g., IndustrySafe).

### 4.2 Training

- 4.2.1 Employees who have potential exposures to electrical hazards shall be trained in and be familiar with the electrical safety-related work practices required by the applicable regulations. Refer to the *S3AM-003-PR1 SH&E Training* for specific required training.



- 4.2.2 Employees shall have reviewed and acknowledged the applicable SH&E plan specific to the project or location.
- 4.2.3 Refer to *S3AM-302-ATT1 Live Electrical Work* for qualifications if working on or near exposed electric conductors or circuit parts that can be energized.

#### 4.3 General Requirements

- 4.3.1 Electrical equipment installed to provide electric power and light at worksites (both temporary and permanent) shall contain markings durable to the expected environment to inform workers of the equipment's:
  - Manufacturer, trademark, or party responsible for the equipment.
  - Voltage, current, or wattage.
  - Any other ratings as necessary.
  - Equipment / installations not appropriately marked shall not be used.
- 4.3.2 Electrical outlets utilized to supply power for electrical equipment during field operations shall be of the three-wire grounding type. They should be tested for correct polarity and adequacy of the ground with a circuit analyzer. If it is determined that the outlet is incorrectly wired or inadequately grounded, it must not be used until serviced by a licensed electrician.
- 4.3.3 GFCI devices will be in place between the equipment and power source for all temporary circuits unless protected by an assured equipment grounding program as defined in this procedure (i.e., circuits that are not part of a permanently installed facility electrical system, such as on a construction site or temporary field installation).
- 4.3.4 Unqualified personnel are not permitted to work on electrical equipment unless it has been de-energized, verified as being free of hazardous energy and locked and tagged out in accordance with *S3AM-325-PR1 Lockout Tagout*.
  - Electrical equipment that has been de-energized but not locked and tagged out shall be treated as energized.
- 4.3.5 After a circuit is de-energized by a circuit protective device, the circuit may not be repeatedly manually reenergized until it has been determined that the equipment and circuit can be safely energized.
- 4.3.6 Temporary or permanent light fixtures that present a shock or burn hazard shall be guarded.
- 4.3.7 Confirm power switches are properly labeled to identify what they control, unless this is clearly confirmed through switch proximity or location. Electric conductors shall be protected from damage.

#### 4.4 Classified Locations

Electrical equipment and wiring may be installed in locations where any of the following may be present: flammable vapors, liquids, or gases; combustible dusts or fibers; or a concentration or quantity of flammable or combustible material. Below is a list of each type of location and the associated hazards.

##### 4.4.1 Class I Locations

Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures. Class I locations include the following:

##### A. Class I, Division 1 location is a location:

1. In which ignitable concentrations of flammable gases or vapors may exist under normal operating conditions; or
2. In which ignitable concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or

3. In which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

B. Class I, Division 2 location is a location:

1. In which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or
2. In which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment; or
3. That is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

#### 4.4.2 Class II Locations

Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations include the following:

A. Class II, Division 1 location is a location:

1. In which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures; or
2. Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes, or
3. In which combustible dusts of an electrically conductive nature may be present.

B. Class II, Division 2 location is a location in which:

1. Combustible dust will not normally be in suspension in the air in quantities sufficient to produce explosive or ignitable mixtures, and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus; or
2. Dust may be in suspension in the air as a result of infrequent malfunction of handling or processing equipment, and dust accumulations resulting therefrom may be ignitable by abnormal operation or failure of electrical equipment or other apparatus.

#### 4.4.3 Class III Locations

Class III locations are those that are hazardous because of the presence of easily ignitable fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures. Class III locations include the following:

- A. Class III, Division 1 location is a location in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used.
- B. Class III, Division 2 location is a location in which easily ignitable fibers are stored or handled, except in process of manufacture.

#### 4.5 Distribution System Setup

- 4.5.1 Under no circumstances shall electrical lines be routed through doorways, hatches, windows, or other openings.

- 4.5.2 Electric lines crossing work areas, personnel, or vehicular traffic areas shall be either fastened securely overhead (at a height that provides safe clearance for work operations), or protected by a cover capable of withstanding the imposed loads without creating a trip hazard.
- 4.5.3 Circuit breakers shall be labeled to indicate their use.
- 4.5.4 All circuit breaker panels shall have no openings or uncovered knockouts and shall be kept covered when not in use.
- 4.5.5 All live parts of electrical equipment operating at 50 volts or more shall be properly guarded against accidental contact.
- 4.5.6 Extension Cord Use
  - Extension cords and electrical connections on handheld and other power tools will be inspected prior to use for cuts, kinks, frayed wires, etc. If any deficiency is noted, the equipment will be tagged "OUT OF SERVICE" and removed from service. Manufacturer-installed insulated electrical cords will not be repaired except by a licensed electrician.
  - Extension cords are not to be placed across aisles, through doors, through holes in a wall, or in areas where the cord may be damaged or create a tripping hazard.
  - Extension cord sets for use in field operations should be of the three-wire grounding type and will be rated for the intended load.
  - Use of extension cords is allowed only for temporary installations not to exceed 90 days.
  - "Daisy chaining" or connecting a series of extension cords together is not permitted.
  - Extension cords shall be provided with a plug cap that is either molded to the cord or equipped with a cord clamp to prevent strain on the terminal screws.
  - Extension cords shall not be fastened with staples or otherwise hung in a manner that could damage the outer jacket or insulation.
  - Ground fault circuit interrupters shall be used or, if permitted by legislation, an "assured equipment grounding conductor program" is to be established for all nonpermanent wiring needed for construction purposes or when working outdoors, in wet or moist areas or elsewhere as required by legislation.
- 4.5.7 Temporary Lights/Task Lights
  - A temporary light shall not be suspended by the cord unless the cord and light are designed for suspension.
  - Temporary lights shall be equipped with bulb protectors unless they are installed at least 7 or more feet overhead.
- 4.6 Working on or Near Energized Parts
  - 4.6.1 Working on or near energized parts covers either potential direct physical contact or contact by means of tools or equipment and working close enough to the energized part to draw an arc.
  - 4.6.2 Any work on exposed, live electrical systems above 50 volts shall be conducted by a licensed electrician who is a Qualified Person.
  - 4.6.3 Refer to *S3AM-302-ATT1 Live Electrical Work*.
  - 4.6.4 Prior to performing any work near exposed, energized systems, the Qualified Person shall:
    - Confirm with the Licensed Electrician that it is safe to do so.
    - Perform a Shock Hazard Analysis.
    - Perform an Arc Flash Analysis.
    - Establish emergency contacts.

- Complete and have approved the Energized Electrical Work Permit. Refer also to S3AM-218-PR1 *Permit to Work* for additional guidance related to Safe Work Permits.
- Have all required personal protective equipment (PPE), insulated tools, and test equipment tested and ready to use.
- Know and understand the procedures to be followed.
- Ensure that adequate lighting and clearance space is available.
- Remove all conductive clothing and jewelry.

#### 4.6.5 Working Near Overhead Power Lines

- Personnel working in the vicinity of overhead power lines, either on the ground or elevated, shall comply with S3AM-322-PR1 *Overhead Lines*.
- All workers and equipment including cranes and drill rigs shall maintain a clearance distance of at least 50 feet (15.24m meters) from overhead power lines unless a detailed assessment has been completed demonstrating that a smaller clearance distance provides protection.

### 4.7 Grounding

4.7.1 “Ground fault protection” is required on construction sites. To provide this protection, either “ground fault circuit interrupters” (GFCI) are to be used with temporary receptacles, or if permitted by legislation an “assured equipment grounding conductor program” is to be established in which plug-connected electrical equipment, extension cords, and temporary receptacles are tested on a periodic basis.

#### 4.7.2 Ground Fault Circuit Interrupters

- A GFCI is an electrical device that is designed to prevent electrocution from electrical leakage. It is designed to measure the difference in amperage between the “hot” wire and the “neutral” wire in a circuit. Under ideal conditions, the amperage should be the same in both wires. If there is electrical leakage (a ground-fault), the amperages will be different. If the difference is more than a predetermined amount, the GFCI “trips” and stops the flow of electricity.
- GFCIs may trip from many causes including but not limited to:
  - Electrical leakage in the tool from internal defects, damaged insulation or from normal leakage in long runs of cords.
  - Moisture in the air or cords lying in water or on moist dirt.
  - Too many tools on one GFCI circuit.
  - Faulty wiring of the GFCI into the circuit.
  - Defective GFCI.
  - Any such tripping will require the problem to be corrected before the protected circuit can be re-set.

4.7.3 All 120-volt, single-phase, 15- and 20-ampere temporary receptacles shall be protected with “approved” GFCIs. “Approved” means listed by Underwriters Laboratories.

4.7.4 There are several types of GFCIs.

- A combination circuit breaker and GFCI that is installed in place of the ordinary circuit breaker.
- A receptacle containing a built-in GFCI.
- A portable GFCI that plugs into a receptacle and allows the extension cord or tool to be plugged into the GFCI.
- A portable unit containing several GFCI protected receptacles.

4.7.5 GFCIs contain a test button and a reset button. Each GFCI needs to be tested prior to use and on a periodic basis depending upon the manufacturer's recommendations (at a minimum monthly).

4.7.6 Assured Equipment Grounding Conductor Program

- If allowed by local legislation, assured equipment grounding conductor program is to be used instead of GFCIs to provide ground fault protection, the program shall be governed by the following requirements.
- Temporary receptacles shall be electrically grounded in accordance with the temporary wiring requirements of the National Electrical Code (United States)/Canadian Electrical Code.
- Extension cords shall be three-wire cords containing an equipment grounding conductor (ground wire).
- Electrical equipment that is plugged into a receptacle or extension cord (portable electrical tools, bench grinders, electric heaters, etc.) shall have a ground wire properly attached to the non-current-carrying metal parts of the equipment. (Double-insulated tools have no ground wire and are therefore exempt from these testing and recording requirements but still need to be inspected for defects.)
- The Manager or Supervisor is required to designate one or more competent persons to administer this testing and recording program. Refer to S3AM-202-PR1 Competent Person Designation.
- Periodic testing of all plug connected equipment, all extension cords, and all temporary receptacles is to be conducted at the following times:
  - Before a new item (equipment, cord, or receptacle) is put into use.
  - After any repairs to the item.
  - After any incident in which the item may have been damaged.
  - Within three months of the last test. (An exception is allowed in the Standard in which extension cords, and temporary receptacles, which are fixed in place and are not exposed to damage, may be tested every months months.)
- The purpose of the test is to determine the following:
  - Temporary receptacles—to be sure that the receptacle is grounded.
  - Extension Cords—to be sure that the ground wire is connected to the proper terminal at each end and that the ground wire is continuous throughout the length of the cord.
  - Plug Connected Equipment—to be sure that the ground wire is connected to the proper terminal and to the non-current carrying metal parts of the equipment and that the ground wire is continuous from the equipment to the plug.
- The tests may be conducted using the following instruments:
  - A receptacle tester may be used to test receptacles and to test extension cords when plugged into a receptacle.
  - A continuity tester, or a volt-ohm meter, may be used to test equipment and to test extension cords when not plugged into a receptacle.
- Records must be kept to show which items have passed the test and when the test was conducted. These records may be either written inspection logs, a color-coding system using colored tape attached to the item, or some other effective means.
- Color coding shall be used in the following manner:
  - After a plug-connected piece of equipment or an extension cord has been inspected and passed the test, colored tape is to be placed around the cord near the plug. After a temporary receptacle has passed the test, colored tape is to be placed on the cover plate.

- Any set of colors may be used, with the exception of white, black, or silver.
- If there has been no overall site requirements established by the general contractor, use the following colors for the test periods.

January, February, March	Red
April, May, June	Blue
July, August, September	Orange
October, November, December	Green

- The tests administered every three months are to begin on the first working day of each quarter. Testing and color coding are to be continued until all items covered by this program have been tested. The test administered every six months, for those receptacles and extension cords needing only semi-annual testing, are to be color coded using the quarterly color current at the time of the semi-annual test.
- A visual inspection of plug-connected equipment, extension cords, and temporary receptacles is to be made by the user before each use. The purpose of the visual inspection is to look for damage or defects that could affect the safe use of the item. (Exception: extension cords and temporary receptacles that are fixed in place and not exposed to damage are not required to be given a daily visual inspection, but it is a good idea to do the daily visual inspection anyway.)
- Equipment, cords, or receptacles showing damage or defects that could affect its safe operation are not to be used. This applies not only to the visual inspection before each use but also applies to any evidence of damage observed any time during use. Damaged items are to be taken out of service and are not to be used until properly repaired and retested.
- Equipment covered by this program is not to be used until the equipment has been tested and color coded according to the requirements of this program.
- A copy of this program is to be kept at the worksite.

#### 4.8 PPE/Work Practices

4.8.1 PPE requirements shall be determined based on the results of each of the following: Task Hazard Analysis, Shock Hazard Analysis, and Arc Flash Analysis. Refer to the *S3AM-208-PR1 Personal Protective Equipment* and *S3AM-302-ATT1 Live Electrical Work*.

#### 4.8.2 PPE

2 – Required PPE (range based on maximum voltage)	
50 to 240 volts	<ul style="list-style-type: none"> <li>• <b><u>Eye/Face:</u></b> Safety glasses with side shields or goggles and Arc-Flash Face Shield or Arc-Flash Suit Hood (4 cal/cm<sup>2</sup>)</li> <li>• <b><u>Body:</u></b> Flame-Retardant long-sleeved shirt/pants or coverall (4 cal/cm<sup>2</sup>)</li> <li>• <b><u>Hand:</u></b> Electrical Hazard (EH) gloves (Class 00 with leather protectors)</li> <li>• <b><u>Foot:</u></b> EH-rated footwear</li> <li>• <b><u>Head/Ears:</u></b> Class E hard hat, hearing protection (ear canal inserts)</li> <li>• <b><u>Tools:</u></b> ANSI/CSA-approved, voltage-rated</li> </ul>
Above 240 to 480 volts	<ul style="list-style-type: none"> <li>• <b><u>Eye/Face:</u></b> Safety glasses with side shields or goggles and Arc-Flash Face Shield and Sock Hood (8 cal/cm<sup>2</sup>) or Arc-Flash Suit Hood (8 cal/cm<sup>2</sup>)</li> <li>• <b><u>Body:</u></b> Flame-Retardant long-sleeved shirt/pants or coverall (8 cal/cm<sup>2</sup>)</li> <li>• <b><u>Hand:</u></b> EH gloves (Class 00 with leather protectors)</li> <li>• <b><u>Foot:</u></b> EH-rated footwear</li> <li>• <b><u>Head/Ears:</u></b> Class E Hard hat, hearing protection (ear canal inserts)</li> <li>• <b><u>Tools:</u></b> ANSI/CSA-approved, voltage-rated</li> </ul>

480 to 600 volts	<ul style="list-style-type: none"> <li>• <b>Eye/Face:</b> Safety glasses with side shields or goggles and Arc-Flash Suit Hood (8 cal/cm<sup>2</sup>)</li> <li>• <b>Body:</b> Flame-Retardant long-sleeved shirt/pants or coverall (8 cal/cm<sup>2</sup>)</li> <li>• <b>Hand:</b> EH gloves (Class 0 or higher with leather protectors)</li> <li>• <b>Foot:</b> EH-rated footwear (carbon fiber recommended)</li> <li>• <b>Head/Ears:</b> Class E Hard hat, hearing protection (ear canal inserts)</li> <li>• <b>Tools:</b> ANSI/CSA-approved, voltage-rated</li> </ul>
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#### 4.9 Portable Electrical Equipment

4.9.1 Refer to *S3AM-305-PR1 Hand & Power Tools*.

## 5.0 Records

5.1 The Shock Hazard Analysis and the Arc Flash Analysis forms shall be retained in the project file.

5.2 The completed *S3AM-302-FM1 Energized Electrical Work Permit* or equivalent shall be retained in the project file.

## 6.0 Attachments

6.1 [S3AM-302-FM1](#) [Energized Electrical Work Permit](#)

6.2 [S3AM-302-FM2](#) [Electrical Hazard Checklist](#)

6.3 [S3AM-302-ATT1](#) [Live Electrical Work](#)

6.4 [S3AM-302-ATT2](#) [Generator Safety](#)

Americas

**Energized Electrical Work Permit**

S3AM-302-FM1

**PART 1: To be completed by the requester**

Job Work Number \_\_\_\_\_

- (1) Description of circuit/equipment/job location:
- (2) Description of work to be done:
- (3) Justification of why the circuit/equipment cannot be de-energized or the work cannot be deferred until the next scheduled outage:

\_\_\_\_\_  
Requester/Title\_\_\_\_\_  
Date/Time**PART II: To be completed by the electrically qualified persons *doing* the work:**Check When  
Complete

- |   |  |
|---|--|
| (1) Detailed job description procedure to be used in performing the above detailed work:                    | <input type="checkbox"/>                                 |
| (2) Description of the Safe Work Practices to be employed:  | <input type="checkbox"/>                                 |
| (3) Results of the Shock Hazard Analysis:   | <input type="checkbox"/>                                 |
| (4) Determination of Shock Protection Boundaries:   | <input type="checkbox"/>                                 |
| (5) Results of Flash Hazard Analysis:   | <input type="checkbox"/>                                 |
| (6) Determination of the Flash Protection Boundary:   | <input type="checkbox"/>                                 |
| (7) Necessary personal protective equipment to safely perform the job:                                      | <input type="checkbox"/>                                 |
| (8) Means employed to restrict the access of unqualified persons from the work area:                        | <input type="checkbox"/>                                 |
| (9) Evidence of completion of a Job Briefing including discussion of any job-related hazards:               | <input type="checkbox"/>                                 |
| (10) Do you agree that the above described work can be done safely?<br>(If <i>no</i> , return to requester) | <input type="checkbox"/> Yes <input type="checkbox"/> No |

\_\_\_\_\_  
Electrically Qualified Persons(s)\_\_\_\_\_  
Date/Time\_\_\_\_\_  
Electrically Qualified Persons(s)\_\_\_\_\_  
Date/Time\_\_\_\_\_  
Electrically Qualified Persons(s)\_\_\_\_\_  
Date/Time\_\_\_\_\_  
Electrically Qualified Persons(s)\_\_\_\_\_  
Date/Time

Authorized by: \_\_\_\_\_

\_\_\_\_\_  
Authorized Supervisor\_\_\_\_\_  
Date/Time

Notes:



Americas

**Electrical Hazard Checklist**

S3AM-302-FM2

Location Inspected: \_\_\_\_\_ Job No.: \_\_\_\_\_

Date Inspected: \_\_\_\_\_ Name of Inspector: \_\_\_\_\_

Check Yes, No, or NA for Not Applicable. If a comment is required, circle the number, and see Page 3.

**Electrical Equipment Markings**

- |    |  |                              |                             |                             |
|----|--|------------------------------|-----------------------------|-----------------------------|
| 1. | Disconnecting switches and circuit breakers are labeled to indicate their use or equipment served. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 2. | The necessary voltage, wattage, or current ratings are labeled.                                    | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 3. | Circuit breakers clearly indicate whether they are in the "on" or "off" position.                  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 4. | Markings for arc flash hazards per NFPA 70E or CSA Z462 are on each panel or distribution box.     | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

**Electrical Grounding**

- |     |  |                              |                             |                             |
|-----|--|------------------------------|-----------------------------|-----------------------------|
| 5.  | Extension cords used have a grounding conductor (third plug).  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 6.  | Ground-fault circuit interrupters (GFCIs) are installed as required or an assured equipment grounding conductor program is in use.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 7.  | Portable electrical tools and equipment are of the double-insulated type.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 8.  | GFCIs open the circuit on a ground current of 5 milliamperes or greater, and are equipped with an integral push-button test circuit.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 9.  | GFCIs are installed in accordance with the manufacturer's instructions.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 10. | Ground-fault circuit interrupters are tested prior to initial use, and periodically thereafter.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 11. | Grounding rods are at least 5/8-inch- (0.625-centimeter)-diameter steel or iron rods, 1/2-inch- (1.27-centimeter)-diameter copper-clad steel, or 3/4-inch-(1.9-centimeter)-diameter galvanized pipe. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 12. | Grounding rods are in 8-foot (2.5-meter) lengths and driven to full depth.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 13. | The paths from circuits, equipment, structures, and conduits or enclosures to ground are:  |                              |                             |                             |
|     | • Permanent and continuous.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
|     | • Have ample carrying capacity for current likely to be imposed on them.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
|     | • Have resistance sufficiently low to permit current flow to operate circuit breakers and similar overcurrent devices on the circuit.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 14. | Driven ground-rod electrodes have a resistance to ground not exceeding 25 ohms.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 15. | Upon installation of the driven ground-rod electrode, the resistance was tested and recorded.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 16. | Conductors, used for bonding and grounding circuits, are of sufficient size to carry the anticipated current.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 17. | Grounds are not removed until all work is complete.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

Electrical Hazard Checklist (S3AM-302-FM2)

Revision 6 January 15, 2019

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Page 1 of 4

### Electrical Guarding

- |     |  |                              |                             |                             |
|-----|--|------------------------------|-----------------------------|-----------------------------|
| 18. | Switches, receptacles, etc., are provided with tight-fitting covers or plates.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 19. | All energized parts of electrical circuits and equipment are guarded against accidental contact by approved cabinets or enclosure.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 20. | All unused openings (including conduit knockouts) in electrical enclosures and fittings are enclosed with appropriate covers, plugs, or plates.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 21. | Ground-fault circuit interrupters are installed on each temporary 15- or 20-ampere, 120-volt AC circuit at locations where construction, demolition, modifications, alterations, or excavations are being performed. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 22. | Electrical switches and breakers (rated 440 volts or greater) are provided with a means for locking them out in the OFF position.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

### Electrical Systems

- |     |  |                              |                             |                             |
|-----|--|------------------------------|-----------------------------|-----------------------------|
| 23. | Circuit breakers accessible to personnel are protected from physical damage, and located away from ignitable material.                             | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 24. | Weatherproof cabinets or enclosures are used when switches, circuit breakers, fuse panels, and motor controllers are in a wet or outside location. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 25. | A readily accessible, manually operated switch is provided for each incoming service or supply circuit rated less than 5 kilovolts.                | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 26. | Electrical raceways and enclosures are securely fastened in place.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 27. | Overcurrent protection is provided for fuses or circuit breakers for each feeder and branch circuit.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 28. | Insulating fuse tongs or extractors are used when removing fuses from circuits rated 50 to 600 volts.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 29. | Fuse cabinets have close-fitting doors that can be locked.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

### Extension Cords

- |     |   |                              |                             |                             |
|-----|---|------------------------------|-----------------------------|-----------------------------|
| 30. | Clamps or other securing means are provided on flexible cords or cables at plug receptacles, tools, equipment, etc., and the cord jackets are securely held in place. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 31. | Flexible cords and cables are free of splices and taps.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 32. | Only 3-wire grounded-type extension cords, designated for hard or extra-hard service, are used.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 33. | Extension cords are listed by Underwriters Laboratories, Inc.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 34. | Extension cords are checked for damage before use.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 35. | The rated load on extension cords is not exceeded.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 36. | Extension cords are of adequate length and multiple cords are not connected together.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 36. | Extension cords are not fastened with staples, hung by nails, or suspended by wire.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

### Temporary Wiring

- |     |  |                              |                             |                             |
|-----|--|------------------------------|-----------------------------|-----------------------------|
| 37. | Temporary wiring is guarded, buried, or isolated by elevation to prevent accidental contact by workers and equipment.                  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 38. | A vertical clearance above walkways for temporary wiring is not less than 10 feet (3 meters) from circuits carrying 600 volts or less. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

- |     |  |                              |                             |                             |
|-----|--|------------------------------|-----------------------------|-----------------------------|
| 39. | All exposed temporary wiring is supported on insulators.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 40. | Temporary wiring is protected from accidental damage.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 41. | Nonconductive lamp sockets and connections are permanently molded to the conductor insulation on lighting strings. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 42. | Lighting strings have lamp guards.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 43. | Broken or defective bulbs are replaced promptly.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 44. | Lights are protected from accidental contact or breakage.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 45. | Wiring installed in conduit is equipped with bushings at outlets and terminals.                                    | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 46. | Receptacles are of the grounding type, and electrically connected to the equipment-grounding conductor.            | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

### Worker Practices

- |     |  |                              |                             |                             |
|-----|--|------------------------------|-----------------------------|-----------------------------|
| 47. | Personnel performing electrical repairs are properly trained and qualified.                          | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 48. | Workers de-energize, ground, or guard electrical circuits before working in close proximity to them. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 49. | Workers consider all electrical systems as live until verified de-energized and grounded.            | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 50. | Proper lockout/tag-out procedures are used for de-energizing electric circuits.                      | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 51. | Arc flash protection protocols are in place for work on circuits of 50 volts or higher.              | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

### Equipment

- |     |   |                              |                             |                             |
|-----|---|------------------------------|-----------------------------|-----------------------------|
| 52. | Only fiberglass or wood ladders are used when working near electrical hazards.  | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 53. | Insulation mats are placed on floors and on frames of equipment when working on energized equipment.                    | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 54. | Only voltage-rated tools are used on or near live circuits. Voltage rating is appropriate for the work being performed. | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

### Personal Protective Equipment

- |     |  |                              |                             |                             |
|-----|--|------------------------------|-----------------------------|-----------------------------|
| 55. | Rubber matting, blankets, insulated sleeves, and rubber gloves are inspected before use.   | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 56. | Workers use safety glasses and face shields during work activities where there is a reasonable probability of eye injury (and on systems with 50 or more volts). | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |
| 57. | Workers wear arc flash protective clothing, hoods, face shields, and gloves when working on live circuits greater than 50 volts (per NFPA 70E or CSA Z462).      | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> NA |

### COMMENTS:

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## **1.0 Purpose**

- 1.1 The purpose of this attachment to *S3AM-302-PR1 Electrical Safety* is to confirm that all live electrical work conducted under the control of AECOM personnel is carried out in accordance with legislation and recognized best practices in order to provide adequate protection to workers from potential arc flash and / or electrical shock.

## **2.0 Definitions**

- 2.1 **Arc Rating** – The maximum incident energy resistance demonstrated by a material prior to breakdown or at the onset of a second-degree skin burn (expressed in cal / cm<sup>2</sup>).
- 2.2 **Flash Hazard** – A dangerous situation associated with the release of energy caused by an electric arc.
- 2.3 **Energized Electrical Equipment** – Electrically connected to or having a source of voltage.
- 2.4 **Shock Hazard** – A dangerous situation associated with the possible release of energy caused by contact or approach to live parts.

## **3.0 Responsibilities**

### **3.1 Manager**

- 3.1.1 Be familiar with all precautions and Federal and State / Provincial regulations and Best Practices.
- 3.1.2 Provide training on this Work Instruction to Qualified Persons covering:
- Nature and control of known shock and arc flash hazards.
  - Means of eliminating and controlling shock and arc flash hazards.
  - Special electrical personal protective equipment (PPE) requirements (task specific).
  - Procedure for reporting any deviations to this Work Instruction.
- 3.1.3 Confirm employees are provided with safe access to the work area.
- 3.1.4 Control access to energized electrical equipment with potential of shock or arc flash to Qualified Persons only.
- 3.1.5 Confirm availability of proper tools for the operation and maintenance of electrical equipment.
- 3.1.6 Proper identification and guarding of potentially hazardous electrical equipment.
- 3.1.7 Providing available electrical one-line diagrams.
- 3.1.8 Confirm proper housekeeping around energized electrical equipment at all times.
- 3.1.9 Provide proper working conditions, including adequate lighting, to facilitate work in a safe environment.
- 3.1.10 Provide proper supervision of employees.
- 3.1.11 Maintaining a list of authorized electrical supervisor, Qualified Person(s), and attendant.
- 3.1.12 Implementation an ongoing evaluation of this Best Management Practice.
- 3.1.13 Terminate the work and cancel the permit when live work has been completed or any new electrical hazard arises.
- 3.1.14 Verify that communication modes are available and have been tested.

- 3.1.15 Remove unauthorized individuals who enter or who attempt to enter the approach boundaries during live work.
- 3.1.16 Confirm that live work remains consistent with terms of the live work permit and that acceptable working conditions are maintained.
- 3.1.17 Withdraw the live work permit and stop all work if unsafe conditions are reported during any live work (e.g. sparking, smoldering etc.). Do not permit work on that equipment until the cause of any unsafe condition is thoroughly investigated and the live work procedure has been reviewed to prevent reoccurrence.

### 3.2 **Authorized Electrical Attendant**

- 3.2.1 Practice all precautions and Federal and State / Provincial regulations and Best Practices.
- 3.2.2 Understand the hazards that may be faced during live work, including the potential for arc flash, shock hazard, and other related hazards.
- 3.2.3 Be aware of the potential of arc flash or shock possible to the Qualified Persons.
- 3.2.4 Maintain an accurate count of Qualified Persons working near the live equipment or inside approach boundaries.
- 3.2.5 Remain near the approach boundary until relieved by another authorized electrical attendant.
- 3.2.6 Communicate with Qualified Persons as necessary to confirm maintenance of safe conditions at all times.
- 3.2.7 Monitor activities inside and outside the approach zone to determine if it is safe for the worker to continue to remain in the approach zone. Order the Qualified Persons to stop live work under any of the following conditions:
  - The attendant detects a problem;
  - The attendant detects the signs of short-circuiting, such as electrical sparking, smoldering, or any other abnormality;
  - The attendant detects a situation outside the approach zone that could endanger the worker; and
  - If the attendant cannot effectively and safely perform all assigned duties.
- 3.2.8 Perform no other duties that might interfere with the attendant's primary duty to monitor and protect the Qualified Persons.

### 3.3 **Qualified Persons (Authorized Electrical Worker)**

- 3.3.1 Perform all work in accordance with Federal and State / Provincial regulations, AECOM policies and procedures, and this work instruction.
- 3.3.2 Be continuously alert, focused, and aware of the hazards of performing the task.
- 3.3.3 Understand AECOM Safety, Health and Environmental policies and standards as well as site-specific electrical safe work practices.
- 3.3.4 Examine and understand all the documents provided by AECOM and manufacturers, including all specific hazards, advisories, cautions, etc.
- 3.3.5 Be knowledgeable of the use and selection of the proper tools to safely perform the electrical task safely.
- 3.3.6 Complete a Safe Work Plan prior to the start of a task and during work, if conditions change.
- 3.3.7 Maintain good housekeeping around work areas. Remove all debris, materials, etc., at the completion of tasks.
- 3.3.8 Report any hazardous (uncontrolled) conditions to AECOM's authorized supervisor.

- 3.3.9 Understand the hazards that may be faced during live work, including arc flash, shock, or other electrical hazards.
- 3.3.10 Properly inspect prior to use, and properly use required PPE and electrical tools as specified in this work instruction and the applicable SH&E Plan.
- 3.3.11 Communicate with the authorized electrical attendant as necessary.
- 3.3.12 Alert the attendant whenever any abnormality occurs (e.g., sparking, minor shock, burning smell, etc.) or symptoms of unsafe conditions are observed.
- 3.3.13 Stop all work and exit from the approach zone whenever:
  - An order to evacuate is given by the authorized electrical attendant or the authorized supervisor; or
  - When the worker observes any warning sign or symptom of short circuiting or a dangerous situation; or
  - When the supervisor gives an order to stop work.

## **4.0 Multi-employer Live Electrical Work Coordination**

### **4.1 AECOM will:**

- Inform the client / owner / controlling authority, or if applicable, the host employer, of hazards presented by the work conducted by AECOM, hazards identified during the course of work not previously identified, and measures in place to control hazards identified by AECOM, client / owner or host employer.
- Inform the contractor that the workplace contains shock and / or arc flash potential and that live work is allowed only through compliance with a live work permit program meeting the requirements of the applicable Federal and State / Provincial legislation.
- Appraise the contractor of the elements of the work, including the hazards identified and all past experiences with the live work that make the live work hazardous.
- Appraise the contractor of any precautions or procedures that have been implemented for the protection of employees in the approach zone where contractor personnel will be working.
- Prior to work commencing, coordinate live work operations with the contractor when both AECOM employees and contractor employees will be working in or near approach zone, so that employees of AECOM and the contractor do not endanger each other.
- Debrief the contractor at the conclusion of the live work operations.

### **4.2 Contractor Requirements** – In addition to complying with the live work permit requirements, each contractor who is retained to perform live electrical work will:

- Obtain any available information regarding live work from the Manager.
- Coordinate live work operations with the Manager when both AECOM personnel and contractor personnel will be jointly working in or near the approach zone.
- Practice work in accordance with Federal and State / Provincial regulations and industry best practices.
- Inform AECOM's Manager of the live work permit that the contractor will be using and of any hazards confronted or created during live work, either through debriefing or during live work.

## **5.0 Required Minimum Qualifications**

- 5.1 All electrical work including instrumentation, installations, maintenance, troubleshooting, calibration, operation of stringing equipment, and operation of breakers will only be conducted by qualified, trained, and skilled personnel (this includes AECOM personnel and contractors / subcontractors). These personnel will

meet all qualification requirements mandated by the Federal / State / Provincial regulations as well as applicable electrical associations and trade bodies (e.g., NFPA 70E – refresher training in safety related practices and any changes to the NFPA standard shall be completed at intervals not exceeding three years).

- 5.2 When permitted by regulatory requirements and as applicable to the work conducted, unauthorized workers may perform specific tasks associated with electrical work (e.g., operating stringing equipment) while under the supervision of a qualified person / authorized electrical worker and according to established procedures).
- 5.3 The Manager, in consultation with the Safety, Health and Environment (SH&E) Department, will determine the minimum qualifications requirements for any work with the potential for arc flash.

## **6.0 Working on or Near Electrical Conductors of Circuit Parts**

- 6.1 Safe work practices shall be used to safeguard employees from injury when working on or near exposed electric conductors or circuit parts that can be energized.
  - Live Parts – Safe Work Conditions: Live parts to which an employee might be exposed shall be put into an electrically safe work condition before an employee works on or near them.
  - Live Parts – Unsafe Work Conditions: Only qualified persons shall be permitted to work on electrical conductors or circuit parts that have not been put into electrically safe conditions.
- 6.2 Working on or near exposed electrical conductors OR circuit parts that are, or might become, energized – Prior to working on or near exposed electrical conductors and circuit parts operating at 50 volts or more, lockout / tagout devices shall be applied in accordance with AECOM and site-specific policies. Temporary grounding / bonding of the lines or equipment shall be conducted in accordance with regulatory requirements and in a manner that will prevent employee exposure to hazardous differences in electric potential.
- 6.3 Electrical Hazard Analysis – If the live parts operating at 50 volts or more are not placed in electrically safe condition, other safety-related work practices shall be used to protect employees who might be exposed to electrical hazards. Safe work practices mentioned below shall be established before any person approaches exposed live parts within limited approach boundary:
  - 6.3.1 Shock Hazard Analysis – A shock hazard analysis shall determine the voltage to which personnel will be exposed, boundary requirements, and the PPE necessary in order to minimize the possibility of electrical shock.
  - 6.3.2 Flash Hazard Analysis – A flash hazard analysis shall be done in order to protect personnel from the possibility of being injured by an arc flash. The analysis shall determine the flash protection boundary and the PPE that people within the flash protection boundary shall use.

## **7.0 Shock Hazard Analysis and Approach Boundaries**

- 7.1 A comprehensive Shock Hazard Analysis Survey is the method used to:
  - 7.1.1 Systematically analyze shock hazards,
  - 7.1.2 Identify approach boundaries, and
  - 7.1.3 Identify appropriate PPE.
- 7.2 Before permitting live work on electrical equipment, each project site having electrical equipment operating at more than 50 volts is required to conduct a Shock Hazard Analysis Survey. Upon completion of the survey, the applicable electrical areas / spaces will be labeled in accordance with survey results. As applicable, temporary barriers, or barricades, shall be installed when access to opened enclosures containing exposed energized electrical equipment is not controlled by authorized personnel.
- 7.3 Shock hazard analysis for individual equipment is not required if a facility-wide shock hazard analysis has been conducted and if conditions (including labels and signage) are maintained at all times.

*NOTE: Only authorized personnel are allowed to work within the approach boundaries.*



- 7.4 No qualified person shall approach or take any conductive object closer to exposed live parts operating at 50 volts or more than the restricted approach boundary set forth in National Fire Protection Act (NFPA) 70-E.
- 7.5 In the absence of a facility-wide survey, a Shock Hazard Analysis (including the identification of approach boundaries) shall be conducted (see Appendix A-1 of this procedure) for all electrical equipment operating at over 50 volts.
- 7.6 Results of both facility-wide as well as individual Shock Hazard Analysis Survey shall be made available to all authorized employees, including Qualified Persons and Authorized Attendants. Additionally, any recommendations given by the survey generated from the survey shall be reviewed by the Manager and shall be addressed in a timely manner.

## **8.0 Arc Flash Hazard Analysis and Approach Boundaries**

- 8.1 Arc flash safety requirements apply to all electrical equipment operating at 50 volts or more.
- 8.2 A comprehensive Arc Flash Hazard Analysis Survey is the method used to:
  - 8.2.1 Systematically analyze the potential for arc flash,
  - 8.2.2 Identify the limits of the approach, and
  - 8.2.3 Identify appropriate PPE (refer to appendix A-2).
- 8.3 Prior to performing any work on energized electrical systems, an Arc Flash Hazard Analysis (including the identification of approach boundaries) will be conducted and documented by a qualified person, and reviewed with affected personnel.
- 8.4 Once a comprehensive facility Arc Flash Hazard Analysis Survey has been conducted and electrical work areas / spaces are labeled in accordance with survey results, an individual Arc Flash Hazard Analysis is not required, provided that qualified personnel confirm that the conditions, as indicated on the labels and signs, are maintained.

*NOTE: Only authorized personnel are allowed to work within the limits of approach.*
- 8.5 Reviews of the Arc Flash Hazard Analysis shall be undertaken by a qualified person as appropriate (e.g., when changes are made to the electrical system, minimum every 5 years to confirm accuracy of labelling, etc.)
- 8.6 Please refer to NFPA 70-E for details.

## **9.0 Required PPE Categorized by Exposure**

- 9.1 Employees shall be provided specialized PPE appropriate to the voltage that may be encountered.
- 9.2 The following specialized PPE requirements will be used while working on energized electrical systems. PPE appropriate to the voltage that may be encountered:
  - 9.2.1 As prescribed by the shock hazard analysis and arc flash analysis; or
  - 9.2.2 As identified in the location or project specific SH&E Plan.
- 9.3 All PPE (e.g. eye protection, flame resistant and arc rated clothing, insulated gloves, leather covers, etc.) shall be visually inspected prior to issue, prior to each use, according to manufacturer specifications, and if suspected of damage.
- 9.4 Damaged or defective PPE shall be immediately removed from service.

## **10.0 Required Tools and Equipment**

- 10.1 Employees shall be provided tools and testing or protective equipment approved to the applicable standard (ANSI / ASTM / CSA) for the relevant voltage rating to be used when working on energized electrical systems.

- 10.2 All tools and testing or protective equipment (e.g. sleeves, blankets, hot sticks, etc.) shall be visually inspected and tested prior to use, and as appropriate, according to regulatory requirements (e.g., as per NFPA 70E sleeves / blankets every 12 months, gloves every 6 months, etc.), according to manufacturer's specifications, specific to task (e.g., testing for absence of voltage, equipment function must be verified using a known voltage source before and after absence of voltage test), and if suspected of damage (e.g., after an incident), to confirm that the protection systems associated with the tool or equipment are not damaged or impaired and that diagnostic meters and tools are configured properly.
- 10.3 Tested equipment shall be marked in a manner to identify either the most current test date or the next date testing is due.
- 10.4 Any tool or testing or protective equipment suspected of being compromised will be immediately taken out of service and will be tagged for disposal.

## **11.0 Work on Energized Electrical Systems**

- 11.1 Electrical testing device's voltage shall be certified and operated in accordance with manufacturer's specifications and according to approved procedures appropriate to the electrical systems being tested.
- 11.2 High-voltage testing (in laboratories, shops, and substations, and in the field and on electric transmission and distribution lines and equipment) shall be conducted according to approved procedures appropriate to the electrical system and according to applicable regulatory requirements.
- 11.3 When systems are considered energized, appropriate procedures shall be established to protect workers from hazardous differences in electric potential (e.g., the use of adequate jumpers when working on a neutral conductor, neutral bus or skywire [cutting, splicing, repairing, etc.]).
- 11.4 All electrical maintenance or troubleshooting will be done on de-energized circuits, to the extent practical. Work on energized circuits can only be done under special circumstances using a "Live Work Permit" issued by an authorized electrical supervisor. This permit takes into consideration the voltage levels, known electrical hazards, communication requirements, insulated tool requirements, and need for watch persons, etc. The following procedure will be observed for a live work permit:
- 11.4.1 The person requesting the work (Qualified Person) will complete the permit and will retain the original with him or her during the work. Copy of the permit will be displayed at a prominent location in the control room as a notice that live work has been authorized in certain part of the plant / project.
- 11.4.2 Permit will be reviewed for correctness, proper safety precautions, and adequacy of controls by the authorized electrical supervisor. Consideration must also be given to any specific jurisdictional requirements (e.g., Ontario – equipment protection through the use of Hold-Off tags restricting device operation to previously agreed limits). After satisfying all safety requirements, an authorized electrical supervisor will sign the permit and will give the original copy to the Qualified Person.
- 11.4.3 Upon work completion, the Qualified Person will note any observation on the permit and will return the original to the authorized supervisor.
- 11.4.4 Authorized supervisor will keep both copies of the permit as a controlled record for a period of 12 months.
- 11.5 The following conditions will be met for live electrical work:
- 11.5.1 If a qualified person is working in the vicinity of live electrical line, including overhead lines, whether in an elevated position or on the ground, the person may not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in the below table (or as specified by the applicable jurisdiction) unless:
- The qualified person is insulated from the energized part (gloves, with sleeves if necessary, rated for the voltage involved are considered to be insulation of the person from the energized part on which work is performed), or

- The energized part is insulated both from all other conductive objects at a different potential and from the person, or
- The person is insulated from all conductive objects at a potential different from that of the energized part.

#### APPROACH DISTANCES FOR QUALIFIED EMPLOYEES - ALTERNATING CURRENT

300V and less	Avoid Contact
Over 300V, not over 750V	1 ft. 0 in. (30.5 cm)
Over 750V, not over 2kV	1 ft. 6 in. (46 cm)
Over 2kV, not over 15kV	2 ft. 0 in. (61 cm)
Over 15kV, not over 37kV	3 ft. 0 in. (91 cm)
Over 37kV, not over 87.5kV	3 ft. 6 in. (107 cm)
Over 87.5kV, not over 121kV	4 ft. 0 in. (122 cm)
Over 121kV, not over 140kV	4 ft. 6 in. (137 cm)

- 11.5.2 If any equipment or instrumentation is to be disabled while other related components or systems are still functioning, the Live Work Permit should record how process safety of the remaining systems will be maintained.
- 11.5.3 All electrical and instrumentation work conducted will be recorded in the applicable MCC log. The documentation will include a reference to the permit number where appropriate.
- 11.5.4 The worker will inform the operations supervisor that he or she intends to de-energize a circuit. He or she will also inform the operations supervisor when the work is complete and that the system can be returned to service.
- 11.6 See *S3AM-302-FM1 Energized Electrical Work Permit* for a suggested template for a "Live Work Permit."

## 12.0 Lockout / Tagout Policy and Procedures

- 12.1 All equipment will be locked out prior to any work commencing in accordance with AECOM's procedure *S3AM-325-PR1 Lockout Tagout* and applicable site-specific lockout / tagout program.

## 13.0 Troubleshooting Procedure

- 13.1 Guards and safety interlocks are not to be removed or bypassed except when testing or troubleshooting.
- 13.2 The troubleshooting of electrical equipment often requires working with live circuits. Where possible, work will be done on de-energized circuits following the relevant AECOM and site-specific lockout / tagout policy. However, troubleshooting may require limited work on live circuits; if such work is required it will be done using the "Live Work Permit". Troubleshooting procedures specific to the site or electrical equipment shall be established and followed for the protection of all involved workers.

## 14.0 Housekeeping

- 14.1 All areas containing electrical equipment will:
- 14.1.1 Be maintained and kept clean.
  - 14.1.2 Be well illuminated.
  - 14.1.3 Not be used for storage of supplies.
  - 14.1.4 Not be used for the storage of any flammable materials.
  - 14.1.5 Be assessed for safety hazards.
  - 14.1.6 Be suitably ventilated to control dust, temperature, and humidity.

## 15.0 Communication

- 15.1 Notifications will be provided to appropriate parties (e.g., owner, client, electrical equipment controlling authority) as necessary and required (e.g., Ontario – notification of controlling authority of duration and location of work on or in proximity of equipment energized above 750 V).
- 15.2 Personnel working in or around equipment with electrical hazards will employ a suitable means of communication to confirm their safety.
- 15.3 The means of communication may include:
- 15.3.1 Authorized attendant (required for ALL live work conducted on 600 volts and above).
  - 15.3.2 Permits.
  - 15.3.3 Two-way radios.

## 16.0 Signage and Labels

- 16.1 Motor Control Center (MCC), Electric Contact Relay (ECR) battery rooms, and electrical panels are required to have the following labeling to identify arc flash and shock hazards. The information on the label will include:
- 16.1.1 Flash Hazard Boundary (Arc Flash Current);
  - 16.1.2 Flash Hazard at 18 inches in cal / cm<sup>2</sup> or joules;
  - 16.1.3 PPE Category;
  - 16.1.4 Shock Hazards;
  - 16.1.5 Limited Approach Boundaries;
  - 16.1.6 Restricted Approach;
  - 16.1.7 Prohibited Approach; and
  - 16.1.8 Log book to record all electrically related activities.
- 16.2 All doorways to buildings and enclosures containing energized electrical equipment will be signed to indicate that:
- 16.2.1 Access is restricted to authorized personnel only; and
  - 16.2.2 Electrical hazards exist beyond this (boundary, door, etc.).

### APPENDIX A-1

#### NFPA 70-E Approach Boundaries to Live Parts for Shock Protection

(All dimensions are distance from live part to employee.)

Nominal Voltage Range (Phase to Phase)	Limited Approach Boundary	Exposed Fixed Circuit Parts	Restricted Approach Boundary; includes inadvertent movement adder	Prohibited Approach Boundary
	Exposed Moveable Conductor			
Up to 50 Volts	Not Specified	Not Specified	Not Specified	Not Specified
50-300	10 feet	3.5 feet	Avoid Contact	Avoid Contact
300-750	10 feet	3.5 feet	1 foot	1 inch

More than 750 volts	Consult a Master Electrician, High Voltage Electrician or other authorized electrician.
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## APPENDIX A-2

### NFPA 70-E Protective Clothing and Personal Protective Equipment (PPE) Matrix

#### Protective Clothing Characteristics

PPE Category	Clothing Description (Typical number of clothing layers is given in parentheses)	Required Minimum Arc Rating of PPE [(J/cm <sup>2</sup> (cal/cm <sup>2</sup> )]
1	Arc rated shirt and pants or coverall (1)	16.74 (4)
2	Cotton underwear – conventional short sleeve and brief / shorts, plus FR shirt and FR pants (1 or 2)	33.47 (8)
3	Cotton underwear plus FR shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls (2 or 3)	104.6 (25)
4	Cotton underwear plus FR shirt and FR pants plus multilayer flash suit (3 or more)	167.36 (40)
<p>NOTE:</p> <p><b>Arc rating:</b> Arc rating is defined in Article 100 and can be either ATPV or E<sub>BT</sub>.</p> <p><b>ATPV:</b> ATPV is defined in ASTM F 1959-99 as the incident energy on a fabric or material that results in sufficient heat transfer through the fabric or material to cause the onset of a second-degree burn based on the Stoll curve.</p> <p><b>E<sub>BT</sub>:</b> E<sub>BT</sub> is defined in ASTM F 1959-99 as the average of the five highest incident energy exposure values below the Stoll curve where the specimens do not exhibit breakopen. E<sub>BT</sub> is reported when ATPV cannot be measured due to FR fabric breakopen.</p>		

When working on energized electrical systems, workers shall wear insulated rubber gloves of the class rated to the voltage to which the worker may be exposed. In addition to live electrical work, the following are examples of potential exposures that would require rubber glove use:

- controlling poles by using tools and/or ropes in the proximity of energized overhead lines.
- stringing or sagging conductors in the proximity of energized overhead lines.
- workers on the ground are guiding lifted materials where the "Safe Limits of Approach" for non-insulated booms cannot be maintained.

## Generator Safety

### 1.0 Objective/Overview

- 1.1 Portable generators should be used with extreme caution in order to prevent personal injury. When using a portable generator it is important to follow the manufacturer's instructions to avoid injuring someone or damaging your generator or appliances.
- 1.2 Allow only trained, authorized personnel to operate the generator. Along with training, consider the need for other safety measures, including proper maintenance of equipment and personal protective equipment (PPE). It is important to note that muscle strains are the most common injury associated with portable generators.

### 2.0 Safe Operating Guidelines

- 2.1 Follow manufacturer's recommended operating instructions; every generator is not the same.
- 2.2 Routinely inspect all areas where generators are positioned for hazards to the operation of the generator (e.g., site congestion, rainy or wet conditions, etc.), and hazards the operation of the generator can present (e.g., flammable materials, exhaust proximity to an occupied confined space / HVAC fresh air intake, etc.).
- 2.3 Verify ongoing inspection and scheduled maintenance for owned and leased equipment.
- 2.4 Maintain adequate ventilation. Generators emit carbon monoxide (CO). Never operate a generator in an enclosed building without proper ventilation.
- 2.5 Turn the generator off and allow it to cool prior to re-fueling. Gasoline and its vapors may ignite if they come into contact with hot components or an electrical spark.
- 2.6 Gasoline shall only be stored and dispensed to portable generators using a UL/FM approved safety can of 5 gallons (19 liters) or less. No smoking or open flames within 50 feet (15.24 meters) of the refueling area is permitted.
- 2.7 To avoid a shock, make sure that your hands are dry and that you are standing in a dry place whenever you operate the generator.
- 2.8 Turn off equipment and lights supplied by the generator until it is running.
- 2.9 Use the right extension cord. Use only UL-listed, three-prong extension cords. Be sure the extension cord is the proper size (wire-gauge) to handle the electric load that will be plugged into it.
- 2.10 Ensure the generator is properly grounded prior to each use.
- 2.11 Position generators away from flammable / combustible materials.
- 2.12 When long term power is needed, evaluate alternative sources for sustainability.
- 2.13 Using a portable generator to tie into the wiring of an existing structure shall be done only by a licensed electrician.
  - 2.13.1 Potential Hazards include:
    - Lifting, carrying, and pulling starter cords;
    - Burns from contact with the hot muffler or engine;
    - Shocks/electrocution;
    - Noise exposure; and
    - Inhaling exhaust gases, CO.

2.13.2 Training Requirements include:

- Review of applicable standard operating procedures;
- Back Injury Prevention;
- Demonstrated knowledge on the use of a generator; and
- Review of manufacturers operating guidelines.

2.13.3 Level D PPE include:

- Leather Gloves;
- Hearing Protection; and
- FR or non-synthetic clothing when a fire hazard is present.

2.13.4 Other Safety Tips include:

- Have a Class A:B:C fire extinguisher readily available at all times.

2.14

## Hand & Power Tools

S3AM-305-PR1

### 1.0 Purpose and Scope

- 1.1 This procedure provides the AECOM requirements for all manually operated hand and power tools and associated use, handling and storage. These requirements apply to tools provided by AECOM for employee use as well as tools provided by employees for use on AECOM work sites.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

### 2.0 Terms and Definitions

- 2.1 None

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-118-PR1 Hearing Conservation
- 3.3 S3AM-208-PR1 Personal Protective Equipment
- 3.4 S3AM-302-PR1 Electrical Safety
- 3.5 S3AM-325-PR1 Lockout Tagout

### 4.0 Procedure

- 4.1 Roles and Responsibilities
  - 4.1.1 **Managers/Supervisors**
    - Ensure that all aspects of this procedure are followed and adhered to on all AECOM projects, sites and locations.
    - If a specific tool is not included in the work instructions related to this procedure, appropriate guidelines shall be established prior to work associated with that tool, including following manufacturer's recommendations.
    - Ensure compliance with applicable client requirements and restrictions regarding hand or power tools.
  - 4.1.2 **Safety, Health and Environment (SH&E) Manager**
    - Provide technical guidance and support as to this procedure and associated work instructions.
  - 4.1.3 **Employees**
    - Work only with tools for which they are appropriately trained and familiar with.
    - Follow manufacturer's recommendations for its use and never modify the equipment without first obtaining authorization from the manufacturer.
    - Comply with applicable client requirements and restrictions regarding hand or power tools.
- 4.2 Requirements
  - 4.2.1 Always conduct a task hazard assessment (THA) prior to work commencing and include the identified hazards associated with the anticipated tool use.



- 4.2.2 No employee shall use any hand or power tool, unless they are familiar with the use and operation of the equipment or have received specific instruction on its use and operation.
- 4.2.3 All tools will be used 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 screw driver as a chisel, pry bar, wedge or punch or wrenches as hammers.
- 4.2.4 Use approved tools only. Never modify or use makeshift tools.
- 4.2.5 Do not apply excessive force or pressure on tools unless permitted by the manufacturer's specifications. This includes additional force by hammering with body weight, foot or other tools.
- 4.2.6 Keep surfaces and handles clean and free of excess oil and grease to prevent slipping.
- 4.2.7 Do not carry sharp tools (e.g. knife, chisel, screwdriver, etc.) in pockets; this practice may cause puncture wounds.
- 4.2.8 All tools shall 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.
- 4.2.9 Ensure proper ergonomics principles are observed when using hand and power tools, such as but not limited to:
  - Avoid static and awkward positions when possible.
    - Move at intervals to reduce muscle fatigue.
    - Consider tools with a trigger strip, rather than a trigger button. This strip will allow the exertion of more force over a greater area of the hand that, in turn, will reduce muscle fatigue
  - Do not apply excessive force or pressure on tools.
  - If possible use tools with comfortable grips that are designed to allow the wrist to stay straight. Avoid using a bent wrist.
  - Choose hand tools that have a centre of gravity within or close to the handle.
  - Frequently used tools that weigh more than 1 pound (0.45 kilograms) should be counter-balanced.
  - Ensure proper body positioning when using a tool to prevent slips or falls in the event of unanticipated tool behaviour (slip, kickback, etc.). Avoid over-reaching.
  - Pull on tools such as a wrench 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.
  - Hand-arm vibration exposure is associated with the use of hand tools.
    - Reduce power to the lowest setting that can complete the job safely. This action reduces tool vibration at the source.
    - Consider the need for controls such as limiting time of use.
    - If safe to do so, adjust to a looser but stable grip, and use anti-vibration gloves.
  - Use of heavy tools such as jackhammers can cause fatigue and strains. Heavy rubber grips can reduce these effects by providing a secure handhold.
  - Do not increase a tool's leverage by adding sleeved additions (e.g. a pipe or snipe) to increase tool handle length.
- 4.2.10 Avoid placing fingers and hands in danger zones:
  - Ensure hands and fingers have sufficient clearance in the event the tool slips.
  - Ensure stability of the work-piece. Use work-piece holders (e.g. vise, chisel holder, etc.) whenever possible to prevent injury to hands or deflection of tool or work-piece.

- Use push sticks or guides when cutting or machining smaller material.
- 4.2.11 Secure 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.
- 4.2.12 Utilize good housekeeping practices to ensure tools do not present a tripping hazard.
- 4.2.13 Ensure no part of a tool extends over the edge of the bench top. Place sharp tools (e.g., saws, chisels, knives) on benches so that sharp points or edges face away from the edge.
- 4.2.14 When using saw blades, knives, or other tools, if possible direct the tools away from aisle areas and away from other employees working in close proximity.
- 4.2.15 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.
- 4.2.16 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.
  - Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials shall be used.
  - Electrical tools shall be identified as intrinsically safe.
- 4.2.17 If the task presents electrical hazards, worker must be competent 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.
- 4.2.18 The fluid used in hydraulic power tools must be an approved fire-resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed. The exception to fire-resistant fluid involves all hydraulic fluids used for the insulated sections of derrick trucks, aerial lifts, and hydraulic tools that are used on or around energized lines. This hydraulic fluid shall be of the insulating type.
- 4.2.19 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.
- 4.2.20 Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.
- 4.2.21 Make provisions to prevent tools from automatically restarting upon restoration of power. Refer to *S3AM-325-PR Lockout Tagout*.
- 4.3 Training
  - 4.3.1 Instruction in the proper use, safe handling, and maintenance of tools will be provided to employees unfamiliar with the tool.
    - Assess the employee's training needs as per *S3AM-003-PR1 SH&E Training* procedure.
    - Refer to the applicable work instructions associated with this procedure for any additional training specifics.
    - Training shall include applicable manufacturer's recommendations and guidelines.
  - 4.3.2 Employees shall demonstrate knowledge and competency in the use, safe handling and maintenance of the applicable tool prior to operation.
- 4.4 Personal Protective Equipment (PPE)
  - 4.4.1 Utilize basic PPE appropriate to the task; gloves, safety-toed boots, hard hats and safety glasses with side shields. Refer to *S3AM-208-PR1 Personal Protective Equipment*.
  - 4.4.2 Ensure lockout devices (padlocks, multiple lock hasps, tags) are utilized as necessary. Refer to *S3AM-325-PR Lockout Tagout*.

- 4.4.3 Ensure PPE is appropriate to the work and use additional PPE as required (e.g. mono-goggles, hearing protection, respiratory protection, etc.).
  - Dual eye protection is required to be worn by any employee undertaking or within 3 ½ feet (1 meter) of a task that produces projected particles or material.
  - Head and face protection is recommended for employees working with pneumatic tools.
  - 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.
- 4.4.4 Screens shall also be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.
- 4.4.5 Refer to the applicable work instructions associated with this procedure for any additional specialized PPE.
- 4.5 Inspections
  - 4.5.1 All tools must be inspected prior to each use.
    - Any tool that is defective or has missing parts must not be used.
    - Every broken or defective tool must be tagged 'out of service' or 'do not use' and immediately removed from service.
    - Tagged tools will be returned to the supervisor for repair or replacement.
  - 4.5.2 All tools must be inspected to manufacture's specifications and according to tool rests and guard adjustment tolerances. All tools will be inspected to ascertain that all safety devices are present and functioning properly. Refer to *S3AM-305-FM1 Hand & Power Tool Maintenance Inventory* and *S3AM-305-FM2 Hand & Power Tool Inspection Report*.

## 5.0 Records

- 5.1 None

## 6.0 Attachments

- 6.1 [S3AM-305-ATT1 Chainsaw](#)
- 6.2 [S3AM-305-ATT2 Circular Saw](#)
- 6.3 [S3AM-305-ATT3 Cut Off Saw](#)
- 6.4 [S3AM-305-ATT4 Handheld Grinder](#)
- 6.5 [S3AM-305-ATT5 Impact Wrench](#)
- 6.6 [S3AM-305-ATT6 Nail Gun](#)
- 6.7 [S3AM-305-ATT7 Dustless Vacuum](#)
- 6.8 [S3AM-305-ATT8 Power Drill](#)
- 6.9 [S3AM-305-ATT9 Pressure Washer](#)
- 6.10 [S3AM-305-ATT10 Reciprocating Saw](#)
- 6.11 [S3AM-305-ATT11 Sander](#)
- 6.12 [S3AM-305-ATT12 Knives](#)

- 6.13 [S3AM-305-ATT13 Clearing & Grubbing Equipment](#)
- 6.14 [S3AM-305-ATT14 Pneumatic Tools](#)
- 6.15 [S3AM-305-ATT15 Manual Hand Tools](#)
- 6.16 [S3AM-305-ATT16 Small Engines](#)
- 6.17 [S3AM-305-ATT17 Electric & Battery Hand Tools](#)
- 6.18 [S3AM-305-FM1 Hand & Power Tool Maintenance Inventory](#)
- 6.19 [S3AM-305-FM2 Hand & Power Tool Inspection Report](#)

## Chainsaw

S3AM-305-ATT1

### 1.0 Objective / Overview

- 1.1 Available in a variety of types and capacities, chainsaws are one of the most powerful, yet dangerous cutting tools available.
- 1.2 Working safely with a chain saw includes proper training, good body mechanics and felling technique, well-maintained equipment, and protective clothing.

### 2.0 Hazards

- 2.1 Improper operation (kickback – sudden and violent reverse movement of the saw)
- 2.2 Hand/arm vibration
- 2.3 Noise
- 2.4 Flying/falling debris
- 2.5 Sharp, moving blade
- 2.6 Defective tool

### 3.0 Safe Operating Guidelines

- 3.1 Only approved operators are permitted to operate a chainsaw.
- 3.2 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT16 Small Engines* for additional guidelines.
- 3.3 Inspect saws prior to use and periodically during use:
  - 3.3.1 A sharp chainsaw is safer than a dull one. Worn chains shall be replaced immediately.
  - 3.3.2 Keep the saw clean, lubricated, and adjusted.
  - 3.3.3 Inspect and test the chain brake, chain catch, throttle lock, handles and guards, all nuts and bolts, spark arrestor, and muffler and air filter.
  - 3.3.4 The chain tension should be properly adjusted and the carburetor tuned. The idle must be correctly adjusted; the chain should not move when the saw is in the idle mode.
  - 3.3.5 Ensure the saw is fitted with an inertia break and hand guard.
  - 3.3.6 Ensure the saw is fueled with the appropriate fuel type.
  - 3.3.7 Do not operate a chain saw that is damaged or improperly adjusted, or is not completely and securely assembled. If a chainsaw is defective, remove it from service, and tag it clearly "Out of service for repair" or "Do Not Use". Replace damaged equipment immediately – do not use defective tools "temporarily." DO NOT ATTEMPT FIELD REPAIRS.
- 3.4 Never "drop start" the saw (the saw is held in the air with one hand on the handlebar and the other on the pull cord) as no control is provided to prevent rotation of the saw back toward the user.
- 3.5 Ensure an appropriately sized fire extinguisher or fire-fighting equipment is readily available.
- 3.6 A chainsaw is not only dangerous to the operator but also to surrounding persons. Do not allow others in the area when chainsaws are operated.
- 3.7 Never operate a chain saw when fatigued.

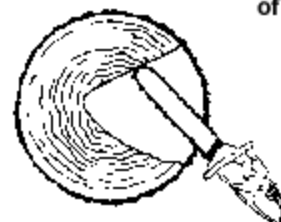
- 3.8 Make sure there are no nails, wire, or other imbedded material in the material to be cut that can cause flying particles or kickback.
- 3.9 Keep all parts of the body away from the saw chain when the engine is running.
  - 3.9.1 Keep the saw close to the body.
  - 3.9.2 Bend from the knees, not the waist. Improper lifting techniques and poor posture contribute to injuries.
  - 3.9.3 Always avoid standing on the log and making cuts with the saw between your legs; always cut with the saw to the outside of your legs.
  - 3.9.4 Always stand to one side of the limb to be cut, never straddle it.
  - 3.9.5 Never cut above chest height.
- 3.10 Determine where the tree/limb will fall prior to cutting.
  - 3.10.1 Start cutting only after a clear escape path has been made.
  - 3.10.2 Always ensure that personnel and equipment are not in the path of the falling tree/log, and that you have time to move away.
  - 3.10.3 If necessary, flag/or fence off the area to prevent entry.
- 3.11 Always keep in mind where the chain will go if it breaks; never position body or allow others in line with the chain.
- 3.12 Avoid operations that could result in kickback of the saw towards the operator.
- 3.13 Keep the chain out of the dirt, debris will fly, the teeth will be dulled and the chain life shortened.
- 3.14 Shut the saw off when carrying through brush or on slippery surfaces. The saw may be carried no more than 50 feet (15 meters) while idling.



**Blade nose strikes another object**



**Improper starting of bore**



**Top or blade nose touches bottom or side of kerf during reinsertion**

## **4.0 Personal Protective Equipment**

- 4.1 Dual eye protection – safety glasses with side shields and a face shield
- 4.2 Chainsaw Chaps
- 4.3 Wear appropriate apparel. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
- 4.4 Safety toe work boots
- 4.5 Hardhat with lateral impact protection
- 4.6 Gloves providing impact, abrasion, cut, tear, & puncture resistance
- 4.7 Hearing Protection

## Americas

## Circular Saw

S3AM-305-ATT2

### 1.0 Objective / Overview

- 1.1 The circular saw is used in cutting wood products (e.g. plywood, construction lumber, etc.).
- 1.2 Safe measures for use include proper training, good body mechanics and operating technique, well-maintained equipment, and protective equipment.

### 2.0 Hazards

- 2.1 Kickback – Sudden and violent reverse movement of the saw
- 2.2 Noise
- 2.3 Flying debris
- 2.4 Sharp, moving blade (severe cuts)
- 2.5 Defective tool
- 2.6 Improper operation



### 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Use sharp blades and ensure cracked and dull blades are removed from service. Dull blades cause binding, stalling and possible kickback.
- 3.3 Use the correct blade for the application and check for proper operation before each cut.
- 3.4 Check often to ensure that guards return to their normal position quickly. Never defeat the guard to expose the blade.
- 3.5 Portable circular saws having a blade greater than 2 inches (5.08 centimeters) in diameter must be equipped at all times with guards. An upper guard must cover the entire blade of the saw.
- 3.6 A retractable lower guard must cover the teeth of the saw, except where it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work position.
- 3.7 Before starting a circular saw, be sure the power cord and extension cords are out of the blade path and are long enough to freely complete the cut. A sudden jerk or pulling on the cord can cause loss of control of the saw and a serious accident.
- 3.8 Secure the work being cut to avoid movement.
- 3.9 For maximum control, hold the saw firmly with both hands after securing the work piece.
- 3.10 Keep the upper and retracting lower blade guard and the motor free from dust.
- 3.11 Do not hold or force the retracting lower guard in the open position.
- 3.12 Do not over tighten the blade-locking nut.
- 3.13 Do not twist the saw to change, cut or check alignment.
- 3.14 Do not use a saw that vibrates or appears unsafe in any way.
- 3.15 Do not force the saw during cutting.
- 3.16 Do not cut materials without first checking for obstructions or other objects such as nails and screws.
- 3.17 Check frequently to be sure clamps remain secure.

- 3.18 Avoid cutting small pieces that can't be properly secured and material on which the saw shoe can't properly rest. Use a push stick or guide when cutting operation requires the hands of the operator to come close to the blade.
- 3.19 Do not overreach. Keep proper footing and balance.
- 3.20 When starting the saw, allow the blade to reach full speed before contacting the work piece.
- 3.21 Circular saws are designed for right-hand operation; left-handed operation will demand more care to operate safely.
- 3.22 Never place hand under or in front of the shoe or guard of the saw when operating.
- 3.23 Cut at the proper depth ( $\frac{1}{4}$  inch / 0.64 centimeters) below work surface. Set the depth of the blade prior to use, when the saw is unplugged.

#### **4.0 Personal Protective Equipment**

- 4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewelry can become caught in moving parts.
- 4.2 Gloves that provide cut, abrasion and impact resistance.
- 4.3 Kickback apron as necessary.
- 4.4 Safety toed boots.
- 4.5 Safety glasses with side shields and faceshield.
- 4.6 Hearing Protection.



## Cut Off Saw

S3AM-305-ATT3

### 1.0 Objective / Overview

- 1.1 Cut-off saws are high-speed cutting tools and very dangerous to operate. Therefore, it is very important to review the general safety rules, training, Personal Protective Equipment and procedures for working with portable cut off saws.
- 1.2 Cut off saws are used in a variety of activities (i.e. concrete, piping, metal, etc.).

### 2.0 Hazards

- 2.1 Noise
- 2.2 Flying debris
- 2.3 Sharp, moving blades (severe cuts)
- 2.4 Ignition sources (hot engine, sparks)
- 2.5 Hand/arm vibration
- 2.6 Kickback – Sudden and violent reverse movement of the saw

### 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* or *S3AM-305-ATT16 Small Engines* for additional guidelines
- 3.2 In addition to inspecting the general tool prior to operation, inspect the abrasive wheel for cracks and chips and appropriate wheel type.
  - 3.2.1 If cracked or chipped, replace wheel before use.
  - 3.2.2 Do not use abrasive-type wheels for rough grinding.
- 3.3 Ensure the saw is started in accordance with manufacturer's specifications:
  - 3.3.1 Start the saw on firm ground or other solid surface in an open area.
  - 3.3.2 Never "drop start" the saw as in the above picture (the saw is held in the air with one hand on the handlebar and the other on the pull cord) as no control is provided to prevent rotation of the saw back toward the user.
- 3.4 Handling
  - 3.4.1 Hold the saw firmly with two hands when the engine is running, and whenever the blade is rotating until it comes to a complete stop.
  - 3.4.2 Carry the saw with engine stopped, muffler away from your body, while protecting the cutting wheel from striking the ground or other objects.
- 3.5 Cutting
  - 3.5.1 Clear the working area.
  - 3.5.2 Begin cutting at full throttle and continue at full throttle until the cut is finished.
  - 3.5.3 Avoid standing in a direct line with the cutting wheel.
  - 3.5.4 Use only downward pressure on the saw, as lateral pressure may cause the blade to break and shatter.

- 3.5.5 Do not change the direction of the cut once started, as this can also cause the blade to break and shatter.
- 3.5.6 Do not cut above shoulder height.
- 3.5.7 Avoid operating the saw if the terrain is wet and/or frozen.
- 3.5.8 Keep flammable and combustible materials away from saw while cutting.
- 3.5.9 Ensure an appropriate fire extinguisher or fire-fighting equipment is readily available.
- 3.6 Maintenance
  - 3.6.1 Shut off the engine and remove the spark plug wire before adjusting or working on the saw.

## **4.0 Personal Protective Equipment**

- 4.1 Safety glasses with side shields and faceshield.
- 4.2 Chainsaw chaps.
- 4.3 Safety toe work boots.
- 4.4 Gloves that provide cut abrasion and impact resistance.
- 4.5 Hearing protection: earplugs and/or earmuffs.
- 4.6 Respirator if required (concrete operations).

# Handheld Grinder

S3AM-305-ATT4

## 1.0 Objective / Overview

- 1.1 Handheld grinders are high-speed electric- or pneumatic-powered grinding tools used to shape or cut metal, and can be dangerous to operate.
- 1.2 Grinders are used in a variety of activities (i.e., piping installation/repair, metal, restoring, polishing, sharpening, etc.).

## 2.0 Potential Hazards

- 2.1 Kickback – Sudden and violent reverse movement of the grinder
- 2.2 Electric shock
- 2.3 Flying debris
- 2.4 An improperly installed or incompatible wheel can break or explode and cause injury.
- 2.5 Moving parts (severe cuts)
- 2.6 Fire hazard from sparks igniting nearby debris or objects
- 2.7 Noise
- 2.8 Hand/arm vibration

## 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Inspect the tool before every use. Damaged tools must be removed from use and tagged "DO NOT USE".
- 3.3 Grinder guards are to be used at all times and must not be altered.
  - 3.3.1 US requirements specify a maximum of 180° of the grinding wheel to be exposed.
  - 3.3.2 While 120° coverage may be permissible in certain jurisdictions, guards that are greater are not to be cut down.
  - 3.3.3 Replace damaged or defective guards immediately
- 3.4 Grinders must be used with an unmodified manufacturer supplied handle at all times. If removal of the handle is required the reason must be appropriately documented and approved by project / location manager and SH&E manager or designee. Client approval may also be required.
- 3.5 Trigger locks are not permitted. If a grinder is found with a trigger lock, the lock shall be disabled.
- 3.6 Never use the grinder for jobs for which it is not designed (e.g. cutting with a grinding wheel vs. cutting disc).
- 3.7 Grinders must be permanently marked with the manufacturer's established maximum RPM (revolutions per minute).
- 3.8 Inspect the disk or wheel prior to operation:
  - 3.8.1 Wire wheels must be inspected for loose and broken wires.



- 3.8.2 Ensure the RPM (as posted on the wheel) is equal to or greater than that posted on the grinder, the disk / wheel is the correct size for the grinder, and the type of wheel is compatible with the material being ground or cut.
- 3.8.3 Wheels must be replaced as specified by the manufacturer. In the absence of specifications a wheel shall not be worn down to a size which would allow the mounting flange assembly to contact the work-piece or work-piece holding fixture.
- 3.8.4 Ensure the disk or wheel is checked for cracks or other damage. A ring test can be conducted on clean, dry, unmounted wheels greater than 4" (10.16 centimeters) in diameter:
  - Suspend the wheel by its arbor hole;
  - Use a non-metallic tool (wood, plastic) to gently tap the wheel at 45° from the vertical center line on either side of the wheel, approximately 1 to 2 inches (2.5 – 5 centimeters) from the edge;
  - Rotate the wheel 45° and repeat the process until the entire wheel has been tested;
  - A wheel that emits a metallic ring indicates absence of damage, whereas a dull sound means the wheel should be removed from service.
- 3.8.5 If cracked, chipped, or there is any other evidence of damage, remove from service and replace wheel before use.
- 3.9 When mounting the wheels:
  - 3.9.1 Grinders must be unplugged before changing wheels, discs or positioning guards.
  - 3.9.2 Follow manufacturer's specifications (e.g. stamp facing grinder, mount up, mount down, etc.)
  - 3.9.3 Ensure that the mounting flanges are clean and the mounting blotters are used.
  - 3.9.4 Do not over tighten the mounting nut.
  - 3.9.5 Before grinding or cutting, run newly mounted wheels at operating speed to check for vibrations.
- 3.10 General Safety Provisions
  - 3.10.1 Ensure abrasive wheels are stored according to manufacturer specifications (absence of temperature extremes and solvents, dry area protected from impact, first in first out).
  - 3.10.2 Keep the work area clean. Do not grind near flammable and combustible materials. Sparks can ignite debris and flammable vapors. A fully charged fire extinguisher must be located nearby. Use of a fire blanket may be necessary.
  - 3.10.3 All observers should be kept at a safe distance from the work area to ensure they are protected from flying debris / sparks. Whenever practicable, use screens or shields.
  - 3.10.4 Always secure work with clamps or a vise, freeing both hands to operate the tool. Never clamp a handheld grinder in a vice.
  - 3.10.5 Use grinding wheels only at their rated speed.
  - 3.10.6 Ensure safety guard(s) is positioned properly prior to start-up.
  - 3.10.7 Allow the grinder to come to full operating speed before beginning grinding operation.
  - 3.10.8 Do not use the side of a grinding wheel unless the wheel is designed for side grinding.
  - 3.10.9 Always stand to the side of the wheel, never directly behind it.
    - Be sure to keep your footing and maintain proper balance. Keep hands, fingers, and other body parts from coming into contact with the revolving wheel.
    - While in operation, grinder shall be held with a firm grip using both hands. One engaging the trigger, and the second holding the handle.

3.10.10 Grinding aluminum is prohibited.

3.10.11 Tools shall be maintained with care. They should be kept clean and sharp for the best performance. Follow instructions in the user's manual for lubricating and care instructions.

#### **4.0 Personal Protective Equipment (PPE)**

4.1 Please refer to *S3AM-208-PR1 Personal Protective Equipment* for further information.

4.2 Gloves providing appropriate heat, impact, abrasion, cut, tear, & puncture resistance.

4.3 Wear appropriate apparel. Long-sleeved shirts and pants are required; clothing shall be made of natural fibers. Synthetics are not permitted. Note: Long hair, loose or baggy clothing, hoodie strings, ties, or jewelry can become caught in moving parts.

4.4 Dual eye protection required - Safety glasses with sideshields and properly impact-rated face shield. Welding helmets used as a face shield shall be verified as approved by CSA / ANSI for protection against impact.

4.5 Safety toe work boots.

4.6 Hearing protection: earplugs and/or earmuffs.

4.7 Other PPE as necessary for the work site/activity (e.g., hard hat, respiratory protection).

## Impact Wrench

S3AM-305-ATT5

### 1.0 Objective / Overview

- 1.1 Impact wrenches are mainly used for tire changing but that does not limit their use. They can be used in all applications when a certain amount of torque is needed to loosen or tighten nuts and bolts.
- 1.2 The danger comes in to play when employees try to use the wrong sockets with an air wrench. Employees using air wrenches must have a general understanding of how to use them.

### 2.0 Potential Hazards

- 2.1 Flying debris
- 2.2 Noise
- 2.3 Cuts
- 2.4 Hand/arm vibration

### 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT14 Pneumatic Tools* for additional guidelines.
- 3.2 Impact wrench sockets and accessories must be used with this tool. Do not use hand sockets and accessories.
- 3.3 The proper fastening torque may differ depending upon the kind or size of the bolt.
- 3.4 Check the torque with a torque wrench.
- 3.5 Connect tool to air hose of recommended size.
- 3.6 Never use a wire, soft pin, or nail to hold the socket onto the square spindle of the impact wrench.
- 3.7 If the proper retaining device on the tool is broken, the tool shall be removed from service to be repaired.
- 3.8 On applications where a low or critical level of torque is required, it is recommended that each fastener is impacted lightly. Then perform the final tightening with a hand torque wrench.

### 4.0 Personal Protective Equipment

- 4.1 Safety toed boots
- 4.2 Anti-vibration gloves with impact and abrasion and cut resistance.
- 4.3 Safety glasses with side shields.
- 4.4 Hearing protection.

## Nail Gun & Stapling Tool

S3AM-305-ATT6

### 1.0 Objective / Overview

- 1.1 Nail guns and stapling tools (pneumatic power-fastening devices) are useful, but must be handled with care.
- 1.2 Nail guns and stapling tools have been shown to be the cause of unnecessary injuries when the design of the gun places emphasis on speed, rather than safety.

### 2.0 Potential Hazards

- 2.1 Flying debris/nails
- 2.2 Imbedded object
- 2.3 Puncture wounds
- 2.4 Noise

### 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT14 Pneumatic Tool* for additional guidelines.
- 3.2 Permit only experienced and trained persons to operate pneumatic nailing and stapling tools. Never let an inexperienced worker use a nail gun without supervised training.
- 3.3 Never point a nail gun or stapling tool toward the body or any other personnel.
  - 3.3.1 Never rest the gun against any part of your body, or try to climb a ladder with the gun cradled against your body.
  - 3.3.2 Be aware of other workers in the work area.
  - 3.3.3 Be aware of what is located behind the nailing surface. Never place hands or other body parts directly behind the nailing surface.
  - 3.3.4 Ensure no one is in the line of fire should an incorrectly selected fastener eject out the other side of the material.
- 3.4 Inspect a tool before connecting it to air supply:
  - 3.4.1 Check tool safety mechanisms if applicable. Never disable a safety tip on a nail gun or stapling tool.
  - 3.4.2 Tighten securely all screws and cylinder caps.
  - 3.4.3 Pneumatic power-fastening devices that shoot nails, rivets, staples, or similar fasteners and operate at pressures more than 100 pounds per square inch (6,890 kPa), must be equipped with a safety interlock to keep fasteners from being ejected, unless the muzzle is pressed against the work surface.
- 3.5 Check correct air supply and pressure before connecting a tool.
- 3.6 Check that the tool is correctly and securely connected to the air supply hose and that it is in good working order, with the safety mechanism operative, before using.
- 3.7 Always handle a tool as if it loaded with fasteners (nails, staples, etc.). Do not carry a tool with a finger on the trigger or with the trigger depressed.
- 3.8 Equip tools with a work-contacting element that limits the contact area to one that is as small as practical.
- 3.9 Make sure that the mechanical linkage between the work-contacting element and trigger is enclosed.

- 3.10 Disconnect a tool from the air supply and ensure the air is completely exhausted from the tool when the tool is unattended, when loading with fasteners (nails, staples), and during cleaning or adjustment.
- 3.11 Before clearing a blockage, be sure that depressing the trigger exhausts all air from the tool and the tool is disconnected from the air supply.
- 3.12 Use only fasteners recommended by the manufacturer. Ensure fasteners are appropriate to the work surface to ensure fastener does not eject completely through the material.
- 3.13 Avoid nailing into knots as nail can splinter wood.
- 3.14 Permit only properly trained people to carry out tool maintenance.
- 3.15 Do not depress the trigger unless the nosepiece of tool is directed onto a safe work surface and properly aligned both vertically and horizontally with the surface
- 3.16 Do not overreach. Keep proper footing and balance.
- 3.17 Ensure the hand not holding the nail gun or stapling tool is a minimum of 12 inches (30cm) away from the nosepiece of the tool.
- 3.18 Keep the gun properly aligned with your work both vertically and horizontally.

#### **4.0 Personal Protective Equipment**

- 4.1 Gloves providing appropriate protection to the task (e.g. impact, puncture, chemical, etc.).
- 4.2 Safety toed boots.
- 4.3 Use hearing protection, where required.
- 4.4 Wear safety glasses with side shields at all times and face shield if flying debris may be encountered.



## Dustless Vacuum

S3AM-305-ATT7

### 1.0 Objective / Overview

- 1.1 Dustless decontamination system (also referred to as Pentek brand name) removes and packages surface contamination from concrete and steel structures.
- 1.2 The Pentek integrated suite of manually operated equipment (e.g., squirrel III, corner cutter, roto-peen, and crack chaser) is designed for the safe removal of radioactive materials, lead-based paints, polychlorinated biphenyls, pesticides, chemical residues, and other contaminated coatings.
- 1.3 The Pentek system incorporates a high-performance vacuum and waste packaging unit, the VAC-PAC, in conjunction with pneumatically operated equipment to remove contaminated material. Dust and debris are captured at the cutting tool surface. Supporting equipment required to operate the unit includes a 60 kilowatt generator and an air compressor (minimum 350 cubic feet capacity), as well as a drum grapple for drum handling activities.

### 2.0 Hazards

- 2.1 Noise
- 2.2 Vibration
- 2.3 Tripping
- 2.4 Hot surfaces (vacuum unit)
- 2.5 Electrical (high voltage)
- 2.6 Pinch
- 2.7 Back strain
- 2.8 High pressure air

### 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT14 Pneumatic Tool* for additional guidelines.
- 3.2 Prior to use, a pre-operation inspection must be completed to determine if the unit is in safe working condition.
- 3.3 The vacuum unit should be placed a minimum of 50 feet (15.2 meters) away from the work area.
- 3.4 Once in position to begin work, apply the brake to stabilize the unit. When raising the VAC-PAC to insert/remove a drum, do not place your body or any extremity under the VAC-PAC while it is in the raised position.
- 3.5 Two workers should be used to maneuver the unit into place.
- 3.6 A minimum 10 feet (3 meters) clearance will be established around the unit while in operation.
- 3.7 Workers should be aware of their position in relation to the hoses and cable to minimize tripping hazards.
- 3.8 A competent person will train each worker in the operation of the unit.
- 3.9 Maintenance in excess of preventive maintenance activities (e.g., lubrication) will be performed by manufacturer personnel ONLY. Always know where the emergency stop is located.
- 3.10 Operators of a motorized drum grapple must be trained in agreement with the powered industrial truck

standard. Refer to *S3AM-324-PR1 Powered Industrial Trucks*.

- 3.11 Review *S3AM-302-PR1 Electrical Safety* prior to refueling the electrical generator and/or compressor.

## **4.0 Personal Protective Equipment**

- 4.1 Leather gloves (maintenance).
- 4.2 As applicable, Tyvek suit (with hood).
- 4.3 Anti-vibration gloves (operation).
- 4.4 Hearing protection (plugs or muffs).

## Power Drill

S3AM-305-ATT8

### 1.0 Objective / Overview

- 1.1 Available in a variety of types and capacities, portable power drills are undoubtedly the most used power tools.
- 1.2 Because of their handiness and application to a wide range of jobs, drills often receive heavy use. For this reason, you will need to carefully check your drill's capacity limitations and accessory recommendations.

### 2.0 Hazards

- 2.1 Electricity
- 2.2 Flying debris
- 2.3 Rotating and sharp parts
- 2.4 Burns (hot bits)
- 2.5 Manual handling (sprains/strains - wrist)

### 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Always keep drill bits sharp.
- 3.3 Disconnect the power supply before changing or adjusting bit or attachments,
- 3.4 Do not use high speed steel (HSS) bits without cooling or using lubrication.
- 3.5 Be sure the chuck is tightly secured to the spindle. This is especially important on reversible-type drills. Tighten the bit securely as described by the owner/operators manual.
- 3.6 The chuck key must be removed from the chuck before starting the drill. A flying key can be an injury-inflicting missile.
- 3.7 Secure workpiece being drilled to prevent movement.
- 3.8 If the bit is long enough to pass through the material, select a shorter drill bit or provide against damage and injury.
  - 3.8.1 Prevent other workers from accessing the area.
  - 3.8.2 Remove or provide coverage for material that could be damaged by the drill bit.
- 3.9 Secure magnetic drills with a chain or rope to prevent falling. Label cord connections to prevent unplugging.
- 3.10 Check auxiliary handles, if part of the tool. Be sure they are securely installed.
- 3.11 Always use the auxiliary drill handle when provided. It gives you more control of the drill, especially if stalled conditions occur.
- 3.12 Grasp the drill firmly by insulated surfaces.
- 3.13 Always hold or brace the tool securely. Brace against stationary objects for maximum control. If drilling in a clockwise -- forward -- direction, brace the drill to prevent a counter-clockwise reaction.
- 3.14 Do not overreach. Always keep proper footing and balance.
- 3.15 Don't force a drill. Apply enough pressure to keep the drill bit cutting smoothly. If the drill slows down, relieve

the pressure. Forcing the drill can cause the motor to overheat, damage the bit and reduce operator control.

#### **4.0 Personal Protective Equipment**

- 4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
- 4.2 Gloves that provide cut, abrasion and impact resistance.
- 4.3 Safety toed boots.
- 4.4 Safety glasses with side shields and face shield.
- 4.5 Hearing protection.

## Pressure Washer

S3AM-305-ATT9

### 1.0 Objective / Overview

- 1.1 Pressure washing can be divided into three categories based on the water pressure the equipment is capable of producing:
- Ultra high pressure jetting – greater than 30,000 psi
  - High pressure washing – 5,000 to 30,000 psi
  - Pressure washing – less than 5,000 psi
- 1.2 Generally, light duty portable pressure washing equipment and car washes produce less than 5,000 psi. High pressure washing equipment is often used for such tasks as cleaning vessels and process piping. Ultra high pressure jetting is also often employed to clean vessels and to remove coatings and scaling of production equipment. If not used correctly and safely, pressure washers can be dangerous piece of work equipment.
- 1.3 AECOM only allows trained, authorized personnel to operate the high pressure washers. Along with training, other safety measures include: reviewing the manufacturers instructional booklet, proper maintenance of equipment, and personal protective equipment.

### 2.0 Hazards

- 2.1 Kickback – Sudden and violent reverse movement of the gun
- 2.2 Flying debris
- 2.3 Slips and trips on wet surfaces and hoses
- 2.4 Noise
- 2.5 Manual handling
- 2.6 Exhaust fumes/carbon monoxide (CO) in enclosed spaces
- 2.7 Contact with high pressure / high temperature fluids

### 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, *S3AM-305-ATT17 Electric & Battery Hand Tools* or *S3AM-305-ATT16 Small Engines* for additional guidelines.
- 3.2 Ensure area is properly flagged with tags identifying work being performed and hazards. Keep all unauthorized workers out of area while job in progress.
- 3.3 Inspect all hoses, fittings, wands, cords and hose reel for damage or defects.
- 3.3.1 Equipment is complete and assembled correctly (i.e. nozzle tip correctly connected to the wand and not directly to hose).
  - 3.3.2 Ensure trigger mechanism is functioning properly.
  - 3.3.3 Fittings are securely attached.
  - 3.3.4 Insulated components are in place.
- 3.4 Check fuel connections and hoses for signs of leaks, defects or damage.
- 3.5 Confirm nozzle / jets are clear by turning on water, without pump pressure.

- 3.6 Check pressure pump oil level before use. Hold the wand firmly with the trigger released when turning the pump on.
- 3.7 Recheck hoses once the system is pressurized.
- 3.8 Never service equipment while energized or pressurized.
- 3.9 Ensure other personnel are clear of area while pressure washer is pressurized. Non-operators must remain a minimum of 25 feet (7.6m) from the operator.
- 3.10 Do not wash at a 90 degree angle to minimize spray and flying debris.
- 3.11 Never point a pressure washer at yourself or others. Contact with high pressure fluid can result in serious cut or injection injuries.
- 3.12 Increase pressure slowly during operation to prevent hose kick-back.
- 3.13 Do not drive over, pull on, or kink the high pressure hose. Damage to the hose may compromise the wire braiding inside and cause the hose to burst.
- 3.14 Whip checks must be used for all high pressure connections.
- 3.15 High-pressure washing equipment should be cleaned often to avoid dirt buildup, especially around the trigger and guard area.
- 3.16 Always set the trigger safety lock when the gun valve is not in use.
- 3.17 Relieve the pressure in the system before coupling and uncoupling hoses.
- 3.18 Visually inspect the full length of high pressure discharge hose and inspect other high pressure fluid-handling components for abrasions or cuts, damage caused by exposure to chemicals and for damage caused by kinks in the hose.
- 3.19 High pressure washers shall be used to clean or decontaminate equipment, surfaces or structures only.
- 3.20 High pressure washers WILL NOT be used to clean or decontaminate workers or personal protective equipment while it is being worn.
- 3.21 Maintain a distance from the spray contact point to reduce noise exposure and risk of being struck by flying debris. Avoid overreaching and maintain a stable stance.
- 3.22 When shutting down a pressure washer, turn the pump off before turning the water supply off.
- 3.23 After turning off pressure washer, ensure all residual pressure is released from system by squeezing the trigger. Consult the operator's manual for any other procedures specific to the equipment for shut-down.
- 3.24 Protect unit from freezing, when applicable.

## **4.0 Personal Protective Equipment**

- 4.1 Hardhat.
- 4.2 Safety glasses with side shields and a face shield.
- 4.3 Gloves providing appropriate protection (rubber, chemical).
- 4.4 Hearing protection.
- 4.5 PVC (or equivalent) rain suit.
- 4.6 Safety toed boots with metatarsal protection.

## **Reciprocating Saw**

**S3AM-305-ATT10**

### **1.0 Objective / Overview**

- 1.1 The versatility of the reciprocating saw, in cutting metal, pipe, wood and other materials have made it a widely used tool.
- 1.2 By design, it is a simple tool to handle. Its demands for safe use, however, are very important.

### **2.0 Potential Hazards**

- 2.1 Flying debris
- 2.2 Noise
- 2.3 Sharp, moving parts (cuts)
- 2.4 Hand/arm vibration
- 2.5 Electricity

### **3.0 Safe Operating Guidelines**

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Use sharp blades. Dull blades can produce excessive heat, make sawing difficult, result in forcing the tool, and possibly cause an accident.
- 3.3 Ensure appropriate blade selection. Different work surfaces demand different blades
- 3.4 Position yourself to maintain full control of the tool, and avoid cutting above shoulder height. Always use two hands to operate the saw.
- 3.5 To minimize blade flexing and provide a smooth cut, use the shortest blade that will do the job.
- 3.6 The work piece must be clamped securely, and the shoe of the saw held firmly against the work to prevent operator injury and blade breakage.
- 3.7 Maintain firm contact between the saw's shoe and the material being cut.
- 3.8 When making a "blind" cut (cannot see behind what is being cut), be sure that hidden electrical wiring, or water pipes are not in the path of the cut.
- 3.9 If wires are present, they must be disconnected at their power source by a qualified person or avoided, to prevent the possibility of lethal shock or fire.
- 3.10 Water pipes must be drained and capped.
- 3.11 Always hold the tool by the insulated grouping surfaces. When making anything other than a through cut, allow the tool to come to a complete stop before removing the blade from the work piece. This prevents breakage of the blade, and possible loss of tool control. Do not operate reciprocating saw in explosive atmospheres.
- 3.12 Do not overreach. Keep proper footing and balance at all times.
- 3.13 Check for misalignment or binding of moving parts, breakage or parts and any other condition that may affect the tool's operation.

## **4.0 Personal Protective Equipment**

- 4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewelry can become caught in moving parts.
- 4.2 Gloves that provide cut abrasion and impact resistance.
- 4.3 Kickback apron, as necessary.
- 4.4 Safety toed boots.
- 4.5 Safety glasses with side shields and face shield.
- 4.6 Hearing protection.



# Sander

S3AM-305-ATT11

## 1.0 Objective / Overview

- 1.1 Sanders are commonly used at project sites for a variety of tasks.
- 1.2 Often times the hazards associated with sanders are overlooked; they don't appear threatening because they don't have sharp blades or bits. These misconceptions can be prevented through proper training and personal protective equipment (PPE) selection.

## 2.0 Potential Hazards

- 2.1 Kickback – Sudden and violent reverse of the sander
- 2.2 Noise
- 2.3 Hand/arm vibration
- 2.4 Dust exposure
- 2.5 Flying debris
- 2.6 Severe abrasive parts
- 2.7 Electricity
- 2.8 Fuel (fine dust) and ignition sources (electricity, friction)

## 3.0 Safe Operating Guidelines

- 3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Disconnect power supply before changing a sanding belt, making adjustments, or emptying dust collector.
- 3.3 Inspect sanding belts before use. Replace those belts that are worn or frayed.
- 3.4 Install sanding belts that are the same widths as the pulley drum.
- 3.5 Adjust sanding belt tension to keep the belt running true and at the same speed as pulley drum.
- 3.6 Secure the sanding belt in the direction shown on the belt and the machine. Keep hands away from the sanding belt.
- 3.7 Before starting a sander, be sure the power cord and extension cords are out of the belt path and are long enough to freely complete the task. The sander must be either double insulated or connected to a ground fault circuit interrupter.
- 3.8 Use two hands to operate sanders – one on the trigger and the other on the front handle knob. Move sanders away from the body.
- 3.9 Clean dust from the motor and vents at regular intervals.
- 3.10 Do not use a sander without an exhaust system or dust collector present that is in good working order. The dust created when sanding can be a fire and explosion hazard. Proper ventilation is essential as well as guarding against open flame and sparks.
- 3.11 Empty the collector when ¼ full. Minimise dust disturbance when emptying the collector.
- 3.12 Do not exert excessive pressure on a moving sander. The weight of the sander provides adequate pressure for the job.

- 3.13 Do not work on unsecured stock unless it is heavy enough to stay in place. Clamp the stop into place or use a 'stop block' to prevent movement.
- 3.14 Do not overreach. Always keep proper footing and balance.
- 3.15 Do not cover air vents of the sander.
- 3.16 Check often to ensure that guards are in their normal position.

#### **4.0 Personal Protective Equipment**

- 4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
- 4.2 Gloves that provide cut, abrasion and impact resistance.
- 4.3 Safety toed boots.
- 4.4 Safety goggles and faceshield.
- 4.5 Hearing protection.
- 4.6 Respiratory protection, as necessary.

**Americas****Knives****S3AM-305-ATT12****1.0 Objective / Overview**

- 1.1 Knives serve a variety of purposes at work sites, and can be a useful tool, when used safely and correctly.
- 1.2 Learning proper positioning and correct use of a knife will drastically reduce the potential of cut-related injuries.

**2.0 Hazards**

- 2.1 Improper body positioning
- 2.2 Improper knife selection
- 2.3 Defective knife
- 2.4 Improper knife operation (including storage)

**3.0 Safe Operating Guidelines**

- 3.1 Select the appropriate knife for the task. Consider using a rounded tip blade if the task allows.
- 3.2 Always be sure that knives are sharp and not dull. A dull blade will require more force to cut, increasing the likelihood of injury (e.g. hand slipping, knife breaking, etc.). Replace dull blades – A knife that tears rather than cuts, generally indicates the blade is dull.
- 3.3 Be sure the blade is seated in the frame of the knife correctly, closed, and fastened together properly.
- 3.4 Always direct the cut away from yourself and others
  - 3.4.1 Keep body parts away from the cut line, (e.g., fingers, leg, etc.)
  - 3.4.2 Ensure that the material being cut is stabilized and not against a body part (e.g. cutting rope against your leg).
  - 3.4.3 Always pull the knife, never push the knife (the blade may break, and momentum could cause the body to come into contact with broken blade).
- 3.5 Ensure knife blades are protected or retracted when not in use.
  - 3.5.1 Never carry a knife with an exposed blade in your pocket.
- 3.6 Use of razor and break away utility knives is prohibited.
  - 3.6.1 Purchase safety-equipped utility knives with guarding or automatically retracting blades.
- 3.7 When using a knife to cut thicker materials, use several passes. Increased force on the blade can cause it to stray from the intended cut path, or break the blade.
- 3.8 When changing blades, always handle from the non-sharp side. Cover blade with duct tape and dispose.
- 3.9 Use an alternate tool when possible (scissors, wire cutters, etc.).
- 3.10 Let a falling knife fall.

**4.0 Personal Protective Equipment**

- 4.1 Cut resistant gloves are mandatory when using knives (Kevlar, thick leather, etc.).

**Americas****Clearing & Grubbing Equipment****S3AM-305-ATT13**

The following safety precautions will be followed during site clearing and tree falling.

**1.0 General**

- 1.1 Refer to *S3AM-305-PR1 Hand & Power Tools* for additional guidance.
- 1.2 As applicable, refer also to *S3AM-305-ATT15 Manual Hand Tools*, *S3AM-305-ATT16 Small Engines*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidance.
- 1.3 All clearing activities shall terminate during electrical storms and periods of high winds.
- 1.4 Dead, broken or rotted limbs or trees (widow makers) shall be felled first.
- 1.5 Be aware of the presence of other personnel when using any tool, especially picks or axes.

**2.0 Machete, Pick and Axe Use**

- 2.1 A machetes, picks and axes will only be used for their designated purpose; do not carelessly swing the tool when it is not needed.
- 2.2 To prevent lacerations, employees will wear Kevlar gloves and Kevlar chain saw chaps.
- 2.3 Machetes, picks and axes shall not be used when other employees are in the immediate work area.

**3.0 Use of Weed Whips**

- 3.1 Weed whips may be used to clear vegetation such as grass, light brush, briars and tree seedlings. The L-shaped weed whip cuts grass and weeds but is unstable for use on larger growth; the triangular-frame weed whip cuts briars and woody stems up to a half-inch in diameter. A "Suwannee" sling is a heavy duty weed whip that also has an axe blade. It does the same work as a weed whip, but can also cut through large materials. The heavier weight of this tool allows it to more easily cut off larger material than a weed whip.
- 3.2 When using weed whips, employees should follow these safety procedures:
  - 3.2.1 Select the correct tool for the types and size of vegetation present across the landfill.
  - 3.2.2 Employees will wear gloves that provide impact, abrasion, cut, tear, and puncture resistance when using weed whips.
  - 3.2.3 Weed whips are meant to be swung back and forth with both hands. Avoid using a golf swing. The tool should be swung no higher than an employee's side.
  - 3.2.4 Strong swings should be made to prevent the blade from bouncing or glancing off springy growth.
  - 3.2.5 Screws hold the serrated double-edge blade in place. These screws can work loose so check them before each use.
  - 3.2.6 At the end of the day, inspect the whips for damage. Clean, sharpen, and oil as necessary and store with a sheath in place.

**4.0 Chain Saws**

- 4.1 Refer to *S3AM-305-ATT1 Chainsaw*.

**5.0 Felling Trees Manually**

- 5.1 Before cutting begins, survey the work area for dead limbs, the lean of the tree to be cut, wind conditions and the location of other trees.

- 5.2 Remove lodged trees (tree has not fallen to the ground after being separated from its stump) as soon as possible. Never work under a lodged tree.
- 5.3 The distance between workers should be maintained at twice the height of the trees being felled.

## **6.0 Chipping Operations**

- 6.1 Prior to use, make sure all safety devices and controls, such as emergency shut-off devices, are tested and verified to be functioning properly.
- 6.2 Access covers and doors shall not be opened until the drum or disk is at a complete stop.
- 6.3 Infeed and discharge ports shall be designed to prevent employee contact with disc, knives and blower blades.
- 6.4 The operator must be completely familiar with the controls and proper use of the equipment.
- 6.5 Workers feeding material into self-feeding wood chippers are at risk of being fed through the chipper if they reach or fall into the infeed hopper or become entangled in branches feeding into the machine.
  - 6.5.1 Make sure two workers (buddy system) are in close contact with each other when operating the chipper.
  - 6.5.2 Stand to the side of the chipper while inserting limbs into chipper, never stand directly in front.
  - 6.5.3 Insert trunk portion of tree/limb first. This will prevent the branches from getting entangled with clothing, etc. and pulling you in with the tree/limb.
  - 6.5.4 Bystanders should be kept at least 25 feet (7.6m) away when in operation.
  - 6.5.5 Keep the area around the wood chipper free of tripping hazards.
- 6.6 Never wear loose clothing that may get caught on feed material or moving parts.

## **7.0 Personal Protective Equipment**

- 7.1 Wear proper apparel for the task.
  - 7.1.1 Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
  - 7.1.2 Wear clothing with long sleeves and full length pants of durable material.
- 7.2 Use gloves that provide impact, abrasion, cut, tear and puncture resistance.
- 7.3 Safety toed boots with ankle support.
- 7.4 Safety glasses with side shields and face shield.
- 7.5 Hearing protection as necessary.

## Pneumatic Tools

S3AM-305-ATT14

### 1.0 Objective / Overview

- 1.1 Pneumatic tools utilize air pressure to perform the tool's task.
- 1.2 Safe measures for use include proper training, good body mechanics and operating technique, well-maintained equipment, and protective equipment.
- 1.3 There are several dangers associated with the use of pneumatic tools. First and foremost is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.

### 2.0 Hazards

- 2.1 Improperly secured air hoses
- 2.2 Noise
- 2.3 Flying debris
- 2.4 Defective tool
- 2.5 Improper operation

### 3.0 Safe Operating Guidelines

- 3.1 Review the manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.
- 3.2 Never use bottled gas as a power source for pneumatic tools.
- 3.3 Drain water from air compressor tank and condensation from air lines.
  - 3.3.1 Blow out the air line before connecting a tool. Hold hose firmly and blow away from yourself and others.
- 3.4 Pneumatic tools must be checked to see that the tools are fastened securely to the air hose to prevent them from becoming disconnected. Pneumatic tools must have the air supply controlled according to manufacturer's specifications.
- 3.5 Make sure that hose connections fit properly and are equipped with a mechanical means of securing the connection between tool/hose/compressor to prevent whipping in case of disconnection or failure (e.g. chains, tie wires, whip checks or equivalent retaining devices).
- 3.6 Safety clips or tool retainers must be in place on pneumatic impact tools to prevent accessories (e.g. chisel on a chipping hammer) or attachments from being ejected.
- 3.7 If an air hose is more than 1/2-inch (12.7 mm) in diameter, a safety excess flow valve must be installed at the source of the air supply to reduce pressure in case of hose failure.
- 3.8 In general, the same precautions should be taken with an air hose that are recommended for electric cords, as the hose is subject to the same kind of damage or accidental striking, and because it also presents tripping hazards. Avoid creating trip hazards caused by hoses laid across walkways, curled underfoot, on ladders.
- 3.9 Airless spray guns that atomize paints and fluids at pressures of 1,000 pounds or more per square inch (6,890 kPa) must be equipped with automatic or visible manual safety devices that will prevent pulling the trigger until the safety device is manually released.

- 3.10 Ensure that the compressed air supplied to the tool is clean and dry. Dust, moisture, and corrosive fumes can damage a tool. An in-line regulator filter and lubricator increases tool life.
- 3.11 Keep tools clean and lubricated, and maintain them according to the manufacturers' instructions.
- 3.12 Use only the attachments that the manufacturer recommends for the tools in use.
- 3.13 Use the proper hose and fittings of the correct diameter and type for the pneumatic or hydraulic application.
  - 3.13.1 The manufacturer's recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.
  - 3.13.2 Use hoses specifically designed to resist abrasion, cutting, crushing and failure from continuous flexing.
  - 3.13.3 Choose air supply hoses that have a minimum working pressure rating of 150 pounds per square inch gauge or 150 percent of the maximum pressure produced in the system, whichever is higher.
  - 3.13.4 Check hoses regularly for cuts, bulges and abrasions. Tag and replace, if defective.
- 3.14 Install quick disconnects of a pressure-release type rather than a disengagement type. Attach the male end of the connector to the tool, NOT the hose.
- 3.15 Reduce physical fatigue by supporting heavy tools with a counter-balance wherever possible.
- 3.16 Do not operate the tool at a pressure above the manufacturer's rating.
- 3.17 Turn off the air pressure to the hose, exhaust the airline and disconnect the tool from the air supply when not in use, before servicing or when changing power tools or attachments.
- 3.18 Do not carry a pneumatic tool by its hose.
- 3.19 Do not use compressed air for cleaning purposes unless the pressure is reduced to 30 pounds per square inch (psi) or less. This rule does not apply for concrete form, mill scale, green cutting, and similar cleaning operations. Proper respiratory, hand, eye, and ear protection must be worn.
- 3.20 Compressed air guns shall never be pointed toward anyone.
  - 3.20.1 Employees shall never "dead-end" them against themselves or anyone else.
  - 3.20.2 A chip guard shall be used when compressed air is used for cleaning.
  - 3.20.3 Never use compressed air to blow debris or to clean dirt from clothes or body.

## **4.0 Personal Protective Equipment**

- 4.1 Gloves providing appropriate protection to the task (e.g. impact, puncture, chemical, etc.)
- 4.2 Safety toed boots
- 4.3 Use hearing protection, where required.
- 4.4 Wear safety glasses with side shields at all times and face shield if flying debris may be encountered.

## Manual Hand Tools

S3AM-305-ATT15

### 1.0 General

- 1.1 Review manufacturer's operating manual and *S3AM-305-PR1 Hand & Power Tools* for additional guidelines.
- 1.2 Carry tools using a heavy belt or apron and hang tools at your sides.
- 1.3 Never carry tools in your pockets or hanging behind your back.

### 2.0 Hammers

- 2.1 Hammers are designed according to the intended purpose. Select a hammer that is comfortable for you and that is the proper size and weight for the job. Misuse can cause the striking face to chip, possibly causing a serious injury.
- 2.2 Choose a hammer with a striking face diameter approximately ½ inch (1.3 centimeters) larger than the face of the tool being struck (e.g., chisels, punches, wedges, etc.).
- 2.3 Strike a hammer blow squarely with the striking face parallel to the surface being struck. Always avoid glancing blows and over and under strikes. (Hammers with beveled faces are less likely to chip or spall).
- 2.4 Look behind and above you before swinging the hammer.
- 2.5 Watch the object you are hitting.
- 2.6 Hold the hammer with your wrist straight and your hand firmly wrapped around the handle.
- 2.7 Do not use handles that are rough, cracked, broken, splintered, sharp-edged or loosely attached to the head. Remove from service and replace the handle if possible.
- 2.8 Do not use any hammer head with dents, cracks, chips, mushrooming, or excessive wear.
- 2.9 Do not use a hammer for any purpose for which it was not designed or intended.
- 2.10 Do not use one hammer to strike another hammer, other hard metal objects, stones or concrete.
- 2.11 Do not redress, grind, weld or reheat-treat a hammer head.
- 2.12 Do not strike with the side or cheek of the hammer.

### 3.0 Pipe Cutters, Reamers, Taps and Threaders

- 3.1 Replace pipe cutter wheels which are nicked or otherwise damaged.
- 3.2 Use a three- or four-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.
- 3.3 Choose a cutting wheel suitable for cutting the type of pipe material required:
  - 3.3.1 Thin wheel for cutting ordinary steel pipe.
  - 3.3.2 Stout wheel for cutting cast iron.
  - 3.3.3 Other wheels for cutting stainless steel, plastic and other materials.
- 3.4 Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75 percent as deep as the thread on the tap.
- 3.5 Use a proper tap wrench (with a "T" handle) for turning a tap.
- 3.6 Use lubricant or machine cutting fluid with metals other than cast iron.



- 3.7 Do not permit chips to clog flutes (grooves in the tap that allow metal chips to escape from the hole). The chips may prevent the tap from turning – this may result in the tap breaking if you continue to apply pressure.
- 3.8 Do not attempt to thread hardened steel. This can chip or damage the die.
- 3.9 Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.
- 3.10 Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

## **4.0 Pliers and Wire Cutters**

- 4.1 Pliers are made in various shapes and sizes and for many uses. Use the correct pliers or wire cutters for the job.
- 4.2 Choose pliers or wire cutters that have a grip span of 2½ – 3½ inches (6.4 – 8.9 centimeters) to prevent palm or fingers from being pinched when the tools are closed.
- 4.3 Use adjustable pliers that allow for a firm grip of the work piece while maintaining a comfortable handgrip (i.e., hand grasp is not too wide).
- 4.4 Use tools only if they are in good condition.
  - 4.4.1 Make sure that the cutting edges are sharp. Dull and worn-down cutting edges require many times more force for cutting.
  - 4.4.2 Make sure that the toothed jaws are clean and sharp. Greasy or worn-down jaws can result in compromised safety. Such tools also require increased force to hold the work piece which, in turn, increases the risk of muscular fatigue and repetitive strain injuries.
- 4.5 Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tools easier to use.
- 4.6 Pull on the pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or injure your hand.
- 4.7 Cut at right angles. Never rock the cutting tool from side to side or bend wire back and forth against the cutting edges.
- 4.8 Do not cut hardened wire unless the pliers or wire cutters are specifically manufactured for this purpose.
- 4.9 Do not expose pliers or wire cutters to excessive heat.
- 4.10 Do not bend stiff wire with light pliers. Needle-nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.
- 4.11 Do not use pliers as a hammer.
- 4.12 Do not hammer on pliers or wire cutters to cut wires or bolts.
- 4.13 Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers for gripping or a bolt cutter for cutting.
- 4.14 Do not use cushion grip handles for jobs requiring tools with electrically insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
- 4.15 Do not use pliers on nuts and bolts; use a wrench.

## **5.0 Screwdrivers**

- 5.1 Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.
- 5.2 Choose contoured handles that fit the shank tightly, with a flange to keep the hand from slipping off the tool.

- 5.3 Use a slot screwdriver with a blade tip width that is the same as the width of the slotted screw head.
- 5.4 For cross-head screws, use the correct size and type of screwdriver; a Phillips screwdriver may slip out of a screw head designed for use with the slightly flatter-tipped Pozidriv screwdriver.
- 5.5 Use a vise or clamp to hold the stock if the piece is small or moves easily.
- 5.6 Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.
- 5.7 If work must be carried out on "live" electrical equipment, use screwdrivers that have insulated handles designed for electrical work and a non-conducting shaft. Remember, most plastic handles are designed for grip and comfort.
- 5.8 Use non-magnetic tools when working near strong magnets (e.g., in some laboratories).
- 5.9 Use a screw-holding screwdriver (with screw-holding clips or magnetic blades) to get screws started in awkward, hard-to-reach areas. Square-tipped screwdrivers (e.g., Robertson) that hold screws with recessed square holes are also useful in such situations.
- 5.10 Use an offset screwdriver in close quarters where a conventional screwdriver cannot be used.
- 5.11 Use a screwdriver that incorporates the following features when continuous work is needed:
  - 5.11.1 Use a pistol grip to provide for a straighter wrist and better leverage.
  - 5.11.2 Use a "Yankee drill" mechanism (spiral ratchet screwdriver or push screwdriver) which rotates the blade when the tool is pushed forward.
  - 5.11.3 Use a ratchet device to drive hard-to-move screws efficiently, or use a powered screwdriver.
- 5.12 File a rounded tip square making sure the edges are straight. A dull or rounded tip can slip out of the slot and cause hand injury or damage to materials.
- 5.13 Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.
- 5.14 Do not lean or push on a screwdriver with any more force than necessary to keep contact with the screw. A screw properly piloted and fitted will draw itself into the right position when turned. Keep the shank directly over the screw being driven.
- 5.15 Do not hold the stock in one hand while using the screwdriver with the other as an injury may result if the screwdriver slips out of the slot.
- 5.16 Do not hammer screws that cannot be turned.
- 5.17 Do not grind the screwdriver tip to fit another size screw head.
- 5.18 Do not try to use screwdrivers on screw heads for which they are not designed (e.g., straight blade screwdrivers on Phillips, clutch head, Torx or multi-fluted spline screw heads).
- 5.19 Do not use defective screwdrivers (e.g. rounded or damaged edges or tips; split or broken handles; bent shafts).
- 5.20 Do not use a screwdriver for prying, punching, chiseling, scoring, scraping or stirring paint.
- 5.21 Do not use pliers on the handle of a screwdriver for extra turning power. A wrench should be used only on the square screwdriver shank designed for that purpose.
- 5.22 Do not expose a screwdriver blade to excessive heat. Heat can affect the temper of the metal and weaken the tool.
- 5.23 Do not use a screwdriver to check if an electrical circuit is live. Use a suitable meter or other circuit testing device.
- 5.24 Do not carry screwdrivers in clothing pockets.

## **6.0 Snips**

- 6.1 Wear safety glasses and protective gloves when working with snips. Small pieces of metal may go flying in the air and cut edges of metal are sharp.
- 6.2 Snips are made in various shapes and sizes for various tasks. The handle can be like those on scissors with finger and thumb holes or like plier handles. Models are available for cutting in straight lines and in curves to the left or right.
- 6.3 Select the right size and type of snips for the job; check the manufacturer's specifications about the intended use of the snips (e.g., type of cut - straight, wide curve, tight curve, right or left, and maximum thickness and kind of metal or other material that can be cut).
  - 6.3.1 Universal snips can cut in both straight and wide curves.
  - 6.3.2 Straight snips and duckbill snips (flat blade, "perpendicular" to the handle, with pointed tips) are generally designed to cut in straight lines; some duckbill snips are designed for cutting curved lines.
  - 6.3.3 Hawk's bill snips (with crescent-shaped jaws) are used for cutting tight circles.
  - 6.3.4 Aviation snips have compound leverage that reduces the effort required for cutting.
  - 6.3.5 Offset snips have jaws that are set at an angle from the handle.
- 6.4 Use only snips that are sharp and in good condition.
- 6.5 Use snips for cutting soft metal only. Hard or hardened metal should be cut with tools designed for that purpose.
- 6.6 Use ordinary hand pressure for cutting. If extra force is needed, use a larger tool.
- 6.7 Cut so that the waste is on the right if you are right-handed or on the left if you are left-handed.
- 6.8 Avoid springing the blades. This results from trying to cut metal that is too thick or heavy for the snips you are using.
- 6.9 Keep the nut and the pivot bolt properly adjusted at all times.
- 6.10 Oil the pivot bolt on the snips occasionally.
- 6.11 Do not try to cut sharp curves with straight cut snips.
- 6.12 Do not cut sheet metal thicker than the manufacturer's recommended upper limit (e.g., cuts up to 16-gauge cold, rolled steel or 18-gauge stainless steel). Do not extend the length of handles to gain greater leverage.
- 6.13 Do not hammer or use your foot to exert extra pressure on the cutting edges.
- 6.14 Do not use cushion grip handles for tasks requiring insulated handles. They are for comfort primarily and not for protection against electric shocks.
- 6.15 Do not attempt to re-sharpen snips in a sharpening device designed for scissors, garden tools, or cutlery.

## **7.0 Wrenches**

- 7.1 Use the correct wrench for the job - pipe wrenches for pipes and plumbing fittings, and general-use wrenches for nuts and bolts.
  - 7.1.1 Do not use pipe wrenches on nuts and bolts.
  - 7.1.2 Use a box or socket wrench with a straight handle, rather than an off-set handle, when possible.
  - 7.1.3 Do not use a conventional adjustable wrench for turning a tap – it will cause uneven pressure on the tap that may cause it to break.
  - 7.1.4 Do not use a makeshift wrench.

- 7.2 Inspect pipe wrenches periodically for worn or unsafe parts and replace them:
  - 7.2.1 Wrenches must not be used when jaws are sprung to the point that slippage occurs.
  - 7.2.2 Ensure that the teeth of a pipe wrench are sharp, clean and free of oil and debris.
  - 7.2.3 Do not use worn adjustable wrenches. Inspect the threads, knurl, jaw and pin for wear.
  - 7.2.4 Discard any bent or damaged wrenches (e.g., open-ended wrenches with spread jaws or box wrenches with broken or damaged points).
- 7.3 Select the correct jaw size to avoid slippage.
  - 7.3.1 Ensure that the jaw of an open-ended wrench is in full contact (fully seated, "flat," not tilted) with the nut or bolt before applying pressure.
  - 7.3.2 Face a pipe wrench or adjustable wrench "forward," adjust tightly and turn the wrench so pressure is against the permanent or fixed jaw. Do not pull on a wrench that is loosely adjusted.
  - 7.3.3 Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids the ratcheting action.
  - 7.3.4 Do not insert a shim in a wrench for better fit.
  - 7.3.5 Before applying pressure, ensure that the jaws have a good bite.
  - 7.3.6 Make sure adjustable wrenches do not "slide" open during use.
  - 7.3.7 Do not increase the leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length. Use a larger wrench as necessary.
- 7.4 Ensure that the pipe or fitting is clean to prevent unexpected slippage and possible injury.
- 7.5 Maintain a proper stance with feet firmly placed to maintain balance.
  - 7.5.1 Position the body in a way that will prevent loss of balance and injury if the wrench slips or something (e.g., a bolt) suddenly breaks.
  - 7.5.2 Pull, rather than push on the wrench handle as body balance is more likely to be maintained if the wrench slips.
  - 7.5.3 Pull using a slow, steady pull; do not use fast, jerky movements.
- 7.6 Apply a small amount of pressure to a ratchet wrench initially to ensure that the ratchet wheel (or gear) is engaged with the pawl (a catch fitting in the gear) for the direction you are applying pressure.
- 7.7 Support the head of the ratchet wrench when socket extensions are used.
- 7.8 Stand aside when work is done with wrenches overhead.
- 7.9 Do not use a wrench on moving machinery.
- 7.10 Do not use the wrong tools for the job. For example: Do not use pliers instead of a wrench or a wrench as a hammer. Do not use pipe wrenches for lifting or bending pipes.
- 7.11 Do not strike a wrench (except a "strike face" wrench) with a hammer or similar object to gain more force.
- 7.12 Do not expose a wrench to excessive heat (like from a blow torch) that could affect the temper of the metal and ruin the tool.

## **8.0 Files/Rasps**

- 8.1 Do not use a file as a pry bar, hammer, screwdriver, or chisel.
- 8.2 When using a file or a rasp, grasp the handle in one hand and the toe of the file in the other.
- 8.3 Do not hammer on a file.

## **9.0 Chisels and Punches**

- 9.1 Use the right size and type of chisel (metal or wood) or punch (drift pin, centre, pin) for the job.
- 9.2 Use tools only if they are good condition (i.e., cutting edges are sharp, struck head is not mushroomed or chipped).
  - 9.2.1 Do not use chisels or punches if the cutting edge is dull, mushroomed or chipped, or if the point of a punch is slanted or damaged.
  - 9.2.2 Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel. Replace broken or splintered handles.
  - 9.2.3 Redress striking tools with burred or mushroomed heads.
    - Redress the point or cutting edge to its original shape.
    - Do not use a grinder to redress heat-treated tools. Use a whetstone.
    - Grind to a slightly convex cutting edge.
    - The point angle of the chisel should be 70° for hard metals, 60° for soft.
    - Do not apply too much pressure to the head when grinding a chisel. The heat generated can remove the temper. Immerse the chisel in cold water periodically when grinding.
  - 9.2.4 Replace any chisel or punch that is bent, cracked, shows excessive wear or cannot successfully be redressed.
- 9.3 Check stock thoroughly for knots, staples, nails, screws, or other foreign objects before chiseling or punching.
- 9.4 Hold the chisel, for shearing and chipping, at an angle which permits the bevel of the cutting edge to lie flat against the shearing plane.
- 9.5 Use the appropriate type and size of hammer for the chisel or punch, such as:
  - 9.5.1 A wooden or plastic mallet with a large striking face on chisels.
  - 9.5.2 Heavy-duty or framing chisels made of a solid or molded handle can be struck with a steel hammer.
  - 9.5.3 Ball-peen hammers are generally chosen for use with punches.
  - 9.5.4 Refer to the 'Hammers' section of this document for further guidance.
- 9.6 Chip or cut away from the body. Keep hands and body behind the cutting edge.
- 9.7 Make finishing or paring cuts with hand pressure alone.
- 9.8 Provide hand protection if possible:
  - 9.8.1 Use a sponge rubber shield, punch or chisel holder.
  - 9.8.2 Clamp small work pieces in a vise and chip towards the stationary jaw when working with a chisel.
  - 9.8.3 Do not allow bull point chisels to be hand-held by one employee and struck by another. Use tongs or a chisel holder to guide the chisel so that the holder's hand will not be injured.
- 9.9 Do not use cold chisels for cutting or splitting stone or concrete.
- 9.10 Do not use a drift pin punch (also called an aligning punch) as a pin punch intended for driving, removing, or loosening pins, keys, and rivets.
- 9.11 Do not use a wood chisel on metal.
- 9.12 Do not use a wood chisel as a pry or a wedge.
- 9.13 Place chisels safely within the plastic protective caps to cover cutting edges when not in use.

- 9.14 Store chisels in a “storage roll,” a cloth or plastic bag with slots for each chisel, and keep them in a drawer or tray.

## **10.0 Hacksaws**

- 10.1 Select correct blade for material being cut.
- 10.2 Keep saw blades clean and lightly oiled using light machine oil on the blade to keep it from overheating and breaking.
- 10.3 Secure blade with the teeth pointing forward. Tighten the nut until the blade is under tension.
- 10.4 Keep blade rigid, and frame properly aligned.
- 10.5 Cut using steady strokes, directed away from you.
- 10.6 Use entire length of blade in each cutting stroke.
- 10.7 Cut harder materials more slowly than soft materials.
- 10.8 Clamp thin, flat pieces requiring edge cutting.
- 10.9 Do not apply too much pressure on the blade as the blade may break.
- 10.10 Do not twist when applying pressure.
- 10.11 Do not use when the blade becomes loose in the frame.

## **11.0 Vises**

- 11.1 When clamping a long work piece in a vise, support the far end of the work piece by using an adjustable pipe stand, saw horse or box.
- 11.2 Position the work piece in the vise so that the entire face of the jaw supports the work piece.
- 11.3 Do not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.
- 11.4 Do not slip a pipe over the handle of a vise to gain extra leverage.

## **12.0 Clamps**

- 12.1 Do not use a C-clamp for hoisting materials.
- 12.2 Do not use a C-clamp as a permanent fastening device.

## **13.0 Pry Bars**

- 13.1 Establish balance and stable footing when using a bar for prying.
- 13.2 Pry bars must be appropriate to the task to prevent slipping or tool breakage.

## **14.0 Jacks**

- 14.1 All jacks—including lever and ratchet jacks, screw jacks, and hydraulic jacks—must have a stop indicator, and the stop limit must not be exceeded.
- 14.2 The manufacturer’s load limit must be permanently marked in a prominent place on the jack, and the load limit must not be exceeded.
- 14.3 A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up. Put a block under the base of the jack when the foundation is not firm, and place a block between the jack cap and load if the cap might slip.
- 14.4 To set up a jack, make certain of the following:

- 14.4.1 The base of the jack rests on a firm, level surface;
  - 14.4.2 The jack is correctly centered;
  - 14.4.3 The jack head bears against a level surface; and
  - 14.4.4 The lift force is applied evenly.
- 14.5 Clear all tools, equipment and any other obstructions from under the load before lowering the jack.
- 14.6 Proper maintenance of jacks is essential for safety. All jacks must be lubricated regularly. In addition, each jack must be inspected according to the following schedule:
- 14.6.1 For jacks used continuously or intermittently at one site—inspected at least once every 6 months;
  - 14.6.2 For jacks sent out of the shop for special work—inspected when sent out and inspected when returned; and
  - 14.6.3 For jacks subjected to abnormal loads or shock—inspected before use and immediately thereafter.

## Small Engines

S3AM-305-ATT16

### 1.0 Objective / Overview

- 1.1 Operate small engine machines (liquid fuel tools), such as push mowers, weed trimmers, pumps and leaf blowers, in a safe manner.
- 1.2 Workers must be trained and competent in the safe operation and maintenance of the tool.

### 2.0 Potential Hazards

- 2.1 Flying debris
- 2.2 Noise
- 2.3 Moving and sharp parts
- 2.4 Hot surfaces

### 3.0 Safe Operating Guidelines

- 3.1 Review *S3AM-305-PR1 Hand & Power Tools* and the manufacturer's operating manual for further guidance.
- 3.2 Do not wear loose or baggy clothing around tools with rotating parts.
- 3.3 Never run the engine indoors, in poorly ventilated areas, or in a location where the exhaust could be drawn into a building through an opening.
  - 3.3.1 When an engine must be operated in an enclosed space, effective ventilation and/or proper respirators such as atmosphere-supplying respirators must be utilized to avoid breathing carbon monoxide.
- 3.4 Never store engine with fuel in fuel tank inside a building with potential sources of ignition such as hot water and space heaters, clothes dryers, electric motors, etc.
- 3.5 Ensure the fuel cap is in place. Never start or operate the engine with the fuel fill cap removed.
- 3.6 Refuelling:
  - 3.6.1 Never remove fuel cap or add fuel when engine is running.
  - 3.6.2 Shut down the engine and allow it to cool prior to refueling to prevent accidental ignition of hazardous vapors.
  - 3.6.3 Never pour gasoline on hot surfaces.
  - 3.6.4 Fill in well-ventilated area.
  - 3.6.5 Do not re-fuel around an open flame or while smoking.
- 3.7 Use only properly labelled, American National Standards Institute/Canadian Standards Association-approved red gasoline containers to store and dispense fuel.
- 3.8 The worker must be careful to handle, transport, and store gas or fuel only in approved flammable liquid containers, according to proper procedures for flammable liquids.
- 3.9 Noise hazards associated with gasoline engines must be mitigated by the use of proper hearing protection. Ear plugs, ear muffs or a combination of the two must be used to protect workers from excessive noise levels.
- 3.10 Appropriate fire extinguishers must also be available in the area.



- 3.11 Do not pour fuel from engine or siphon fuel by mouth.
- 3.12 Never leave the engine unattended while it is running.
- 3.13 Never operate the engine with an unguarded engine shaft.
- 3.14 Do not modify the engine or tamper with the factory setting of the engine governor.
- 3.15 Never operate the engine without a muffler guard in place and avoid touching hot areas of the engine.
- 3.16 Keep all flammable materials away from the muffler and the rest of the engine; do not idle or park the engine in dry grass or ground cover.
- 3.17 When working on the equipment, avoid accidental starts by removing the ignition key, turn off all engine switches, disconnect the battery and disconnect the spark plug, keeping it away from metal part.

#### **4.0 Personal Protective Equipment**

- 4.1 Always wear safety glasses with shields. Add face shield if potential for flying debris.
- 4.2 Gloves providing the appropriate protection (e.g. impact, abrasion, chemical, etc.).
- 4.3 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts. Long pants and long sleeve shirt.
- 4.4 Safety toe work boots.
- 4.5 Hearing protection (earmuffs or earplugs).

## Electric & Battery Hand Tools

S3AM-305-ATT17

### 1.0 Objective / Overview

- 1.1 Electric and battery hand tools, also known as power tools, allow the user to perform their task more easily by providing more torque, speed, etc.

### 2.0 Hazards

- 2.1 Electricity

### 3.0 Safe Work Practices (General)

- 3.1 Review manufacturer's operating manual and *S3AM-305-PR1 Hand & Power Tools* for additional guidelines.
- 3.2 All electrical tools and equipment must be operated in accordance with the requirements of *S3AM-302-PR1 Electrical Safety*.
- 3.3 Keep all people not involved with the work at a safe distance from the work area.
- 3.4 Inspect power tools prior to each use.
  - 3.4.1 Ensure that the power tool has the correct guard, shield or other attachment that the manufacturer recommends.
  - 3.4.2 Ensure that the tools are properly grounded using a three-prong plug (no loose or faulty prongs), are double insulated (and are labeled as such), or are powered by a low-voltage isolation transformer; this will protect users from an electrical shock.
  - 3.4.3 Check the handle and body casing of the tool for cracks or other damage.
  - 3.4.4 If the tool has auxiliary or double handles, check to see that they installed securely.
  - 3.4.5 Inspect cords for defects: check the plug and power cord for cracking, fraying, and other signs of wear or faults in the cord insulation.
  - 3.4.6 Ensure power tool switches and triggers are fully functional.
  - 3.4.7 If equipped with a trigger-lock, ensure it is disabled.
  - 3.4.8 If a power tool is defective, remove it from service, and tag it clearly "Out of service for repair" or "Do Not Use". Replace damaged equipment immediately – do not use defective tools "temporarily."  
DO NOT ATTEMPT FIELD REPAIRS.
- 3.5 Maintain tools with care; keep them sharp and clean for best performance.
- 3.6 Follow instructions in the user's manual for lubricating and changing accessories.
- 3.7 Do not over-reach. Be sure to keep good footing and maintain good balance when operating power tools.
- 3.8 If they are available, choose tools with double handles to permit easier holding and better manipulation of the tool.
- 3.9 Do not brush away sawdust, shavings or turnings while the power tool is running. Never use compressed air for cleaning surfaces or removing sawdust, metal turnings, etc.
- 3.10 Do not operate power tools that are not specified as intrinsically safe in an area containing explosive vapors or gases.
- 3.11 Do not clean tools with flammable or toxic solvents.
- 3.12 Do not surprise or touch anyone who is operating a power tool. Startling an operator could result in injury or

property damage.

- 3.13 Hand-held power tools must be equipped with a constant-pressure switch or control that shuts off the power when pressure is released.
  - 3.13.1 Powered hand tools shall not be capable of being locked in the ON position. Trigger locks are not permitted.
  - 3.13.2 All power tools should be ordered without trigger locks; if a tool is found with a trigger lock intact it must be disabled.
- 3.14 Avoid accidental starting. Do not hold fingers on the switch button, and ensure it is in the OFF position while plugging the tool in or while carrying an energized (plugged-in, battery in place) tool.
- 3.15 Do not leave a running tool unattended and ensure the power tool will not re-energize when not in use and when servicing, cleaning, making adjustments, applying flammable solutions or changing accessories:
  - 3.15.1 Ensure it has stopped running completely.
  - 3.15.2 Ensure the trigger or switch is OFF.
  - 3.15.3 Ensure the power tool is disconnected from the power supply (unplugged or battery removed).
- 3.16 Operate power tools within their design limitations.
- 3.17 Store power tools, batteries and electrical cords in a clean, dry area off the ground when not in use.
- 3.18 Do not use power tools in damp or wet locations unless they are approved for that purpose.
- 3.19 Keep work areas well lighted when operating power tools.
- 3.20 Equipment must have proper guards or shields and they must remain in place to protect the operator and others from the following:
  - 3.20.1 Point of operation.
  - 3.20.2 In-running nip points.
  - 3.20.3 Rotating parts.
  - 3.20.4 Flying chips and sparks.
- 3.21 If a guard is removed to clean or repair parts, replace it before testing the equipment and returning the machine to service
- 3.22 If, due to damage or deterioration, the original guard provided on a piece of equipment cannot be put in place, the tool must be removed from service.
- 3.23 Do not modify, remove, or disable any machine guards.
- 3.24 Remove any wrenches and adjusting tools before turning on a tool.
- 3.25 Use clamps, a vice or other devices to hold and support the piece being worked on, when practical to do so. This will allow you to use both hands for better control of the tool and will help prevent injuries if a tool jams or binds in a work piece.

## **4.0 Battery Powered Tools**

- 4.1 Use only the type of battery specified by the tool manufacturer for the battery-powered tool to be used.
- 4.2 Recharge a battery or battery-powered tool only with a charger that specified for the battery.
- 4.3 Store a battery pack safely so that no metal parts, nails, screws, wrenches and so on can come in contact with the battery terminals; this could result in shorting out the battery and possibly cause sparks, fires or burns.

## **5.0 Safe Work Practice (Electric)**

- 5.1 During use, keep power cords clear of tools and the path that the tool will take.
- 5.2 Employees' hands shall not be wet when plugging and unplugging cord and plug connected equipment and extension cords.
- 5.3 Portable electric equipment shall be disconnected when not in use, before servicing, and when changing accessories such as blades, bits, and cutters.
- 5.4 Portable electric equipment and extension cords used in potentially wet locations shall be approved for use in those locations by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation (e.g., F.M., UL, etc.).
- 5.5 The outlet box for portable extension cords for outdoor use shall be weatherproof and shall be maintained in good condition.
- 5.6 Maintain electrical cords and connections in good working order:
  - 5.6.1 Cords and connection must be American National Standards Institute/Canadian Standards Association approved and bear a standardized certification marking (e.g., CSA, ANSI, UL, CE etc.).
  - 5.6.2 To prevent overheating, use only approved extension cords that have the proper wire size for the length of cord and power requirements of the electric tool to be used.
    - Do not connect or splice extension cords together to make a longer connection.
    - For outdoor work, use outdoor extension cords marked "W-A" or "W."
  - 5.6.3 Eliminate octopus connections: if more than one receptacle plug is needed, use a power bar or power distribution strip that has an integral power cord and a built-in overcurrent protection.
  - 5.6.4 Portable electrical equipment shall not be carried by the cord, nor raised or lowered by the cord.
  - 5.6.5 Electrical cords shall not be removed from a receptacle by pulling on the cord line.
  - 5.6.6 Cords shall not be placed across walkways unless appropriate cord and worker protection is in place to prevent damage to the cord and worker tripping hazards (e.g. cable protectors, cords suspended over walkway, etc.).
  - 5.6.7 Do not walk on or allow vehicles or other moving equipment to pass over unprotected power cords. Cords should be put in conduits or protected by placing planks on each side of them.
  - 5.6.8 A cord should not be pulled or dragged over nails, hooks, or other sharp objects that may cause cuts in the insulation.
  - 5.6.9 Keep cords away from heat, oil, sharp edges and moving parts.
  - 5.6.10 Never use extension cords as permanent wiring as they are for temporary use only. Do not run behind bookshelves, or furniture if the cord cannot be monitored for severe bending or damage.
  - 5.6.11 Inspect cords frequently for such damage such as fraying, kinks, cuts, and cracked or broken outer jackets. Any cord that exhibits damage or feels more than comfortably warm to the touch shall be removed from service, tagged "Do Not Use" and checked by an electrician.
  - 5.6.12 Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.
- 5.7 Electrical shock associated with power tool use can cause heart failure and burns, as well as injury from falls. Under certain conditions, even a small amount of electric current can result in fibrillation of the heart and death.
  - 5.7.1 Verify that the power source is the same voltage and current as indicated on the nameplate of the tool. Using a higher voltage can cause serious injury to the operator as well as burn out the tool.
  - 5.7.2 All electrical connections for these tools must be suitable for the type of tool and the working

conditions (wet, dusty, flammable vapors).

- 5.7.3 To protect the worker from shock and burns, electric tools must have a three-wire cord with a ground and be plugged into a grounded receptacle, be double insulated, or be powered by a low-voltage isolation transformer.
- 5.7.4 All outdoor receptacles must be protected by means of a ground fault circuit interrupter (GFCI or GFI) available in portable or fixed models. Do not use any electric power tools outdoors in a receptacle that is not properly protected.
- 5.7.5 Three-wire cords contain two current-carrying conductors and a grounding conductor. Any time an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground.
- 5.7.6 The third prong must never be removed from the plug.
- 5.7.7 Double-insulated tools are available that provide protection against electrical shock without third-wire grounding. On double-insulated tools, an internal layer of protective insulation completely isolates the external housing of the tool.
- 5.7.8 Avoid body contact with grounded surfaces like refrigerators, pipes and radiators when using electric powered tools; this will reduce the likelihood of shock if the operator's body is grounded.
- 5.7.9 Report all shocks and/or sparks from electrical tools, no matter how minor. The tool in question should be tagged out and not be used until it has been checked for ground fault.
- 5.8 Only authorized persons are permitted to activate, de-activate or lockout electrical equipment.
- 5.9 Where there is or may be a danger to a worker, from the inadvertent operation of electrical equipment, then that equipment must be locked out and tagged prior to commencing work. Refer to *S3AM-325-PR1 Lockout Tagout*.
  - 5.9.1 Switch off all appropriate devices (MCC, Distribution Panel, Disconnect).
    - Stand to one side when engaging or disengaging an electrical circuit breaker to avoid electrical flash backs Lock and tag Electrical Supply devices in the "OFF" position.
  - 5.9.2 Test to be sure the equipment cannot be operated at the STOP-START switch.
  - 5.9.3 Test to be sure electrical equipment is de-energized.
  - 5.9.4 After completion of task, remove padlocks and destroy tags.

## 6.0 Personal Protective Equipment (Level D PPE)

- 6.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.
- 6.2 Use gloves with protection appropriate to the task (e.g. impact, abrasion, puncture, etc.).
- 6.3 Safety toed boots.
- 6.4 Use hearing protection as necessary.
- 6.5 Kickback aprons as necessary.
- 6.6 Wear safety glasses with side shields at all times (or safety goggles) and face shield if flying debris may be encountered.

## 7.0 Belt Sanders

- 7.1 Refer to *S3AM-305-ATT11 Sanders*.

## 8.0 Drills

- 8.1 Refer to *S3AM-305-ATT8 Power Drill*.

## **9.0 Planers and Joiners**

- 9.1 Use blades of the same weight and set at the same height.
- 9.2 Ensure that the blade-locking screws are tight.
- 9.3 Guard planers and joiners to prevent contact with the blades throughout the full length of the cutting area.
- 9.4 Support the material (stock) in a comfortable position that will allow the job to be done safely and accurately.
- 9.5 Check stock thoroughly for staples, nails, screws, or other foreign objects before using a planer.
- 9.6 Start a cut with the infeed table (front shoe) resting firmly on the stock and with the cutter head slightly behind the edge of the stock.
- 9.7 Use two hands to operate a planer - one hand on the trigger switch and the other on a front handle.
- 9.8 Do not put fingers or any object in a deflector to clean out chips while a planer is running.
- 9.9 Disconnect the power supply when stopping to dump out chips.
- 9.10 Do not set a planer down until blades have stopped turning.
- 9.11 Keep all cords clear of cutting area.

## **10.0 Routers**

- 10.1 Ensure that the bit is securely mounted in the chuck and the base is tight.
- 10.2 Put the base of the router on the work, template or guide. Make sure that the bit can rotate freely before switching on the motor.
- 10.3 Secure stock. Never hold or have another individual hold the material. Sudden torque or kickback from the router can cause damage and injury.
- 10.4 Before using a router, check stock thoroughly for staples, nails, screws or other foreign objects.
- 10.5 Keep all cords clear of cutting area.
- 10.6 Always hold both hands on router handles, until a motor has stopped. Do not set the router down until the exposed router bit has stopped turning.
- 10.7 When inside routing, start the motor with the bit above the stock. When the router reaches full power, lower the bit to two times the required depth.
- 10.8 When routing outside edges, guide the router counter clockwise around the work.
- 10.9 When routing bevels, moldings and other edge work, make sure the router bit is in contact with the stock to the left of a starting point and is pointed in the correct cutting direction.
- 10.10 Feed the router bit into the material at a firm, controlled speed.
- 10.11 Softwood may enable fast router cutting speed. With hardwood, knotty and twisted wood, or with larger bits, cutting may be very slow.
- 10.12 The sound of the motor can indicate safe cutting speeds. When the router is fed into the material too slowly, the motor makes a high-pitched whine. When the router is pushed too hard, the motor makes a low growling noise.
- 10.13 When the type of wood or size of the bit requires going slow, make two or more passes to prevent the router from burning out or kicking back.
- 10.14 To decide the depth of cut and how many passes to make, test the router on scrap lumber similar to the work.

## **11.0 Circular Saws**

11.1 Refer to *S3AM-305-ATT2 Circular Saw*.

## **12.0 Other Saws**

12.1 Use lubricants when cutting metals.

12.2 Keep all cords clear of cutting area.

12.3 Cut green or wet material slowly and with caution. Check all material being cut for nails, hard knots, etc.

12.4 Make sure guards are installed and are working properly.

12.4.1 Table saws must be fitted with blade guards and a splitter to prevent the work from squeezing the blade and kicking back on the operator.

- Exposed parts of the saw blade under the table must be properly guarded.
- All swing cutoff and radial saws that are drawn across a table with limit stops to prevent the saw from traveling beyond the edge of the table

12.4.2 Ensure band saw blades are fully enclosed except at the point of operation.

12.4.3 Ensure swing cut-off saws have a guard completely covering the upper half of the saw.

12.5 Remember sabre saws cut on the upstroke.

12.6 Position the saw beside the material before cutting and avoid entering the cut with a moving blade.

12.7 Secure and support stock as close as possible to the cutting line to avoid vibration.

12.7.1 Hold the material being cut firmly against a back guide or fence and cut with a single, steady pass.

12.7.2 Use a push stick or guide when cutting operation requires the hands of the operator to come close to the blade.

12.7.3 When cutting long stock, provide extension tables and a helper to assist the operator.

12.7.4 Keep the base or shoe of the saw in firm contact with the stock being cut.

12.7.5 Automatic feed devices should be used whenever feasible.

12.8 Select the correct blade for the material being cut and allow it to cut steadily. Do not force it. Clean and sharp blades operate best.

12.9 Set the blade to go no further than 1/8 to 1/4 inch deeper than the material being cut.

12.10 Do not start cutting until the saw reaches its full power.

12.11 Do not force a saw along or around a curve. Allow the machine to turn with ease.

12.12 Do not insert a blade into or withdraw a blade from a cut or lead hole while the blade is moving.

12.13 Do not put down a saw until the motor has stopped.

12.14 Do not reach under or around the stock being cut.

12.15 Maintain control of the saw always. Avoid cutting above shoulder height.

12.16 External Cuts

12.16.1 Make sure that the blade is not in contact with the material or the saw will stall when the motor starts.

12.16.2 Hold the saw firmly down against the material and switch the saw on.

12.16.3 Feed the blade slowly into the stock, maintaining an even forward pressure.

12.17 Internal Cuts

12.17.1 Drill a lead hole slightly larger than the saw blade. With the saw switched off, insert the blade in the hole until the shoe rests firmly on the stock.

12.17.2 Do not let the blade touch the stock until the saw has been switched on.



Americas

**Hand & Power Tool Maintenance Inventory**

S3AM-305-FM1

EQUIPMENT (MAKE, MODEL, SERIAL #)	EQUIPMENT OWNER	EQUIPMENT STATUS (ON HIRE, ACTIVE, DECOMMISSIONED )	FREQUENCY OF SERVICE	SERVICE TYPE	MANUFACTURER'S STANDARDS	INDUSTRY STANDARDS	LEGISLATED REQUIREMENTS	LOCATION OF EQUIPMENT

## Americas

# Hand & Power Tool Inspection Report

**S3AM-305-FM2**

[illegible]

# Heavy Equipment

S3AM-309-PR1

## 1.0 Purpose and Scope

- 1.1 Outline the safe working requirements for working with and near heavy equipment and heavy equipment operation.
- 1.2 Military related vehicles and equipment (e.g. tanks) are not covered under this standard.
- 1.3 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

## 2.0 Terms and Definitions

- 2.1 **Heavy equipment** –All excavating equipment (e.g. scrapers, loaders, crawler or wheel tractors, excavators, backhoes, bulldozers, graders, agricultural and industrial tractors, etc.), cranes, lift trucks, drills, etc. This may include off-highway trucks (e.g. dump truck, heavy haul truck, etc.). For requirements related to crew trucks refer to *S3AM-005-PR1 Driving*.
- 2.2 **Operator** – Any person who operates the controls while the heavy equipment is in motion or the engine is running.
- 2.3 **Ground personnel/workers** – Personnel performing work on the ground around heavy equipment (note: operators are considered ground personnel when outside of the equipment cab).

## 3.0 References

- 3.1 S3AM-005-PR1 Driving
- 3.2 S3AM-202-PR1 Competent Person Designation
- 3.3 S3AM-213-PR1 Subcontractor Management
- 3.4 S3AM-303-PR1 Excavation
- 3.5 S3AM-322-PR1 Overhead Lines
- 3.6 S3AM-325-PR1 Lockout Tagout
- 3.7 S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance

## 4.0 Procedure

- 4.1 Roles and Responsibilities
  - 4.1.1 **Managers / Supervisors**
    - Responsible for confirming all equipment is in good working order and all equipment operators are verified as qualified on the piece of machinery they are assigned.
    - As applicable, review as-built drawings.
    - Maintain operation manuals at the site for each piece of equipment that is present on the site and in use.
    - Maintain a list of operators for the project, and the specific equipment that they are authorized to operate.
    - Prohibit equipment from being operated by any personnel who have not been specifically authorized to operate it.

- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Confirm subcontractors are properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management*.
- Require that subcontractor employees follow established safety procedures in operation, inspection, and maintenance of vehicles and equipment.
- Inform AECOM and subcontractor machinery operators about applicable local regulations restricting the consecutive minutes of engine idling time allowed.
- Confirm subcontractor machinery and mechanized equipment is approved for use in accordance with the requirements of *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*.
- Confirm that all rented equipment bears any required current certification marks and arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Confirm that AECOM and subcontractor machinery and mechanized equipment is certified, as applicable, in accordance with manufacturer specifications and/or regulatory requirements.
- Visually observe the subcontractors' vehicles and equipment, for any unsafe conditions or practices. Equipment or operation not in compliance with applicable safety standards is prohibited.

#### 4.1.2 **Employees / Ground Personnel**

- Confirm that all rented equipment arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Ground personnel when working in the vicinity of heavy equipment shall have received training, and comply with the applicable rules of engagement.

#### 4.1.3 **Operators (of heavy equipment)**

- Operate the equipment safely, maintain full control of the equipment, and comply with manufacturer's operation manual and the laws governing the operation of the equipment.
- Inspect equipment and immediately report defects and conditions affecting the safe operation of the equipment to the appropriate Supervisor.
- Trainees may operate equipment in accordance with jurisdictional requirements and under the direct supervision of a trainer.

### 4.2 **Communication**

- 4.2.1 Communication between site Managers / Supervisors, heavy equipment Operators, and site Employees / Ground Personnel is a key method of preventing serious injury or death during heavy equipment operations.
- 4.2.2 Managers shall confirm the Industrial site or project specific SH&E Plan is developed and communicated to all affected and involved employees. Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- 4.2.3 Task Hazard Assessments and Daily Tailgate meetings shall be conducted in accordance with *S3AM-209-PR1 Risk Assessment & Management*.
- 4.2.4 Concerning worksites in which other employers control concurrent operations and SH&E issues related to the worksite, the manager shall coordinate with those conducting concurrent operations to confirm appropriate control measures are in place to protect employees from the hazards associated with activities to be performed.

- Coordination shall occur prior to work commencing, periodically thereafter, and as necessary given changes in scope and/or working conditions.
- Affected employees (including managers and supervisors) shall seek to participate in all site SH&E meetings related to concurrent operations.

4.2.5 The following points outline the communication requirements during heavy equipment operations:

- Site Supervisors/t Managers shall confirm that all operators are notified/informed of when, where, and how many ground personnel will be working on site.
- Site Supervisors/ Managers shall inform all ground personnel before changes are made in the locations of designated work areas.
- Prior to work initiating on site, the Site Supervisor/ Manager is to confirm all operators and ground personnel are trained on the hand signals that will be used to communicate between operators and ground personnel.
- Ground Personnel working around heavy equipment operations are to maintain eye contact with operators to the greatest extent possible (always face equipment). Never approach equipment from a blind spot or angle.
- All heavy equipment whose backup view can be obstructed shall be equipped with reverse warning devices (e.g., backup alarms) that can be significantly heard over equipment and other background noise. Reverse signaling lights shall be in working order.
- When feasible, two-way radios shall be used to verify the location of nearby ground personnel.
- When an operator cannot adequately survey the working or traveling zone, a signal person shall use a standard set of hand signals to provide directions. Flags or other high visibility devices may be used to highlight these signals.

4.3 Ground Personnel

4.3.1 Ground clearance around heavy equipment may significantly reduce hazards posed during heavy equipment operations.

4.3.2 The following points outline the clearance requirements during heavy equipment operations:

- Ground Personnel shall always yield to heavy equipment.
- Ground Personnel shall maintain a suitable “buffer” area of clearance from all active heavy equipment.
- A task hazard assessment that identifies any special precautions shall be completed and communicated to all AECOM personnel associated with or affected by the activity.
- Site Supervisors/ Managers shall designate areas of heavy equipment operation and confirm that all ground personnel are aware of designated areas.
  - Designated areas shall include work zone boundaries and travel routes for heavy equipment.
  - Travel routes shall be set up to reduce crossing of heavy equipment paths and to keep heavy equipment away from ground personnel.
  - Work zone boundaries shall consider line of fire hazards related to the equipment and associated activities. Refer also to *S3AM-309-ATT2 Operator Line of Sight*.
  - If working near heavy equipment, Ground Personnel shall stay clear of loads to be lifted or suspended loads, and out of the travel and swing areas (excavators, all-terrain forklifts, hoists, etc.) of all heavy equipment.
  - During winch use, all swampers or other personnel will remain outside the “whip area” of the winch line or tow cable.

- At a minimum, employees shall maintain a distance of at least two pile lengths from where piles are being cut and dropped, other than in situations where cut piles are being guided to the ground utilizing mechanical means (e.g., pile driver and shackle) to control the direction and speed of fall of the cut pile.
- When feasible, Site Supervisors/ Managers shall set up physical barriers (e.g., caution tape, orange cones, concrete jersey barriers) around designated areas and confirm that unauthorized ground personnel do not enter such areas.
- Operators shall stop work whenever unauthorized personnel or equipment enter the designated area and only resume when the area has been cleared.
- Operators shall only move equipment when aware of the location of all workers and when the travel path is clear.
- Ground Personnel shall never stand between two pieces of operating heavy equipment or other objects (e.g., steel support beams, trees, buildings, etc.).
- Ground Personnel shall never stand directly below heavy equipment located on higher ground unless it can be verified ground stability is not a factor and grade of slope is such that it would not contribute to equipment tip-over.
- Ground Personnel may only enter the swing area, work area or path of travel of any operating equipment when:
  - They have attracted the operator's attention and established eye contact, and
  - The operator has idled the equipment down, placed it in neutral, grounded engaging tools, set brakes and communicated entry is permitted.
- Employees shall keep all extremities, hair, tools, and loose clothing away from pinch points and other moving parts on heavy equipment.
- Employees shall not talk, text, or otherwise use a cell phone while standing or walking on a roadway or other heavy equipment path.

4.3.3 At a minimum, all Ground Personnel and Operators outside of heavy equipment shall wear the following:

- High visibility safety vest (fluorescent background material and retro-reflective striping) meeting jurisdictional requirements that is visible from all angles.
  - Background material: should be fluorescent yellow-green, fluorescent orange-red or fluorescent red.
  - Combined-performance retro-reflective material (e.g. the stripes): should be fluorescent yellow-green, fluorescent orange-red or fluorescent red - and shall be in contrast (that is, have a distinct color difference) to the background material.
  - Hazards may require high visibility garments that cover torso, legs and arms.
  - Confirm that vest is not faded or covered with outer garments, dirt, etc.
- American National Standards Institute/Canadian Standards Association- (ANSI/CSA-) approved hard hat
- ANSI/CSA-approved safety glasses with side shields
- At a minimum, CSA or ASTM approved, high-cut (min. 6"), puncture, impact and compression resistant footwear.
- ANSI/CSA-approved hearing protection as needed
- Appropriate work clothes (e.g., full-length jeans/trousers and a sleeved shirt; no tank, crew tops or other loose clothing permitted).

#### 4.4 Prior to work commencing

- 4.4.1 All heavy equipment will be inspected pre-shift and then regularly as required with the details of the inspection recorded in a log book.
- Roll-over protection systems (ROPS) and appropriate overhead protection (Fall Object Protection FOP) shall be in place given the specific equipment requirements. Utilize equipment with enclosed cabs where feasible or accessible.
    - Where use of equipment with enclosed cabs is not feasible or said equipment is not accessible, operators shall use any additional personal protective equipment determined as necessary (e.g. goggles, additional hearing protection, etc.).
  - Equipment operated in hazardous atmosphere environments shall be equipped with the proper safety equipment (e.g., spark arrestors, positive air shut off, etc.).
  - Operation of equipment that has or had cab glass (per the manufacturer's specifications) that is cracked/broken (obstructing the operator's view) or missing is prohibited.
  - A locking device shall be provided that will prevent the accidental separation of towed and towing vehicles on every fifth-wheel mechanism and two-bar arrangement.
  - Trip handles for tailgates of dump trucks and heavy equipment shall be arranged so that when dumping, the operator will be in the clear.
  - The Operator will report defects and conditions affecting the safe operation of the equipment to the Site Supervisor or employer. Any repair or adjustment necessary for the safe operation of the equipment will be made before the equipment is used.
  - Exposed moving parts on heavy equipment (belts, gears, shafts, pulleys, sprockets, spindles, drums, fan belts, flywheels, chains, or other reciprocating, rotating or moving parts) which are a hazard to the operator or to other workers will be guarded.
    - If a part will be exposed for proper function it will be guarded as much as is practicable consistent with the intended function of the component.
- 4.4.2 An approved 4A40BC fire extinguisher shall be present on all heavy equipment. An approved 4A40BC fire extinguisher of appropriate rating shall be present and readily accessible on all heavy equipment.
- Fire extinguishers shall be inspected by the operator prior to heavy equipment operation each shift. Monthly and annual inspections shall be documented.
- 4.4.3 All Operators shall inspect the area adjacent to the machine prior to starting.
- Evaluate ground conditions, concurrent operations and obstructions to identify approved routes of travel and work areas.
  - As applicable, check that there is sufficient swing room and that the outriggers are adequately supported on solid and stable ground
- 4.4.4 Managers / Supervisors shall inform the operators of the equipment that AECOM employees are in the area and inquire if there are any restricted areas or specific rules or requirements. In some industrial facilities, heavy equipment has the 'right of way'.
- 4.4.5 Where the Operator will not have a full view of the path of travel, a signal person will be used on the ground that has a full view of the load, the operator, and the path.
- 4.4.6 All heavy equipment with limited visibility (operator cannot directly or by mirror or other effective device see immediately behind the machine) operated around workers or on a construction site:
- Shall have an audible back-up alarm installed that functions automatically when the vehicle or equipment is put into rear motion.

- All bi-directional equipment shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction.
- Backing up or movement in both directions for bidirectional equipment shall occur only when a signal person communicates that it is safe to do so if alarms or horns are not feasible.

#### 4.5 Operation

- 4.5.1 The Operator of heavy equipment is the only worker permitted to ride the equipment unless the equipment is equipped by the manufacturer for passengers. Manufacturer operator's manual shall be complied with.
- 4.5.2 A person will not operate heavy equipment unless the person has received adequate instruction and training in the safe use of the equipment, and has demonstrated to a qualified supervisor or instructor competency in operating the equipment.
- Oilers, apprentices, and other operators will not be allowed to operate equipment unless authorized by the Manager.
- 4.5.3 The Operator of heavy equipment will operate the equipment safely, maintain full control of the equipment, and comply with the manufacturer's operator manual and the laws governing the operation of the equipment.
- Operation of company-owned, leased, or rented vehicles or equipment while under the influence of alcohol or illegal drugs or otherwise impaired is prohibited.
  - Do not operate any equipment beyond its safe load or operational limits.
  - Operator shall not talk on, text, or otherwise use mobile phones while operating heavy equipment.
  - Never use bucket teeth or boom for lifting or moving heavy objects.
- 4.5.4 When heavy equipment is used for lifting or hoisting or similar operations there shall be a permanently affixed notation stating the safe working load capacity of the equipment and the notation shall be kept legible and clearly visible to the operator.
- 4.5.5 A Supervisor or Manager will not knowingly operate or permit a worker to operate heavy equipment which is, or could create, an undue hazard to the health or safety of any person. Where compliance is refused, the Manager or his or her designate should be notified immediately.
- 4.5.6 The Operator of heavy equipment will not leave the controls unattended unless the equipment has been secured against inadvertent movement.
- The Operator is not to leave suspended load, machine or part or extension unattended, unless it has been immobilized and secured against inadvertent movement.
  - Turn off heavy equipment, place gear in neutral and set parking brake prior to leaving vehicle unattended.
  - Buckets and blades are to be placed on the ground and with hydraulic gears in neutral when not in use.
  - Brakes shall be set and, as necessary, wheels chocked or equivalent (as applicable) when not in use.
- 4.5.7 The Operator will maintain the cab, floor and deck of heavy equipment free of material, tools or other objects which could create a tripping hazard, interfere with the operation of controls, or be a hazard to the operator or other occupants in the event of an accident.
- 4.5.8 If heavy equipment has seat belts required by law or manufacturer's specifications, the Operator and passengers will use the belts whenever the equipment is in motion, or engaged in an operation which could cause the equipment to become unstable.



- Seat belts shall be maintained in functional condition, and replaced when necessary to ensure proper performance.
- 4.5.9 All vehicles transporting material or equipment on public roads shall comply with local laws pertaining to weight, height, length, and width. Obtain any permits required for these loads.
- 4.5.10 Never jump on to or off of a piece of heavy equipment, always maintain 3-points of contact at a minimum.
- 4.5.11 Never exit heavy equipment while it is in motion.
- 4.5.12 Do not ride with arms or legs outside of the truck body of equipment cab.
- Never ride on the outside of a piece of heavy equipment (e.g. in a standing position on the body, on running boards, or seated on side fenders, cabs, cab shields, rear of truck bed, on the load, bucket, etc.).
- 4.5.13 Have vehicle headlights on at all times when driving in the area.
- 4.5.14 Park motor vehicles off the haul roads, or away from the work areas.
- 4.5.15 Do not wear loose clothing or jewelry where there is a danger of entanglement in rotating equipment.
- 4.5.16 Do not enter the swing area of machines such as cranes, heavy drill rigs, or excavators, without first making eye contact with the operator, and receiving permission to do so. Refer to *S3AM-309-ATT2 Operator Line of Sight*.
- 4.5.17 Stay out of the blind areas around heavy equipment and never assume that the equipment operators have seen you or are aware of your presence.
- 4.5.18 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 shall observe and be in constant communication with the operator to prevent contact.
- 4.5.19 Vibrations from moving traffic or heavy equipment can cause excavations or spoil piles to become unstable.
- Excavation activity shall be conducted according to *SOP S3AM-303-PR1 Excavation*.
  - Equipment not involved in the excavating activity or not required to be in the vicinity shall keep clear. Equipment that shall operate in the vicinity shall maintain appropriate setback distances from edges of excavations or spoil piles.
- 4.5.20 All heavy equipment shall be operated in a safe manner that will not endanger persons or property.
- When ascending or descending grades in excess of 5 percent, loaded equipment shall be driven with the load upgrade.
  - When operating an electric-powered, remote controlled, hydraulic device used for demolishing concrete structures and refractory linings as well as excavating, refer to the *S3AM-309-ATT1 Brokk 180* for more specifics.
- 4.5.21 All heavy equipment shall be operated at safe speeds. Do not drive any vehicle at a speed greater than is reasonable and safe for weather conditions, traffic, intersections, width, and character of the roadway, type of motor vehicles, and any other existing condition.
- 4.5.22 Always move heavy equipment up and down the face of a slope. Never move equipment across the face of a slope.
- 4.5.23 Slow down and stay as far away as possible while operating near steep slopes, shoulders, ditches, cuts, or excavations.
- 4.5.24 When feasible, Operators shall travel with the "load trailing", if the load obstructs the forward view of the operator.

- 4.5.25 Slow down and sound horn when approaching a blind curve or intersection. Signal people equipped with 2-way radio communications may be required to adequately control traffic.
- 4.5.26 All haulage equipment / trucks, whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, shall have a cable shield and/or canopy adequate to protect the operator from shifting or falling material. If protection is not available for the operator, the operator shall leave the vehicle and wait in a designated safe location until it is loaded..
- 4.5.27 Equipment shall be shut down prior to and during fueling.
  - Confirm proper grounding/ bonding between equipment and fuel vehicle prior to fueling operations.
  - During fuel operations confirm fuel nozzle remains in contact with the tank.
  - Do not smoke, use electrical devices or have an open flame present while fueling.
  - Fuel shall not be carried in or on heavy equipment, except in permanent fuel tanks or approved safety cans.
- 4.5.28 Site vehicles will be parked in a designated parking location away from heavy equipment.
- 4.5.29 Operators shall never push/pull "stuck" or "broken-down" equipment unless a spotter determines that the area is cleared of all personnel around and underneath the equipment.
- 4.5.30 If designated for work in contaminated areas/zones, equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.
- 4.5.31 Equipment left unattended at night adjacent to travelled roadways shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of that equipment, and shall not be closer than 6 feet (1.8m) (or the regulatory requirement for the work location) to the active roadway.
- 4.5.32 Rubber / pneumatic-tired earthmoving haulage equipment shall be equipped with fenders on all wheels. Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.
- 4.5.33 Lift trucks shall have the rated capacity clearly posted on the vehicle, and the ratings are not to be exceeded.
- 4.5.34 Steering or spinner knobs shall not be attached to steering wheels.
- 4.5.35 High-lift rider industrial trucks shall be equipped with overhead guards.
- 4.5.36 All hot surfaces of equipment, including exhaust pipes or other lines, that present a possible injury or fire hazard, shall be guarded or insulated.
- 4.5.37 All equipment having a charging skip shall be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.
- 4.5.38 Platforms, foot walks, steps, handholds, guardrails, and toeboards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.
- 4.5.39 Substantial overhead protection shall be provided for the operators of fork lifts and similar equipment.
- 4.5.40 In an effort to reduce air emissions, fuel costs, and run-time hours (that can impact equipment warranty), operators shall limit heavy equipment engine idling to not more than five consecutive minutes. Local regulations at the location of the vehicle operation could require less than five consecutive minutes idling time. The idling limit does not apply to:
  - Idling when queuing.
  - Idling to verify that the vehicle is in safe operating condition.

- Idling for testing, servicing, repairing or diagnostic purposes.
- Idling necessary to accomplish work for which the vehicle was designed (cranes, man-lifts, forklifts, etc.)
- Idling required to bring equipment/vehicle to operating temperature, as specified by the manufacturer. Engine heaters shall be used for cold weather starting to avoid engine idling where feasible.
- Idling necessary to ensure safe operation of the vehicle.
- Idling to keep equipment (including windows) clear of ice and snow.
- Idling to provide air conditioning or heat to ensure the health and safety of the operator, but only when seated inside the equipment or vehicle.

#### 4.6 Utilities

- 4.6.1 When contacted by heavy equipment, aboveground and underground utilities may cause severe injuries or death as a result of electrocution, explosion, etc. Refer to the *S3AM-322-PR1 Overhead Lines* procedure for more specifics.
- 4.6.2 The following outline the requirements while performing heavy equipment operations that may lead to contact with aboveground or underground utilities:
- Always be aware of surrounding utilities.
  - Confirm all equipment (e.g., dump trailers, loaders, excavators, etc.) is lowered prior to moving underneath aboveground utilities.
  - Confirm utilities are cleared and identified prior to beginning any earthmoving operation. Contact the local utility service providers for clearance prior to performing work. Confirm documentation of the contact is made; date, number; contact name, organization, etc. Refer to *SOP S3AM-303-PR1 Excavation* and *S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance*.

#### 4.7 Training

- 4.7.1 The Operator or other qualified supervisor will provide all on-site personnel with an orientation to the heavy equipment and its associated hazards and controls.
- 4.7.2 Only designated, qualified personnel shall operate heavy equipment.
- 4.7.3 Operators shall have all appropriate jurisdictional licenses or training to operate a designated piece of heavy equipment.
- 4.7.4 Operators shall be evaluated through documented experience and routine monitoring of activities unless the equipment is operated by an AECOM operator in which case a practical evaluation is required. Operators shall be knowledgeable and competent in the operation of a designated piece of heavy equipment.

#### 4.8 Inspection and Maintenance

- 4.8.1 Maintenance records for any service, repair or modification which affects the safe performance of the equipment will be maintained and be reasonably available to the operator and maintenance personnel regulatory agencies upon request during work hours.
- 4.8.2 Maintenance records will be maintained on the site or project for heavy equipment.
- 4.8.3 Conduct maintenance as prescribed by the manufacturer in the Operation Manual for each piece of equipment.
- 4.8.4 Servicing, maintenance and repair of heavy equipment will not be done when the equipment is operating.
- Lockout and tagout safety procedures are followed. Refer to *S3AM-325-PR1 Lockout Tagout*.

- Motors are turned off, unless required for performing maintenance or repair.
- All ground-engaging tools are grounded or securely blocked.
- Controls are set in a neutral position and brakes are set.
- Electrically driven equipment is installed with provision for tagging and locking out the controls while under repair.
- Manufacturer's requirements for maintenance and repair are followed.
- If continued operation is essential to the process, a safe means of protection shall be provided.
- Provide and use a safety tire rack, cage, or equivalent protection when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

4.8.5 All heavy equipment shall have a documented inspection and if necessary, repaired prior to use.

- Operators shall not operate heavy equipment that has not been cleared for use.
- All machinery and mechanized equipment will be verified to be in safe operating condition (refer to *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*) by a competent person (refer to *S3AM-202-PR1 Competent Person Designation*) within seven days prior to operation on a new site or project. Clearance is valid for up to one year for the given site or project.
- As applicable, all machinery and mechanized equipment shall be inspected / certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.

4.8.6 All heavy equipment shall be inspected at a minimum to the manufacturer's recommendations prior to each work shift. All defects shall be reported to the Supervisor/ Manager immediately.

- Defective heavy equipment shall be immediately tagged and taken out of service until repaired.
- Inspection, maintenance, service and repair records shall be maintained at the site. If a manufacturer's or company-specific inspection checklist is not provided, use *S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist*.
- Records shall be made available for review upon request. Note: Documents may be electronically stored in the project files.

#### 4.9 Fueling and batteries

4.9.1 A well-ventilated area shall be used for refueling.

4.9.2 Only the type and quality of fuel recommended by the engine manufacturer shall be used.

4.9.3 Fuel tanks shall not be filled while the engine is running. All electrical switches shall be turned off.

4.9.4 If there is potential to spill fuel on hot surfaces, the surfaces shall be permitted to cool down prior to fueling. Any spillage shall be cleaned before starting engine.

4.9.5 Spilled fuel shall be cleaned with cotton rags or cloths and disposed of in the proper receptacle; do not use wool or metallic cloth.

4.9.6 Open flames, lighted smoking materials, sparking equipment or any other type of ignition source shall remain a minimum of 35' (10.7m) from the fueling area and/or fuel source. This clearance shall be increased if required or conditions warrant.

4.9.7 Heaters in carrier cabs shall be turned off when refueling the carrier or the drill rig.

4.9.8 Portable containers to be filled shall be placed directly on the ground or be properly grounded prior to filling to prevent creation of a static charge. Portable fuel containers shall not be filled completely to allow expansion of the fuel during temperature changes.

4.9.9 Control electrostatic hazards.

- Before activating fuel pump, touch some part of vehicle / equipment to de-energize any static electricity that may be present.
  - The fuel nozzle shall be kept in contact with the tank being filled to prevent static sparks from igniting the fuel.
  - Fuel containers and transfer hoses shall be kept in contact with a metal surface during travel to prevent build-up of a static charge.
- 4.9.10 Portable fuel containers shall not travel in the vehicle or carrier cab with personnel.
- 4.9.11 Batteries shall be serviced in a ventilated area while wearing appropriate Personal Protective Equipment.
- 4.9.12 When a battery is removed from a vehicle or service unit, the battery shall be disconnected ground post first. Consult the SDS applicable to the battery and/or contents for additional information including; handling, precautions, and first aid measures.
- Spilled battery acid shall be immediately flushed off the skin with a continuous supply of water. Battery storage or maintenance areas shall have readily accessible eye wash stations.
  - Should battery acid get into the eyes, the eyes shall be flushed immediately with copious amounts of water and medical attention shall be sought immediately.
- 4.9.13 When installing a battery, the battery shall be connected ground post last.
- 4.9.14 When charging a battery, cell caps shall be loosened prior to charging to permit gas to escape.
- 4.9.15 When charging a battery, the power source shall be turned off to the battery before either connecting or disconnecting charger loads to the battery posts.
- 4.9.16 To avoid battery explosions, the cells shall be filled with electrolytes. A flashlight (not an open flame) shall be used to check water electrolyte levels. Avoid creating sparks around batteries by shorting across a battery terminal. Lighted smoking materials and flames shall be kept at least a minimum of 35 feet (10.7 meters) away from battery-charging stations.

## 5.0 Records

- 5.1 Inspection, maintenance, service and repair records shall be maintained with the equipment.

## 6.0 Attachments

- 6.1 [S3AM-309-ATT1](#) [Brokk180 Safety Card](#)
- 6.2 [S3AM-309-ATT2](#) [Operator Line of Sight](#)
- 6.3 [S3AM-309-FM1](#) [Approval of Machinery & Mechanized Equipment](#)
- 6.4 [S3AM-309-FM2](#) [Heavy Machinery Pre-Operation Checklist](#)
- 6.5 [S3AM-309-FM3](#) [Rubber Tire Backhoe Operator Skill Evaluation](#)
- 6.6 [S3AM-309-FM4](#) [Scraper Operator Skill Evaluation](#)
- 6.7 [S3AM-309-FM5](#) [Bull Dozer Operator Skill Evaluation](#)
- 6.8 [S3AM-309-FM6](#) [Dump Truck Operator Skill Evaluation](#)
- 6.9 [S3AM-309-FM7](#) [Roller Compactor Operator Skill Evaluation](#)
- 6.10 [S3AM-309-FM8](#) [Front End Loader Operator Skill Evaluation](#)
- 6.11 [S3AM-309-FM9](#) [Grader Operator Skill Evaluation](#)
- 6.12 [S3AM-309-FM 10](#) [Excavator Operator Skill Evaluation](#)
- 6.13 [S3AM-309-FM11](#) [Water Truck Operator Skill Evaluation](#)

- 6.14 [S3AM-309-FM12](#) [Heavy Equipment Maintenance Inventory](#)
- 6.15 [S3AM-309-FM13](#) [Heavy Equipment Inspection Report](#)

## Brokk 180

S3AM-309-ATT1

### 1.0 Objective/Overview

- 1.1 The Brokk 180 is an electric-powered, remote controlled, hydraulic device used for demolishing concrete structures and refractory linings as well as excavating. This machine includes attachments designed exclusively for demolishing work (e.g., grapple, bucket, hydraulic hammer, etc.). By using the remote control unit, an operator can move the machine and attachments in different directions and speeds from afar.

### 2.0 Potential Hazards

- 2.1 Flying debris
- 2.2 Crush/impact/pinch from extendable boom, tracks, and tipping over
- 2.3 Struck-by
- 2.4 Electricity (subsurface utilities when excavating)
- 2.5 Gas lines (subsurface utilities when excavating)
- 2.6 Noise



### 3.0 Safe Operating Guidelines

- 3.1 Prior to use, complete a pre-operation inspection to determine if the unit is in safe working condition.
- 3.2 Position the unit to safely perform the intended task, then deploy the outriggers to stabilize the unit.
- 3.3 Confirm that the operator knows what the lifting capacity is; do not exceed the lifting capacity.
- 3.4 Complete a subsurface utility clearance prior to excavating.
- 3.5 Operator should define a swing radius area and exclude workers from the area. Establish a minimum 15-foot (4.5-meter) clearance around the unit while operating.
- 3.6 Do not allow debris to build up around the unit. Maintain good housekeeping practices.
- 3.7 Prior to removing debris from under the boom, stop, disengage the unit, and position the boom so that the attachment is at rest on the ground.
- 3.8 Personnel operating the unit with the remote control device will be properly trained and certified by a competent person.
- 3.9 The operator will be able to maintain line of sight visual contact with the unit at all times to assess hazards and site security.
- 3.10 Maintenance in excess of preventive maintenance activities (e.g., lubrication, replenishing fluids, etc.) will be performed by manufacturer personnel ONLY.
- 3.11 All operations will comply with the manufacturer's recommended policies.

### 4.0 Training Requirements

- 4.1 Review of applicable Standard Operating Procedures.
- 4.2 Complete knowledge and understanding of remote control functions.
- 4.3 Review and follow manufacturers' recommended policies and practices.

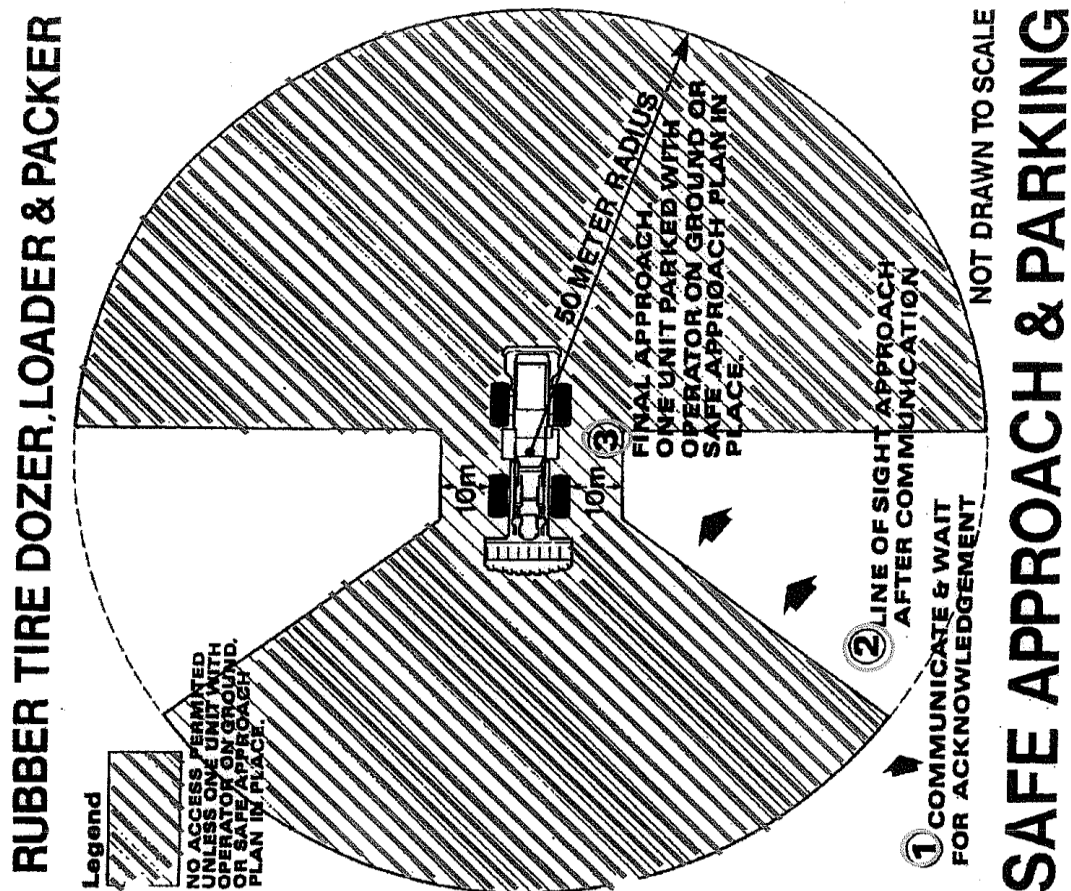
## **5.0 Personal Protective Equipment**

- 5.1 Class II (minimum) American National Standards Institute/Canadian Safety Association Safety Vest
- 5.2 Hard Hat
- 5.3 Safety Toe Boots
- 5.4 Safety glasses with side shields
- 5.5 Hearing protection (ear plugs and/or ear muffs)
- 5.6 Leather gloves

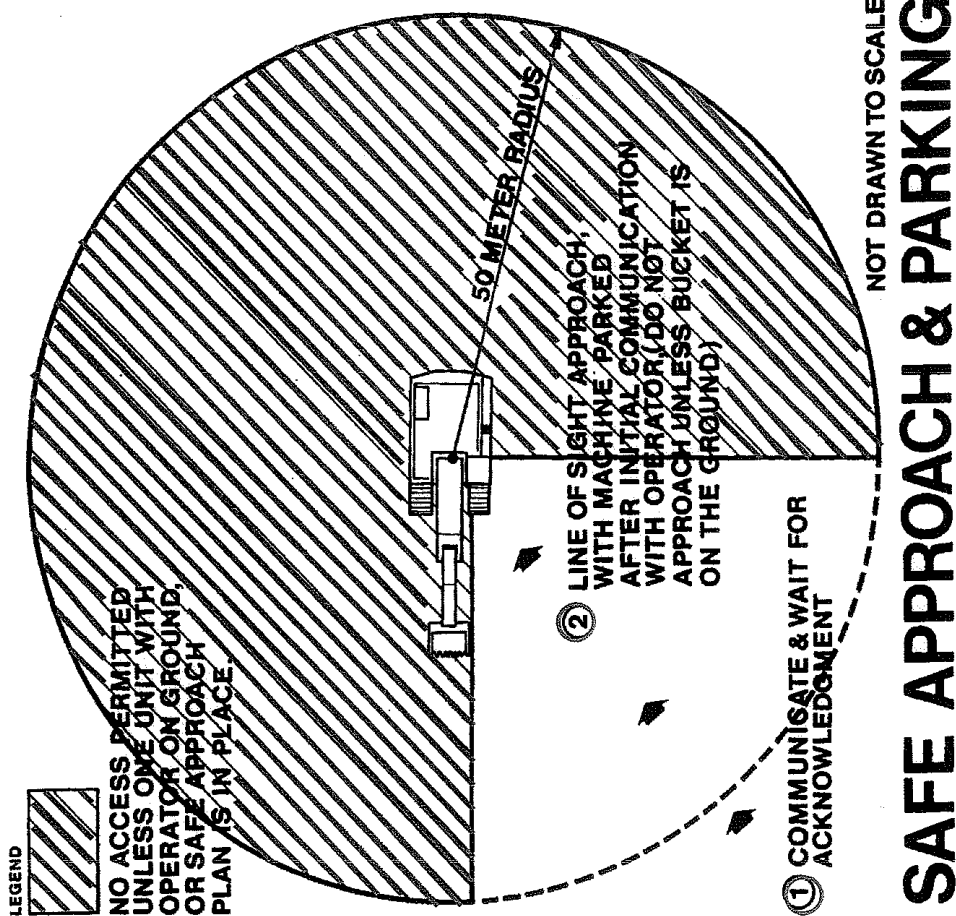
## **6.0 Other Safety Tips**

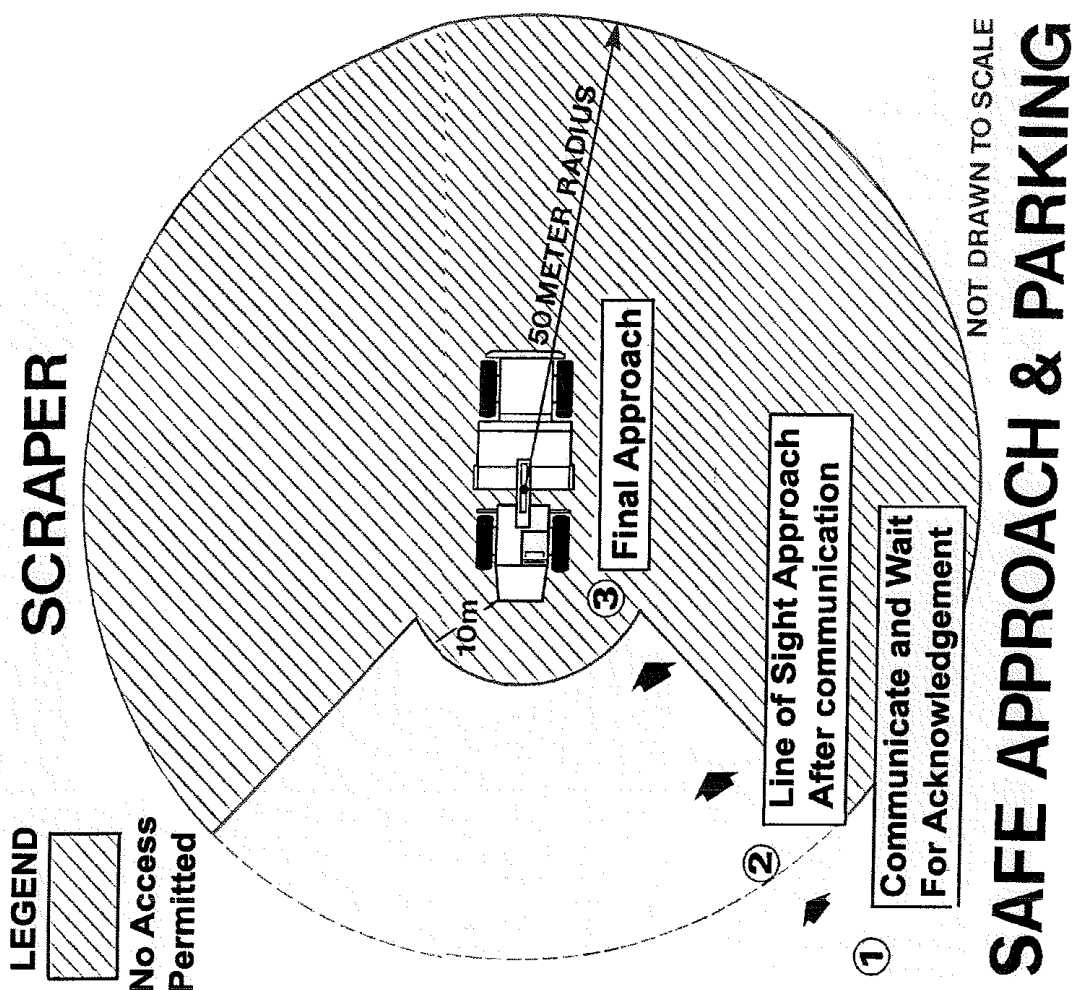
- 6.1 Never stand under a raised boom.
- 6.2 Pay close attention to power cords for potential tripping hazard and equipment entanglement.

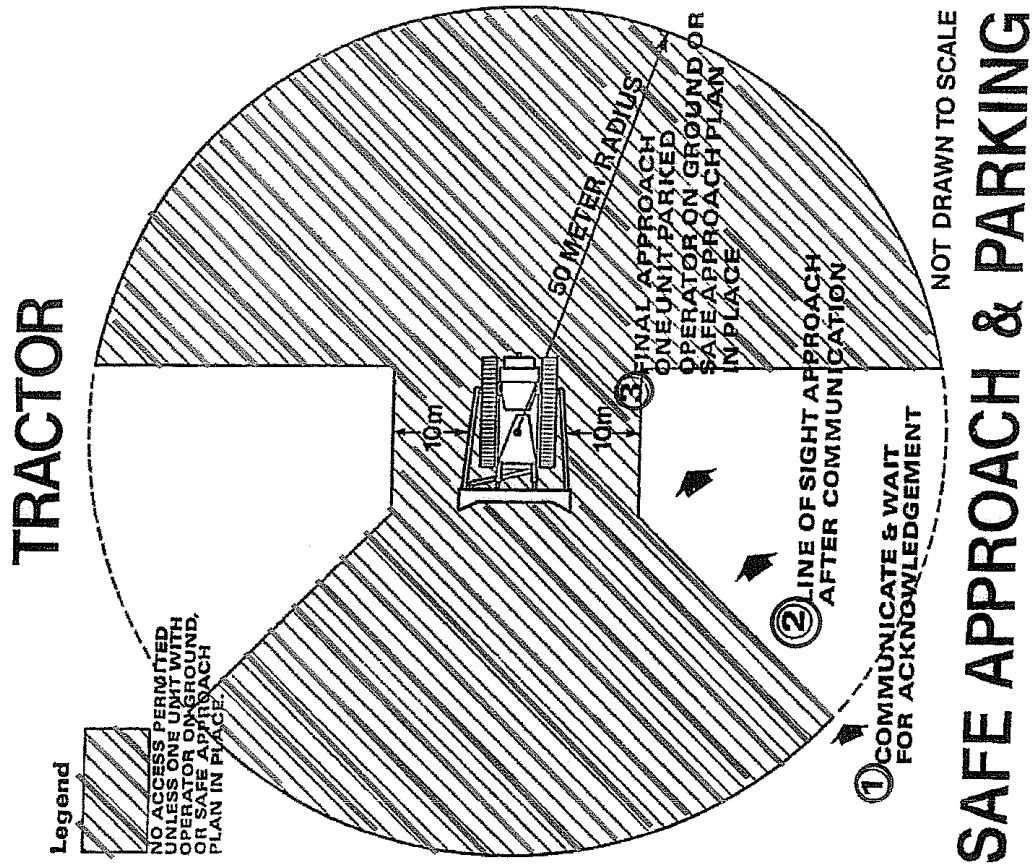


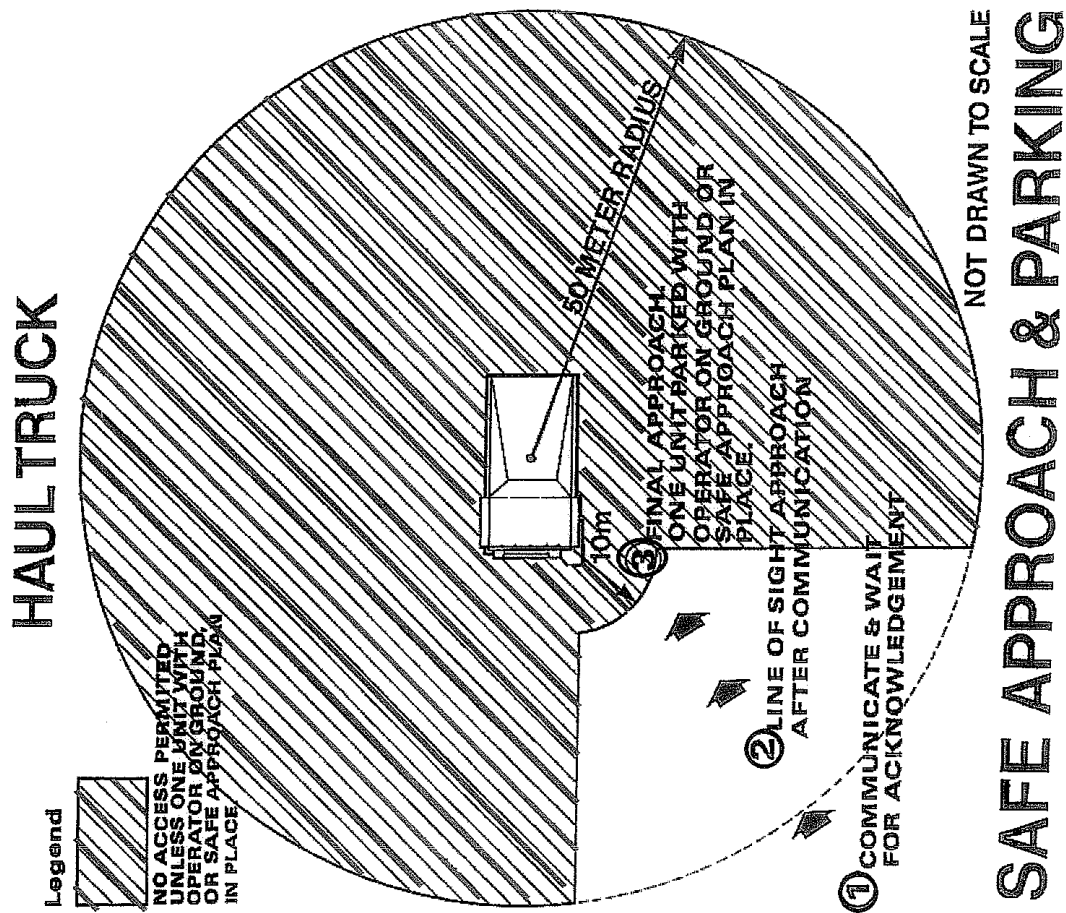


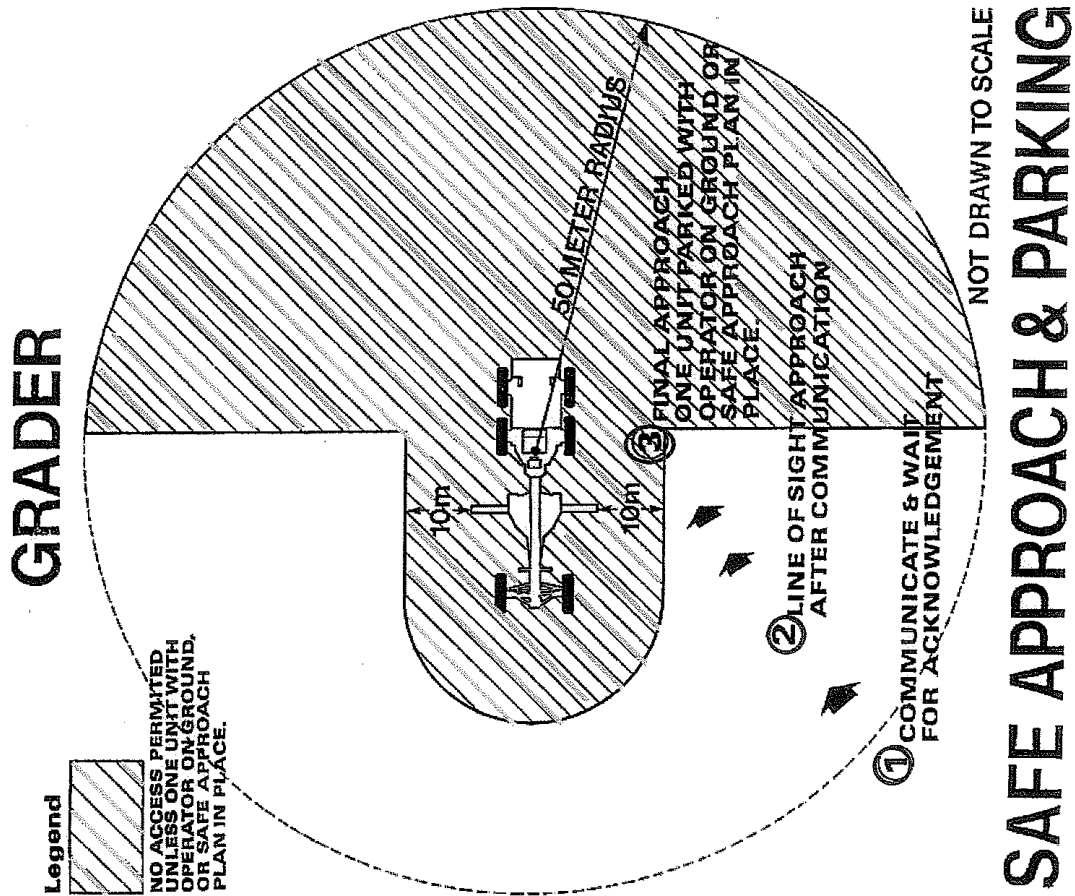
# HYDRAULIC EXCAVATOR



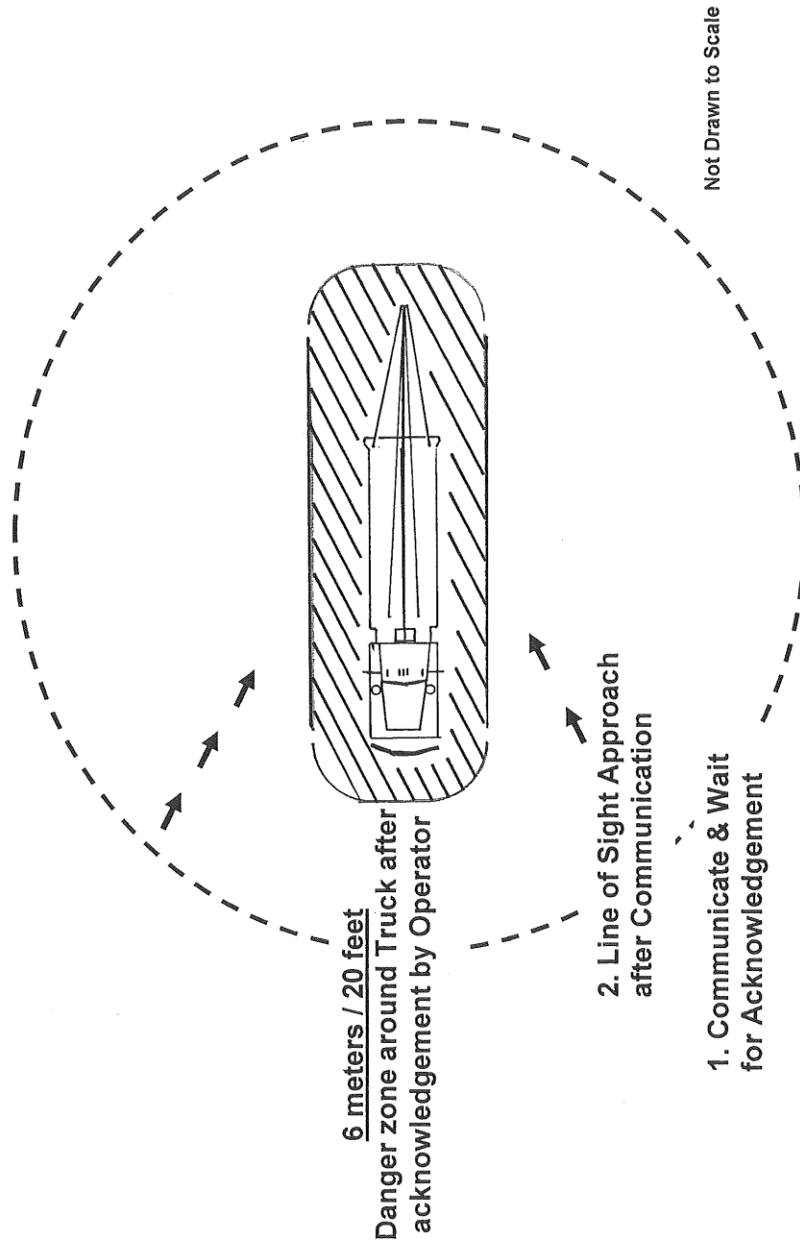








# Bed / Pole Truck



## SAFE APPROACH & PARKING

**Americas****Approval of Machinery and Mechanized Equipment****S3AM-309-FM1****1.0 General Guidelines**

- 1.1 Subcontractor equipment shall comply with all applicable legislative requirements, local, State, Federal, Provincial, Territorial for motor vehicles and material handling heavy equipment.
- 1.2 Approval shall be obtained for all subcontractor machinery and mechanized equipment within seven calendar days of use on the project site.
- 1.3 As applicable, all machinery and mechanized equipment must be certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.
- 1.4 Heavy equipment includes, but is not limited to, drill rigs, front-end loaders, backhoes, trackhoes, bulldozers, forklifts, and similar equipment used for the implementation of the project Statement of Work.

**2.0 Equipment Safety Inspections**

- 2.1 The following presents general guidelines for certifying equipment is in safe operating condition before activities commence at the site and during site operations. The following guidelines are not meant to be all-inclusive.
  - 2.1.1 All machinery and mechanized equipment will be approved to be in safe operating condition (using the attached form) by a competent individual within seven calendar days in advance of operation on a new site or project. This approval is valid for one year for the given site or project.
  - 2.1.2 Equipment will be inspected on a daily basis by the owner/operator and daily logs will be maintained. All discrepancies shall be corrected prior to placing the equipment in service.
  - 2.1.3 Inspections shall include, but are not limited to, all hydraulic lines and fittings for wear and damage, all cable systems and pull ropes for damage and proper installation, exhaust systems, brake systems, and drill controls, etc.
  - 2.1.4 Drill rigs and related support equipment and vehicles shall be inspected by the driller in charge on a daily basis. These inspections shall be recorded on the Daily Drill Rig Checklist or on equivalent subcontractor forms.
  - 2.1.5 Preventive maintenance shall be conducted for all equipment according to manufacturer recommendations and/or the subcontractor's internal policies, schedules, and equipment Standard Operating Procedures.
  - 2.1.6 Only designated qualified persons shall operate and inspect machinery and mechanized equipment.
  - 2.1.7 The contractor shall maintain records of tests and inspections at the site and shall make the records available upon request of the designated authority; the records shall become part of the official project file.
  - 2.1.8 Equipment found to not be in safe operating condition or to have a deficiency that affects the safe operation of the equipment shall immediately be tagged, taken out of service, and its use prohibited until deficiencies have been corrected to a safe condition.
  - 2.1.9 All equipment shall be kept in the exclusion zone until decontaminated within designated decontamination areas.
  - 2.1.10 Equipment with an obstructed rear view must have an audible alarm that sounds when equipment is moving in reverse.



TO: AECOM

DATE:

FROM:

Project Name:

Project Number:

Project Location:

1. This form provides approval of machinery and mechanized equipment to be used on the referenced project for the following work:

Description of equipment work:	
Project site:	
Subcontractor providing equipment: Address:	
Dates (duration) of equipment work:	

2. Inspection and approval of machinery and mechanized equipment, as required by AECOM, has been made within seven calendar days in advance of use on the project site. This approval process shall be repeated for equipment that is used on the project or site for more than one year.

Identification of equipment (make, model, serial no.)		Date of Certification
1		
2		
3		

3. The above listed equipment has been inspected and tested as indicated on this form, and is DECLARED TO BE IN SAFE OPERATING CONDITION BY THE FOLLOWING COMPETENT INDIVIDUAL:

Name		Title
Company		
Signature		Date

4. If there are any questions regarding this certification, please contact the following AECOM representative:

## Wildlife, Plants & Insects

S3AM-313-PR1

### 1.0 Purpose and Scope

- 1.1 Communicates the requirements and precautions to be taken by AECOM employees to protect against the biological hazards associated with insects, arachnids, snakes, poisonous plants, and other animals referred to herein collectively as “biological hazards”.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document’s content.

### 2.0 Terms and Definitions

- 2.1 **Field Work** – Any activity conducted at a site that contains brush, overgrown grass, leaf litter, poisonous plants, or is located near mosquito breeding areas and includes work in structures where animals might exist that harbor fleas or ticks or where spiders and mites could be present. Field work includes, but is not limited to, Phase I, Phase II, Operations Monitoring & Maintenance, biological surveys, and other work that meets the definition of field work.
- 2.2 **Poisonous** – Capable of harming or killing by or as if by poison; toxic or venomous.
- 2.3 **Phase I Environmental Site Assessment** – Investigation of real property to determine the possibility of contamination, based on visual observation and property history, but no physical testing. Under new Environmental Protection Agency regulations that went into effect on November 1, 2006, a Phase I, as it is called for short, will be mandatory for all investors who wish to take advantage of Comprehensive Environmental Response, Compensation, and Liability Act defenses that will shield them from liability for future cleanup, should that prove necessary. The new Phase I rules, called “All Appropriate Inquiry” or AAI, also require more investigation than previously mandated. Investors can expect to see dramatic price increases over prior experiences.
- 2.4 **Phase II Environmental Site Assessment** – Investigation of real property through physical samplings and analyses to determine the nature and extent of contamination and, if indicated, a description of the recommended remediation method.

### 3.0 References

- 3.1 RS2-001-PR1 Firearms Standard
- 3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.3 S3AM-008-PR1 Fitness for Duty
- 3.4 S3AM-113-PR1 Heat Stress
- 3.5 S3AM-208-PR1 Personal Protective Equipment
- 3.6 S3AM-209-PR1 Risk Assessment & Management

### 4.0 Procedure

- 4.1 Roles and Responsibilities
  - 4.1.1 **Managers / Supervisors**
    - Responsible for managing field work.

- Work with employees to see that a Task Hazard Analysis (THA) for the work to be conducted has been performed prior to the beginning of the field work and that it includes an assessment of potential biological hazards.
- Implement control measures at the location to reduce the potential for employees to be exposed to injuries and illnesses from biological hazards while working.
- If the exposures cannot be eliminated or managed with engineering controls, approve the use and cost of Personal Protective Equipment (PPE) and protective repellents and lotions and confirm that exposed employees have and use these products.

#### 4.1.2 **SH&E Manager**

- Confirm training and guidance is provided to employees consistent with this procedure.
- During the performance of site visits, assess the precautions being taken against biological hazards for compliance with this procedure.
- Assist AECOM personnel in identifying hazards and selecting appropriate control measures.
- As applicable, review and approve relevant SH&E Plans for locations that have biological hazards.

#### 4.1.3 **Employees**

- Participate in required training related this procedure.
- Participate in the development of THAs for the task, identify control measures to limit exposure and request PPE, repellents, and protective lotions identified by this procedure.
- Update the applicable THA when a new, unaccounted for biological hazard is identified. Employee shall stop work to identify appropriate elimination or control measures (and obtain any necessary guidance) before continuing work.
- Obtain approval from Managers and/or Supervisors to purchase selected PPE prior to purchasing.
- Implement the precautions appropriate to prevent exposure to the hazardous wildlife, insects and plants.
- Observe requirements for reporting (e.g. tick bites, skin irritations, etc.) as detailed within the procedure and attachments.

### 4.2 Training

4.2.1 Employees shall be trained to recognize organisms that represent a threat in the regions in which they work – experienced field staff shall provide on the job training to assist staff with hazard recognition.

4.2.2 Employees shall be properly trained to the anticipated tasks and the associated required PPE.

### 4.3 Overview

4.3.1 The procedures discussed below are detailed because these hazards have historically posed the most significant risk to AECOM employees. Note that this discussion is not a fully encompassing list of hazards. As part of the SH&E Plan and THA developed by the AECOM personnel, in accordance with *S3AM-209-PR1 Risk Assessment & Management*, additional consideration shall be given to other biological hazards.

4.3.2 Departments of Public Health local to the worksite, as well as the Centers for Disease Control (CDC) can serve as a resource for identifying biological hazards not discussed in this procedure.

4.3.3 If additional biological hazards are identified, employees should stop work and contact the SH&E Manager to discuss the hazards and identify effective control measures. Those control measures shall be implemented at the location prior to restarting work.

#### 4.4 Employee Sensitivity

- 4.4.1 Sensitivity to toxins generated by plants, insects and animals varies according to dosage and the ability of the victim to process the toxin; therefore, it is difficult to predict whether a reaction will occur, or how severe the reaction will be. Employees should be aware that there are a large number of organisms capable of causing serious irritations and allergic reactions. Some reactions will only erupt if a secondary exposure to sunlight occurs. Depending on the severity of the reaction, the result can be severe scarring, blindness or even death.
- 4.4.2 Employees also need to consider whether they are sensitive to the use of insect repellents.

#### 4.5 Planning and Hazard Assessment

- 4.5.1 AECOM personnel shall confirm that the potential for exposure to specific biological hazards are assessed prior to the commencement of work and that the procedures specified by this procedure are integrated into the THA planning process and conveyed to employees conducting the field work. This information shall be communicated in the location-specific SH&E plan, the THA, pre-project kickoff meetings, and tailgate meetings at the location.
- 4.5.2 It is important to note that the precautions to be taken by employees to decrease the risk of exposure to biological hazards can directly increase the risk of heat-related illness due to thermal stresses. Therefore, heat stress monitoring and precautions shall be included as a critical component of the task-specific THA in accordance with *S3AM-511-PR1 Heat Stress*.
- 4.5.3 During the preparation of the location-specific SH&E plan and task specific THA, Managers, Supervisors, and employees shall determine what biological hazards might be encountered during the task or operations and shall prescribe the precautions to be taken to reduce the potential for exposure and the severity of resulting illnesses. Consideration will be given to conditions such as weather, proximity to breeding areas, host animals, and published information discussing the presence of the hazards.
- 4.5.4 It should be assumed that at least one of the biological hazards exists whenever working on undeveloped property. This can include insect activity any time that local temperatures exceed 40 degrees Fahrenheit (4.5 degrees Celsius) for a period of more than 24 hours. The stubble and roots of poisonous plants can be a hazard any time of year, including when some plants are dormant or mown.
- 4.5.5 The hazard assessments shall also consider the additional hazards posed by vegetative clearing such as the increased risk of coming in contact with poison ivy, oak or sumac and hazards associated with the use of tools and equipment to remove vegetation.
- 4.5.6 Employees in the field where biological hazards exist shall not enter the hazard areas unless they are wearing the appropriate protective clothing, repellents, and barrier creams specified below. If the hazard is recognized in the field but was not adequately assessed during the THA, the field staff shall stop work and not proceed until the THA has been amended and approved and protective measures implemented.
- 4.5.7 Employees who have severe allergic reactions are strongly recommended to notify their Manager, field Supervisor and co-workers of the potential for a reaction and demonstrate what medication they might need, where they keep it and how it is administered.
- 4.5.8 A decision flow chart and table for determining the potential for biological hazards in the Americas has been provided in *S3AM-313-ATT1 Biological Hazard Assessment Flow Chart*.

#### 4.5.9 Restrictions:

- No firearms or weapons are allowed to be used without express permission by the Region Executive and Chief Resilience Officer, refer to the *RS2-001-PR1 Firearms Standard*.
- No weapons related work shall occur without an assessment that includes appropriate hazard control measures and training.

- Staff with life-threatening reactions shall not undertake work in areas infested with the allergen (e.g., wasps, poison ivy), unless precautions are met which satisfy a medical practitioner's requirements. Refer to *S3AM-008-PR1 Fitness for Duty*.

#### 4.5.10 Precautions

- Be aware of the potential irritants in your area and know how to recognize them.
- Modify activities to avoid encounters (diurnal rhythms, seasonal rhythms).
- Avoid wearing perfume and cologne and strong smelling deodorants, lotions, soaps, and shampoos.
- When working in areas where there may be small insects that "hitchhike" (e.g., ticks, spiders, scorpions), it is recommended that clothes are turned inside out and shaken at the end of day; do not wear same clothes two days in a row.
- Staff should always be aware of where they are placing their hands, or where they are sitting in order to avoid contact with potential toxins. Avoid reaching into areas where visibility is limited.

#### 4.6 Wildlife Hazards (Wild Animals, Reptiles and Birds)

4.6.1 Employees shall not work alone in areas where the risk of an encounter with dangerous wildlife is high. Wildlife handling shall only be completed under direct supervision of an experienced individual. Refer to the following work instructions for more specifics:

- *S3AM-313-ATT13 Alligators*
- *S3AM-313-ATT9 Large Carnivores & Ungulates*
- *S3AM-313-ATT10 Bear Safety*
- *S3AM-313-ATT11 Small Mammals*
- *S3AM-313-ATT12 Snakes & Scorpions*

#### 4.7 Ticks, Spiders and other Insects

4.7.1 Insects for which precautionary measures should be taken include but are not limited to: mosquitoes (potential carriers of disease aside from dermatitis), black flies, wasps, bees, ticks, fire ants and European fire ants.

4.7.2 Employees with known allergies to insect stings should consult their personal physician for advice on any immediate medications that they should carry with them. Epi-pens<sup>1</sup> shall be carried at all times in the field by employees who are aware that anaphylactic shock is a possibility for them. AECOM highly recommends that employees with known allergies inform their co-workers of the allergy and the location of the medications they might carry for the allergy.

#### 4.7.3 Habitat Avoidance, Elimination and/or Control

- The most effective method to manage worker safety and health is to eliminate, avoid and/or control hazards. Clearing the location of brush, high grass and foliage reduces the potential for exposure to biological hazards. Clearing will not eliminate the exposure to flying insects and there might be an increased exposure to ticks and spiders during the clearing process.
- Projects such as subsurface environmental assessment or remediation are often candidates for brush and overgrown grass to be cleared. In these instances, the Manager shall either request that the client eliminate vegetation, or request approval from the client to have vegetation clearing added to the scope of work.
  - It should be noted that vegetation clearance may unintentionally serve to spread noxious and poisonous plant materials around the site.

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<sup>1</sup> *Epi-pens must be prescribed by a personal physician. Renew epi-pens on a regular schedule to ensure effectiveness and make sure your field companions know where it is and how to use it if you cannot self-administer the dose.*

- As applicable, measures should be taken to prevent spread, such as but not limited to, confirming equipment and materials are not placed on affected areas, and equipment is decontaminated after use and before removal from site.
- When work shall be conducted in areas that cannot or may not be cleared of foliage, personal precautions and protective measures shall be prescribed.
- Mosquitoes breed in stagnant water and typically only travel a quarter mile (less than half a kilometer) from their breeding site. Whenever possible, stagnant water should be drained to eliminate breeding areas. Managers and client site managers should be contacted to determine whether water can be drained and the most appropriate method for draining containers, containment areas, and other objects of standing water.
- If water cannot be drained, products similar to Mosquito Dunks® can be placed in the water to control mosquitoes. Once wet, the Mosquito Dunks® kill the immature, aquatic stage of the mosquito. The active ingredient is a beneficial organism that is lethal to mosquito larvae, but harmless to fish, humans, and other animals. Mosquito Dunks® provide long-term protection for 30 days or more.

#### 4.7.4 Ticks

- Ticks can be encountered when walking in tall grass or shrubs. They crawl up clothing searching for exposed skin where they will attach themselves. The most serious concern is a possibility of contracting a disease.
- Data from the CDC indicates that tick-borne diseases have become increasingly prevalent. At the same time, tick repellents have become both safe and effective so it is possible to prevent the vast majority of bites and, therefore, most related illnesses. The use of permethrin is strongly advised.
- The most common and severe tick-borne illnesses in the U.S. are Lyme disease, Ehrlichiosis, and Rocky Mountain spotted fever. A summary table listing CDC informational resources for these diseases is provided in *S3AM-313-ATT2 Ticks* along with a listing of CDC information resources and maps showing the distribution of common tick-borne diseases in the U.S.
- When working in areas where ticks may occur, it is recommended that clothes are turned inside out and shaken at the end of day; do not wear the same clothes two days in a row.
- Employees should conduct a thorough full body tick check upon exiting the field. Shower within two hours of coming indoors to help wash away loose ticks. Clothes should be laundered in hot water or tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks.
- To remove ticks that are embedded in skin, utilize a tick key. Alternatively use tweezers or fingers to carefully grasp the tick as close to the skin as possible and pull slowly upward, avoiding twisting or crushing the tick. Do not try to burn or smother the tick. Cleanse the bite area with soap and water, alcohol, or household antiseptic. Note the date and location of the bite and save the tick in a secure container such as an empty pill vial or film canister. A bit of moistened paper towel placed inside the container will keep ticks from drying out. Follow AECOM incident reporting guidelines to report the tick bite within 4 hours and notify the Manager or Supervisor.
- Familiarize yourself with the characteristic bulls-eye pattern of Lyme disease infection surrounding the bite. If you notice this type of pattern or rash resulting from a tick bite, immediately report the issue to your supervisor and follow the incident reporting requirements for your business group.
- If you experience symptoms such as fever, headache, fatigue, and a skin rash, you should immediately visit a medical practitioner as Lyme disease is treated easily with antibiotics in the early stages, but can spread to the heart, joints, and nervous system if left untreated.

#### 4.7.5 Chiggers

- Chiggers are mite larvae, approximately ½ millimeter in size, and typically invisible to the naked eye. While chiggers are not known to carry infectious diseases, their bites and resulting rashes and itching can lead to dermatitis and a secondary infection.
- Chiggers are typically active from the last hard freeze in the winter or spring to the first hard freeze. They are active all year in the Gulf Coast and tropical areas.

#### 4.7.6 Spiders

- Spiders can be found in derelict buildings, sheltered areas, basements, storage areas, well heads and even on open ground. Spiders can be found year round in sheltered areas and are often present in well heads and valve boxes.
- Most spider bites produce wounds with localized inflammation and swelling. The Black Widow and Brown Recluse spiders in the U.S. and others outside the U.S. inject a toxin that causes extensive tissue damage and intense pain.
- Additional information on spider identification can be found in attachment *S3AM-313-ATT3 Poisonous Spider Identification*.

#### 4.7.7 Mosquitoes

- When a mosquito bites, it injects an enzyme that breaks down blood capillaries and acts as an anticoagulant. The enzymes induce an immune response in the host that results in itching and local inflammation. The tendency to scratch the bite sites can lead to secondary infections.
- CDC data indicates that mosquito-borne illnesses, including the strains of encephalitis, are a health risk. At least one of the Encephalitis strains listed below is known to exist in every area of the U.S. and in many other countries as well:
  - Eastern Equine encephalitis
  - Western Equine encephalitis
  - West Nile Virus
  - St. Louis encephalitis
  - La Crosse encephalitis
- Mosquitoes can transmit the West Nile Virus and other forms of encephalitis after becoming infected by feeding on the blood of birds which carry the virus.
- Most people infected with the virus experience no symptoms or they have flu-like symptoms. Sometimes though, the virus can cause severe illness, resulting in hospitalization and even death, so proper precautions should be taken. Consult a medical practitioner if you suspect you have West Nile Virus. Other diseases including Dengue Fever and Malaria are spread by mosquitoes in the sub-tropic and tropical parts of the world. See *S3AM-313-ATT4 Mosquito Borne Diseases* for information on the locations where mosquito borne diseases are known to be present.

#### 4.7.8 Bees, Wasps and Hornets

- Wasps and bees will cause a painful sting to anyone if they are harassed. They are of most concern for individuals with allergic reactions who can go into anaphylactic shock. Also, instances where an individual is exposed to multiple stings can cause a serious health concern for anyone. These insects are most likely to sting when their hive or nest is threatened.
- Bees, hornets, and wasps may be found in derelict buildings, sheltered areas, behind covers or lids and even on open ground. Other protective measures are not normally effective against aggressive, flying insects. Be aware of the potential areas for these types of insects, approach these locations cautiously. Avoid reaching into areas where visibility is limited.
- If you see a nest in the area you are working in stop work. Contact the Manager or Site Supervisor for procedures to have the nest removed.

- If stung by a wasp, bee or hornet, notify a co-worker or someone who can help should you have an allergic reaction. Stay calm and treat the area with ice or cold water. Follow AECOM incident reporting guidelines to report the sting within 4 hours and notify the Manager or Supervisor immediately. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or sting, or any swelling or numbness beyond the site of the bite or sting.

#### 4.7.9 Fire Ants

- The fire ant (southern and western U.S.) and the European fire ant (northeastern U.S. and eastern Canada) is often very abundant where it is established. It is very aggressive and commonly climbs up clothing and stings unprovoked when it comes into contact with skin. Painful irritations will persist for an hour or more.

#### 4.7.10 Personal Protective Equipment (PPE)

- Chemically-treated field clothing, full-length clothing, or Tyvek® coveralls.
- Gloves shall also be worn consistent with the recommendations of the site-specific SWP and/or THA to minimize hand exposure.
- Where ticks, chiggers, and spiders are presumed to exist, the Tyvek® or chemically treated clothing will be taped to the work boots.
- See *S3AM-313-ATT2 Ticks* for configuration of clothing for protection against ticks and insects.
- Application of insect repellent to clothing and/or exposed skin. Oil of lemon eucalyptus, DEET, and Permethrin have been recommended by the CDC for effective protection against mosquitoes that may carry the West Nile virus and related diseases.
- Note that DEET will reduce the effectiveness of Fire Resistance Clothing (FRC) and should not be applied to this clothing. If working in FRC, employees can use Permethrin as it has been shown not to reduce the effectiveness of FRC. Permethrin will need to be applied to FRC well in advance of the planned work. If permethrin is unavailable employees can apply DEET to their skin and let dry prior to putting FRC on.
  - Oil of Lemon Eucalyptus is a plant-based insect repellent on the market as Repel Lemon Eucalyptus. The products have been proven to be effective against mosquitoes, deer ticks, and no-see-ums for up to six hours. Derived from Oil of Lemon Eucalyptus, this non-greasy lotion or spray has a pleasant scent and is not known to be toxic to humans. The spray or lotions will be effective for approximately two to six hours and should be reapplied every two hours to sustain protection. Lemon Eucalyptus products cannot be applied to fire retardant clothing.
  - Permethrin is an insecticide with repellent properties registered with the Environmental Protection Agency and recommended by the CDC.
    - Permethrin is highly effective in preventing tick bites when applied to clothing, but is not effective when applied directly to the skin. Two options are available for Permethrin treatment of clothing worn during field work: 1) pre-treatment of fabric by the clothing manufacturer; or 2) manual treatment of their personal clothing using Permethrin spray in accordance with manufacturers recommendations. This will likely require treatment at home or the office prior to field mobilization. Caution should be used when applying Permethrin as it is highly toxic to fish and house cats. AECOM strongly recommends the first option (employees obtaining pre-treated clothing) to avoid the time required, potential risk, and housekeeping issues involved with manually treating the clothing with spray. Purchase pre-treated clothing in accordance with *S3AM-208-PR1 Personal Protective Equipment* and with the approval of your Supervisor or Manager.
    - The Permethrin pre-treatment is odorless and retains its effectiveness for approximately 25 washings. After 25 washings, the pre-treated clothing will be



considered no longer effective and removed from service. Clothing that has been manually treated by employees will be considered effective for five wash cycles.

- Also, use of clothing that has been pre-treated with Permethrin offers a reduction in the use and application of other insect repellents that shall be applied directly to the skin. Supervisor or Manager approval is required prior to purchase.
- If the employee opts not to utilize chemically pre-treated clothing while potentially exposed to insects, spiders and/or ticks, they shall either: 1) wear Tyvek® coveralls taped to the boots, or 2) wear full-length clothing consisting of long-legged pants and long-sleeved shirts treated with an insect repellent containing Permethrin, DEET, or an oil of lemon eucalyptus to their work clothing.
- Safety Data Sheets (SDS) for the repellents, lotions, and cleansers discussed in this Procedure are not required because the repellents, lotion, and clothing are consumer products used in the manner intended for the general public. Although not required, a SDS should be obtained for the products used and placed into the office SDS library and site-specific safety plan.

#### 4.8 Poisonous Plants

##### 4.8.1 Habitat Avoidance, Elimination and/or Control

- If poisonous plants are identified in the work area, employees will mark the plants using either flags or marking paint, and discuss what the specific indicator will be to signal to other employees to avoid the designated area. If employees decide to use ground-marking paint to identify poisonous plants, they should discuss this tactic with the Manager (and Client as appropriate) for approval.
- If removal of the plants is considered, it should be subcontracted to a professional landscaping service that is capable and experienced in removing the plant. If herbicides are considered for use, a discussion shall need to occur with the Manager (and Client as appropriate) to determine whether it is acceptable to apply herbicides at the work site. Application of herbicides may require a license.
- Employees shall not attempt to physically remove poisonous plants from the work area unless a clearing procedure, including PPE, is prepared in advance and approved by the SH&E Manager. The clearing procedure should be included in the SH&E Plan and THA and the required PPE specified.

##### 4.8.2 Poisonous plants that employees should recognize and take precautions to avoid include: poison sumac, poison ivy (terrestrial and climbing), poison oak, giant hogweed<sup>2</sup> (or giant cow parsnip), wild parsnip, devil's club and stinging nettle. Many others are extremely poisonous to eat (e.g., poison hemlock; water parsnip) – do not eat anything that has not been identified. Refer to *S3AM-313-ATT5 Plants of Concern* for information on locations where some of these poisonous plants are found in the U.S.

- Of the toxic plants in the cashew family, poison ivy (*Rhus radicans*) is most widespread. It grows in a variety of forms such as a low sprawling shrub, dense ground cover, or a thick woody vine that grows high into the tree canopy. Poison oak (*Rhus diversiloba*) is typically a low shrub in drier soils. Both of these plants have leaves of three and white berries. Poison sumac (*Rhus vernix*) is a tall shrub that is less prolific in distribution. It grows in wet areas, has a compound leaf with a red leaf stem (rachis), and white berries. All of these plants possess urushiol oils in all parts of the plant. Touching the plant causes an itchy skin rash that can show up within 4-72 hours following contact. People have a wide range of reactions including swelling, itching, rash and bumps, patches or blisters.
- Uroshiol oil can also transfer onto clothing and equipment. The oil can remain active on surfaces for up to 5 years and can be transferred to your skin.

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<sup>2</sup> Phytodermatiti producer: keep skin covered and wash well after exposure

- Wild parsnip is found throughout the U.S. and contains a poison that produces a rash similar to poison oak and ivy. Unlike poison oak and ivy, the active oil will not be present on unbroken leaves. See *S3AM-313-ATT6 Wild Parsnip Identification* for additional information and photos of wild parsnip.
  - Several plants in the carrot family contain toxic sap that causes severe dermatitis if it comes into contact with skin that is then exposed to sunlight. The most serious reaction is caused by the giant hogweed (*Heracleum mantegazzianum*), a plant that is spreading in southern Ontario and is also present in southwestern British Columbia. The plant is enormous, attaining up to 16 feet (5 meters) in height, which it does in one growing season. Contact causes painful blistering that can cause permanent disfigurement. It is to be avoided. Similar but less serious reactions can be caused by meadow parsnip (*Pastinaca sativa*) and cow parsnip (*Heracleum lanatum*). Meadow parsnip can be very abundant on disturbed sites.
  - Nettles, particularly stinging nettle (*Urtica dioica*) and wood nettle (*Laportea canadensis*) contain urticating hairs on the leaves and stems that cause sharp pain or itchiness on contact with skin. The irritation is immediate and normally lasts no more than an hour and there are no lasting consequences.
  - Some plants contain abundant stiff spines that can present a safety hazard, particularly if one is to fall into them. These include the cactus (*Opuntia spp.*), devils club (*Oplopanax horridum*), and prickly-ash (*Zanthoxylon americanum*).
- 4.8.3 A large number of plants are not harmful to touch but may contain poisonous berries or foliage that could cause serious complications or death if they are ingested. It goes without saying to not eat any berries or plants if you are unsure of their identity.
- Remember that in the fall and winter the hazard still exists in the form of stubble and roots.
- 4.8.4 Personal Protective Equipment (PPE)
- Employees conducting clearing, grubbing, or similarly disturbing work activities in areas where poisonous plants exist shall wear long-sleeve clothing or Tyvek® coveralls, and disposable cotton, leather or synthetic gloves. Employees shall not touch exposed skin (neck and face) with potentially contaminated gloves. Tyvek® and gloves worn to protect from exposure to poisonous plants shall be treated as contaminated, removed from the body in a manner that the contamination is not spread, and placed in plastic bags for disposal.
  - Personal clothing that has been exposed to poisonous plants shall be decontaminated with a poisonous plant cleanser such as Tecnu® or removed in a careful manner, bagged and washed separately from other clothing to remove urushiol.
  - Work boots will be decontaminated with either soap and water or a cleansing agent such as Tecnu® cleanser.
  - If foliage is being cleared and includes poisonous plants, exposed skin shall be treated with a dermal barrier cream such as Tecnu®'s Oak 'n Ivy Armor or Enviroderm's Ivy Block and either a full-face respirator or a half-face respirator (with goggles) fitted with a P-100 (HEPA) dust filter.
- 4.9 Bird Droppings and Biological Soil Hazards
- 4.9.1 Work in any area where pigeons or other flying animals (e.g. bats) may nest requires a written statement from the client which states the potential for, and extent of, accumulation of excrement on/in the structure from pigeons or other winged animals.
- 4.9.2 Substantial accumulations of droppings can pose physical and health risks as slippery surfaces (if wet) and if the material is disturbed and becomes airborne, it can be inhaled or ingested if personal hygiene practices are not implemented. Inhalation of airborne droppings can cause diseases such as histoplasmosis. Exposure to surfaces with bird droppings shall be safeguarded by implementing proper work practices, training employees for awareness and using PPE. See *S3AM-313-ATT8 Bird Droppings*.

- 4.9.3 Tularemia is a problem with contaminated soil in some locations. Tularemia is a disease of animals and humans caused by the bacterium *Francisella tularensis*. Rabbits, hares, and rodents are especially susceptible and often die in large numbers during outbreaks. Workers can contract Tularemia through tick and deer fly bites, but also through inhalation of contaminated aerosols or agricultural dusts. Check work areas for carcasses before disturbing the ground (e.g. mowing, brushing, grubbing, excavation, etc.).
- 4.10 Personal Hygiene and Body Checks
- 4.10.1 Tick-borne diseases typically require that the tick be imbedded for four hours to begin disease transfer. The oils from poisonous plants can take up to 4 hours after exposure to penetrate the skin and react with the live proteins under the skin.
- 4.10.2 It is recommended that exposed skin be checked frequently for the presence of ticks, insects, rashes, or discolorations. External clothing should also be checked for the presence of ticks and insects; these should be retained for identification and to determine if medical treatment is needed.
- 4.10.3 Employees shall shower as soon as practical after working in the field and examine their bodies for the presence of ticks, insect bites, rashes, or swollen areas. If imbedded ticks are found, they should be removed using the technique described in *S3AM-313-ATT2 Ticks*.
- 4.11 Employees shall immediately notify their Manager or Supervisor of the presence of an imbedded tick, bee, wasp or hornet sting, other insect bite, rash, or any abnormal reaction. Reporting shall occur within 4 hours for a significant incident and 24 hours for all other SH&E incidents, and in accordance with *S3AM-004-PR Incident Reporting, Notifications & Investigation*.
- 4.12 The Manager or Supervisor shall forward the report to the SH&E Manager for follow up.

## 5.0 Records

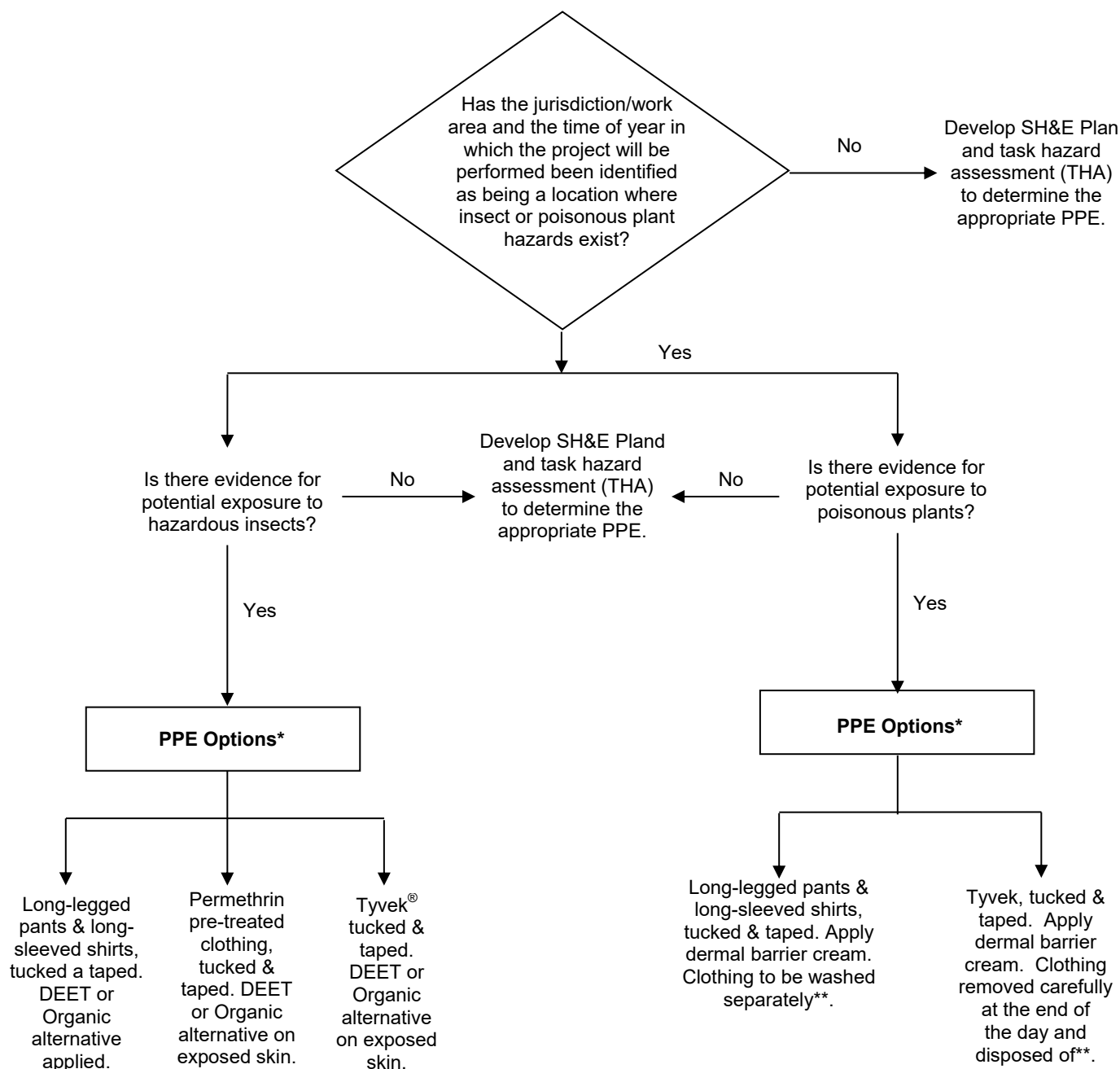
None

## 6.0 Attachments

- 6.1 [S3AM-313-ATT1 Biological Hazard Assessment Flow Chart](#)
- 6.2 [S3AM-313-ATT2 Ticks](#)
- 6.3 [S3AM-313-ATT3 Poisonous Spider Identification](#)
- 6.4 [S3AM-313-ATT4 Mosquito Borne Diseases](#)
- 6.5 [S3AM-313-ATT5 Plants of Concern](#)
- 6.6 [S3AM-313-ATT6 Wild Parsnip Identification](#)
- 6.7 [S3AM-313-ATT7 Alligators](#)
- 6.8 [S3AM-313-ATT8 Bird Droppings](#)
- 6.9 [S3AM-313-ATT9 Large Carnivores & Ungulates](#)
- 6.10 [S3AM-313-ATT10 Bear Safety](#)
- 6.11 [S3AM-313-ATT11 Small Mammals](#)
- 6.12 [S3AM-313-ATT12 Snakes & Scorpions](#)

# Biological Hazard Assessment Decision Flowchart

S3AM-313-ATT1



\* indicates that when both insect and poisonous plant hazards are recognized hazards at a project site, the most conservative combination of the available PPE choices will be selected. Include the selected PPE option in the respective SH&E Plan and THA.

\*\* indicates that clothing that has been known or suspected to have come in contact with poisonous plants must be washed before it can be worn again. Similarly, Tyvek® that has been known or suspected to have come in contact with poisonous plants will be disposed of rather than reused during a subsequent day or project.

## Americas

## Ticks

S3AM-313-ATT2

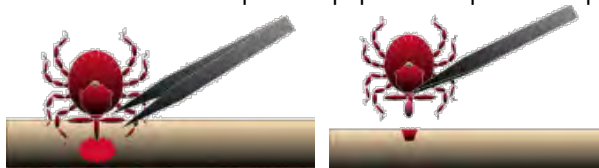
## 1.0 Background

- 1.1 The Public Health Agency of Canada and the Centers for Disease Control and Prevention work with States and Provinces, health authorities and other experts on research to define and monitor the occurrence of the ticks that carry bacterium that cause disease, including but not limited to:
  - 1.1.1 *Borrelia burgdorferi*, the bacterium that causes Lyme disease.
    - In the United States and Canada, the black-legged tick (*Ixodes scapularis*; often referred to as a deer tick) and the western black-legged tick (*Ixodes pacificus*) are the species known to transmit this disease-causing agent, as well as other less common agents.
  - 1.1.2 *Rickettsia rickettsia*, the bacterium that causes Rocky Mountain Spotted Fever.
    - In the United States and Canada, the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), and brown dog tick (*Rhipicephalus sanguineus*) are known to transmit this disease-causing agent.
  - 1.1.3 *Francisella tularensis*, the bacterium that causes Tularemia.
    - In the United States, these include the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), and Lone star tick (*Amblyomma americanum*).
  - 1.1.4 *Ehrlichiosis*, the general name to describe several bacterial diseases that affect animals and humans.
    - In the United States, these include the black-legged tick (*Ixodes scapularis*; often referred to as a deer tick) and the western black-legged tick (*Ixodes pacificus*), and Lone star tick (*Amblyomma americanum*).
- 1.2 Consult local health authorities to determine where tick populations are established or emerging. Locations where distribution may have previously been limited may show evidence of larger populations. Employees working in or adjacent to areas where there are established tick populations may have a greater chance of contact with ticks.
- 1.3 While there is a higher risk of coming in contact with infected ticks in areas where populations are established, there is also a low risk of tick-borne diseases being contracted almost anywhere in the Americas as migratory birds transport infected ticks over large geographic distances. Take precautions to reduce tick contact.
- 1.4 Lyme Disease
  - 1.4.1 The rate of infection of ticks with the bacterium that causes Lyme disease varies. Infection rates are typically higher in adult ticks compared to the other stages (nymphs and larvae).
  - 1.4.2 Despite the lower rates of infection, people are most likely to acquire Lyme disease from a nymph because this stage is so small and thus more likely to go unnoticed and feed for a sufficient amount of time for the Lyme disease bacterium to be transmitted (24-36 hours).
  - 1.4.3 Infection rates are often greater in tick populations that have been established for long periods of time compared to newly established ones.
  - 1.4.4 Lyme disease patients are most likely to have illness onset in April through November with onset peaking in June, July, or August and less likely to have illness onset from December through March

## 2.0 To Remove Attached Ticks



- 2.1 Use fine-tipped tweezers or notched tick extractor, and protect your fingers with a tissue, paper towel, or latex gloves (see figure). Persons should avoid removing ticks with bare hands.
- 2.2 Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. (If this happens, remove mouthparts with tweezers. Consult your health care provider if illness occurs.)
- 2.3 After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- 2.4 Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms. Skin accidentally exposed to tick fluids can be disinfected with iodine scrub, rubbing alcohol, or water containing detergents.
- 2.5 Save the tick for identification in case you become ill. This may help your doctor make an accurate diagnosis of potential diseases by determining what type of tick it is. Place the tick in a sealable plastic bag and put it in your freezer. Write the date of the bite on a piece of paper with a pencil and place it in the bag.



## 3.0 Folklore Remedies Don't Work

- 3.1 Folklore remedies, such as the use of petroleum jelly or hot matches, do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva or regurgitate gut contents, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided.

## 4.0 Configuration of Clothing

- 4.1 Loose-cuff trousers must be tucked into socks, wrapped with duct tape (or equivalent) completely around the cuff of the sock up on to the surface of the pant leg to prevent entry of insects between the sock and pants, and preferably reverse-wrapped with "sticky" side out (see figure below).



## Americas

**Poisonous Spider Identification**

S3AM-313-ATT3

**Black Widow Spider**

- Found in warm, dry parts of throughout the United States and extend into the southern edge of Canada.
- Prefer to spin their webs in dark, sheltered spots close to the ground
- Abdomen usually shows hourglass marking.
- The female is 1 to 1.5 inches (3-4 centimeters) in diameter.
- Have been found in well casings and flush-mount covers.
- Not aggressive, but more likely to bite if guarding eggs.
- Light, local swelling and reddening of the bite are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea.
- If bitten, see physician as soon as possible.

**Brown Spiders (Recluse)**

- Central and South U.S., although in some other areas, as well.
- 0.25-to 0.5-inch (0.6 to 1.3 centimeters)-long body and the size of silver dollar.
- Hides in decaying wood, baseboards, ceilings, cracks, and undisturbed piles of material.
- Bite either may go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of affected tissue, and very slow healing.
- If bitten, see physician as soon as possible.

**Hobo Spider**

- Primarily found in Washington, Oregon, Wyoming, Colorado, Utah, Montana and the Pacific Northwest United States.
- 0.4-to 0.5-inch (1.1 to 1.3 centimeters)-long body and the size of silver dollar.
- Because of its common features and color, it is easily confused with other spider such as Brown Recluse Spiders.
- They rarely climb vertical surfaces and are uncommon above basements or ground level.
- Bite is initially painless. After 24 hours, the bite develops into a blister and after 24-36 hours, the blister breaks open, leaving an open, oozing ulceration.
- If bitten, see physician as soon as possible.



Exercise care when collecting samples and avoid reaching into areas where visibility is limited. If bitten by a spider, attempt to identify the spider, notify a co-worker or someone who can help should the bite site become painful, discolored, or swollen. Stay calm and treat the area with ice or cold water. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or any swelling or numbness beyond the site of the bite.



## Mosquito-Borne Diseases

S3AM-313-ATT4

### 1.0 Background

- 1.1 Employees working outdoors in the Americas may be exposed to mosquitoes that may transmit illnesses, including Encephalitis and Dengue.
- 1.2 Dengue is transmitted by the bite of a mosquito infected with one of the four dengue virus serotypes. Dengue is endemic to South America.
  - 1.2.1 Dengue is a febrile illness that affects infants, young children and adults with symptoms appearing 3-14 days after the infective bite.
  - 1.2.2 Symptoms range from mild fever, to incapacitating high fever, with severe headache, pain behind the eyes, muscle and joint pain, and rash.
  - 1.2.3 Severe dengue (also known as dengue hemorrhagic fever) is characterized by fever, abdominal pain, persistent vomiting, bleeding and breathing difficulty and is potentially fatal.
- 1.3 West Nile encephalitis is an infection of the brain that is caused by a virus known as the West Nile virus.
  - 1.3.1 Most individuals infected with WNV remain asymptomatic. West Nile (WN) fever is typically a mild illness lasting 3 to 6 days.
  - 1.3.2 The main symptoms are sudden onset of fever with chills, rash, malaise, headache, backache, arthralgia, myalgia and eye pain. Other non-specific symptoms may include nausea, vomiting, anorexia, diarrhoea, rhinorrhoea, sore throat, and cough.
  - 1.3.3 The main route of infection is via the bite of a mosquito that has been infected by feeding on West Nile Virus infected birds.
- 1.4 Arboviral encephalitis is a virus that exists in various forms in global distribution. Numerous forms occur in the Americas, including the following four primary forms that can be transmitted by mosquitoes:
  - 1.4.1 Eastern equine encephalitis (EEE) – United States and Canada
  - 1.4.2 Western equine encephalitis (WEE) – United States
  - 1.4.3 St. Louis encephalitis (SLE) – United States and Canada
  - 1.4.4 La Crosse (LAC) encephalitis.all of which are transmitted by mosquitoes – United States
- 1.5 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. Typically, mosquitoes will fly only a quarter of a mile (400 meters) from their breeding location.
- 1.6 The local Public Health Department and Center for Disease Control and Prevention (CDC) should be consulted to determine what diseases transmitted by mosquitoes are present and exposure prevention recommendations.

## Plants of Concern

S3AM-313-ATT5

### 1.0 Background

- 1.1 Poison ivy, oak and sumac (poisonous plants) pose a significant threat to AECOM employees due to the dermatitis that results from exposure to the oil on these plants, called urushiol.



Poison Oak

Poison Sumac

Poison Ivy

- 1.2 Exposure to urushiol produces a rash that can be irritating and cause the exposed employee to scratch the infected area, increasing susceptibility for an infection to result from the rash.
- 1.3 It should be noted that each time an employee is exposed to urushiol, it increases the severity of the reaction they will have in subsequent exposures.
- 1.4 Giant Hogweed is a phototoxic plant that causes skin irritation on contact with the sap and, when exposed to sun causes deep blisters.
- 1.5 Blisters from contact with Giant Hogweed can form black or purplish scars that can last for several years. Even a tiny amount of the sap in the eyes can cause temporary to permanent blindness.



Giant Hogweed



Giant Hogweed Distribution

Image obtained from  
[www.gclandscape.com](http://www.gclandscape.com)

### 2.0 Treatment

- 2.1 In cases that involve severe rashes, medical treatment may be necessary to control the rash.
- 2.2 Employees that develop a rash as a result of exposure to poison ivy, oak or sumac should report the exposure immediately to their Supervisor, Project Manager and Region Safety, Health and Environment Manager.

**Pacific Poison Oak Distribution**



Image obtained from [www.cdc.gov](http://www.cdc.gov)

**Atlantic Poison Oak Distribution**



Image obtained from [www.cdc.gov](http://www.cdc.gov)

**Poison Sumac Distribution**



Image obtained from [www.cdc.gov](http://www.cdc.gov)

**Western Poison Ivy Distribution**



Image obtained from [www.cdc.gov](http://www.cdc.gov)

**Eastern Poison Ivy Distribution**

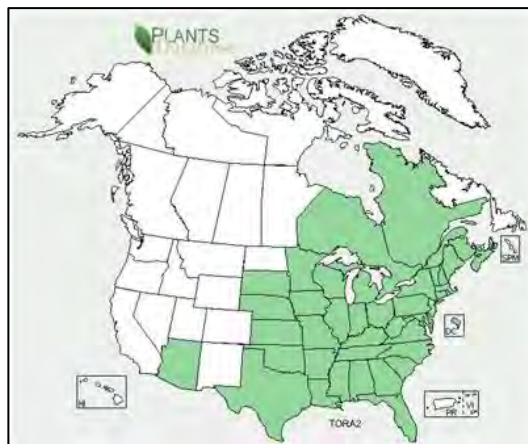


Image obtained from [www.cdc.gov](http://www.cdc.gov)



## Americas

**Wild Parsnip Identification**

S3AM-313-ATT6

**1.0 Background**

- 1.1 Wild parsnip (also known as poison parsnip) looks similar to a large carrot plant and is found in open places along roadsides and in waste places throughout the United States and Canada.
- 1.2 This plant produces a compound that causes severe blistering and discoloration after being exposed to sunlight—a condition known as photodermatitis. That is, when the skin comes in contact with this plant's juice and then is exposed to UV light, a severe burn develops.

**2.0 Hazard**

- 2.1 Everyone can get burned by wild parsnip. Unlike poison ivy, you don't need to be sensitized by a prior exposure. However, wild parsnip is only dangerous when the juice from broken leaves or stems gets on your skin—therefore, you can touch and brush against the undamaged plant without any danger.
- 2.2 If one gets some of the sap of hogweed (or meadow parsnip or cow parsnip) in contact with skin, it is critical that they stay out of the sun for 8 hours. If one needs to remove the plant they should be completely covered with overalls, gloves, hat and safety glasses.



## Bird Droppings Safe Work Practices

S3AM-313-ATT8

### 1.0 Background

- 1.1 According to the National Institute for Occupational Safety and Health (NIOSH), histoplasmosis is an infectious disease caused by inhaling spores of a fungus called *Histoplasma capsulatum* (abbreviated *H. capsulatum*) that may inhabit accumulated masses of pigeon droppings and excrement of other birds and flying animals. Its symptoms vary greatly, but the disease primarily affects the lungs. Occasionally, other organs are affected. This form of the disease is called disseminated histoplasmosis, and it can be fatal if untreated. The acute respiratory disease form of histoplasmosis is characterized by respiratory symptoms, a general ill feeling, fever, chest pains, and a dry or non-productive cough. Distinct patterns may be seen on a chest x-ray. Chronic lung disease resembles tuberculosis and can worsen over months or years. If symptoms occur, they may start within 3 to 17 days of exposure, with an average of 10 days. On a positive note, histoplasmosis is not contagious.
- 1.2 Psittacosis, although primarily a respiratory disease, can cause a wide variety of clinical manifestations. Generally, about 10 days after infection occurs, the clinical illness begins abruptly with fever, chills, weakness, fatigue, muscle pain, anorexia, nausea, vomiting, excessive sweating and difficulty with breathing, headache, backache, and sensitivity to light.
- 1.3 Hypersensitivity pneumonitis is also known as pigeon breeder's disease.

### 2.0 Symptoms

- 2.1 The acute form of hypersensitivity pneumonitis is clinically characterized by chills, fever, cough, breathlessness without wheezing, and malaise 4-10 hours after exposure. In general, an acute attack subsides after 18 to 24 hours.

### 3.0 Treatment

- 3.1 If a person should develop any of the symptoms as noted above, or others, it is important to see a physician and inform him of an exposure to pigeon/bird or bat excrement. A failure to diagnose the preceding conditions could occur if a treating physician is unaware of a patient's exposure to pigeon/bird or bat excrement.

### 4.0 Prevention

- 4.1 Prior to work in any area where pigeons or other flying animals may nest, a written statement from the client shall be obtained in regards to the potential for, and extent of, accumulation of excrement on/in the structure from pigeons and other winged animals.
- 4.2 The client shall be asked to provide appropriate details as to the basis for their statement (e.g., date of last visual survey for pigeon/bird or bat excrement accumulation, date of last excrement removal effort, etc.).
- 4.3 In no case will an AECOM employee or contract employee be permitted to commence structure inspection procedures without the Project Manager having received and evaluated the aforementioned written statement from the client.
- 4.4 According to NIOSH, the best way to prevent exposure to *H. capsulatum* spores during survey and inspection work is to avoid situations where excrement and other potentially contaminated material can become airborne and inhaled. Therefore, it is preferable that the efforts to determine if, and to what extent, there is an accumulation of pigeon/bird or bat excrement on/in structures, or the efforts to clean-up/remove/dispose of such contaminated material, be left to the client or subcontracted out.

## 5.0 Safe Work Practices

- 5.1 In those cases where AECOM employees or contract employees are contracted by the client to determine the extent of accumulation of animal excrement in/on structures, the following minimum safety and health precautions shall be taken. (NOTE: precautionary measures are based on recommendations and best practices prescribed in the NIOSH 2004 public document titled *Histoplasmosis – Protecting Workers at Risk*).
- 5.2 All workers shall wear disposable protective clothing (Tyvek® coveralls). Disposable overalls with hoods shall be donned when working in areas where *H. capsulatum* spore-contaminated material is likely to fall from overhead.
- 5.3 All workers shall wear disposable shoe coverings fitted with ridged soles made of slip-resistant material to reduce the likelihood of slipping on wet or dusty surfaces. Gloves shall be worn.
- 5.4 All workers shall wear a full facepiece air purifying respirator fitted with P100 (HEPA) cartridges. If entering an enclosed area in which the extent of excrement contamination is unknown, additional protective measures shall be taken such that workers shall wear a powered air-purifying respirator (APR) with full facepiece fitted with P100 (HEPA) cartridges. Any variance from these requirements must be approved by the Region Safety, Health and Environment Manager. Workers donning APRs shall be medically screened, cleared, and trained in their proper use in accordance with AECOM safety program standards.
- 5.5 If contaminated material must be disturbed for purposes of removal/disposal or during the structure inspect process, it shall be wetted down prior to all work and will be rewetted as necessary to minimize airborne dusting.
- 5.6 After working in *H. capsulatum* spore-contaminated areas and before removing any respiratory protective equipment, workers shall remove all protective clothing and shoe coverings and seal them in a heavy-duty plastic bag for disposal.
- 5.7 Workers shall observe a high degree of personal hygiene, even if the exposure is casual. Special care shall be taken to wash hands, face, and other areas of exposed skin thoroughly before eating, drinking or smoking.

## Americas

## Large Carnivores & Ungulates

S3AM-313-ATT9

### 1.0 Hazard

- 1.1 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 towards humans; however, all wild animals can be dangerous if they feel threatened or if they are sick or starving.
- 1.2 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 the mating season (September to November) can be very aggressive, especially if provoked.

### 2.0 Personal Protective Equipment

- 2.1 Noise makers such as bear bangers, whistles and bells can be used as deterrents for an approaching animal.
- 2.2 Pepper (bear) spray can be used to ward off an imminent attack.

### 3.0 Safe Work Practice

- 3.1 Most negative encounters with ungulates or carnivores can be avoided with a few key preventative measures:
  - 3.1.1 When working in wilderness isolation, always travel in pairs and make lots of noise.
  - 3.1.2 Always store food in air-tight containers away from sleeping areas (if camping) and never carry strong smelling foods which could attract animals.
  - 3.1.3 Keep your eyes open for fresh animal signs which may indicate a dangerous situation:
    - 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.
    - A fresh kill or carcass which might indicate the presence of a carnivore that may become aggressive to defend its food.
- 3.2 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, you should move away to a safe location. Wildlife should not be enticed by reaching out or simulating calls.
- 3.3 Pets should be kept secure and away from wildlife as their actions can provoke an attack. Moose, deer and other wildlife may appear quite docile; however, if a dog makes them feel threatened, their behavior can become unpredictable.
- 3.4 **If you are approached by a carnivore (wolf, coyote, or cougar):**
  - 3.4.1 Pick up small children immediately.
  - 3.4.2 Try to appear bigger, hold your arms or an object over your head.
  - 3.4.3 Face the animal and retreat slowly. Do not run or play dead.
  - 3.4.4 Maintain steady eye contact with the animal.
  - 3.4.5 If the animal continues to approach, deter an attack by yelling, waving a stick or throwing rocks.
  - 3.4.6 If you are attacked, fight back. Hit the animal with a heavy stick or rock.
- 3.5 **If you are approached by an ungulate (moose, elk, deer, bison or caribou):**
  - 3.5.1 An angry moose, elk or deer will face you with its head and ears lowered.

- 3.5.2 Back away slowly.
- 3.5.3 Look for something to get behind like a tree or a car. You can go faster around an obstacle than the ungulate can.
- 3.5.4 An ungulate is more likely to bluff charge but if it continues the charge and you are attacked in the open, curl up in a ball on the ground. Always protect your head with your arms and lie still.
- 3.5.5 Stay still after the attack until the ungulate moves away.



## Bear Safety

S3AM-313-ATT10

### 1.0 Hazard

- 1.1 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.
- 1.2 The hazard or risk associated with a bear encounter varies significantly depending on the location. It is important to research the project area before field work commences to determine the expected probability of encountering a bear. Remoteness from urbanized areas should not be a criterion, as bears have been encountered within city limits, especially near landfills.
- 1.3 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.
- 1.4 Preparing staff for any type of encounter is key to managing the risk.

### 2.0 Personal Protective Equipment

- 2.1 The best deterrent of a “bad bear encounter” is knowledge: a good understanding of the ecology and the behavior of the bears that will likely be encountered.
- 2.2 Bear Spray and Bear Bangers
  - 2.2.1 Staff must have hands-on training for the safe use of bear spray (a pre-season practice run is a good use of expired bear spray).
  - 2.2.2 Prior to work commencing, staff must ensure that the bear spray they are carrying is still valid and not past its expiration date.
  - 2.2.3 During travel, bear spray must be sealed in an airtight container or bag and must not travel in the cab of a vehicle, aircraft, or helicopter.
- 2.3 Firearms
  - 2.3.1 Environments and conditions which pose a high risk of bear encounters, may warrant the use of an armed wildlife monitor. Project managers, in consultation with appropriate project staff and Safety, Health and Environment Management, are responsible for determining the level of risk for their projects and whether or not such measures are required.
  - 2.3.2 A person hired as an armed bear monitor must be properly trained in wildlife monitoring as well as certified in the expert usage of firearms.
  - 2.3.3 The usage of an armed bear monitor is intended only as an additional precautionary measure to be used in specific environments to ensure the protection of field staff; staff should still be equipped and trained appropriately for the risk.

### 3.0 Restrictions

- 3.1 Staff must not work alone in areas where there is a medium or high risk of a bear encounter.
- 3.2 AECOM personnel shall not carry firearms or attempt to function as a wildlife monitor and/or perform their professional duties. For possible exceptions contact the Regional SH&E Manager who will evaluate the potential hazards with Regional Manager and Legal and provide written response. This can only be overridden with expressed permission of Region Executive and AECOM Chief Resilience Officer, refer to *WP-001-PR Firearms Standard*.

## **4.0 Training**

- 4.1 In-house Bear Awareness training must be taken by all field staff who work in bear country every three years at a minimum, or more often as required.
- 4.2 The Bear Awareness training involves testing and improving the employee's knowledge about bear encounters, watching videos regarding bear awareness and behavior, and participating in group discussions about how to avoid and how to respond to bear encounters.
- 4.3 Specific considerations are given to black bear, grizzly bear, and polar bear encounters.

## **5.0 Safe Work Practice**

- 5.1 Staff must be aware of wildlife signs and avoid wildlife encounters.
- 5.2 Bear Signs
  - 5.2.1 Fresh tracks – It is often better to see the bear's tracks than to see the actual bear. If you can tell the direction that the bear is travelling in, it is prudent to change your course of direction. Bears will travel down the same pathways people or other large animals use. If you have a clear track you can determine which type of bear has passed through the area. If you see more than one track, you can tell that it is possibly a female with cubs. Avoid females with cubs!
  - 5.2.2 Scat – Bear scat will look different depending upon the bear's diet. Close examination of bear scat can sometimes give you an indication of what the bears have been eating at that time of year. If the scat contains remnants of human garbage, there is a human food conditioned bear in the area. These bears associate people with food and can be the most dangerous type of bear to encounter.
  - 5.2.3 Animal carcasses – IF YOU COME ACROSS A CARCASS, LEAVE THE AREA IMMEDIATELY. Grizzly bears will often cover their kills for a few days and let it rot, then come back and eat it. THE BEAR WILL STAY CLOSE BY. Grizzly bears will defend their kill and this is a situation that could prompt a defensive attack by a bear.
  - 5.2.4 Torn-up logs and stumps – Bears will forage for insects in dead logs and rotting trees. You will often see torn up logs and stumps, evidence of their foraging.
  - 5.2.5 Evidence of digging – Holes dug into the ground are often made by grizzly bears digging for roots or ground squirrels. In particular, grizzlies will dig for food in the early spring soon after they leave their dens.
  - 5.2.6 Claw marks on trees – Claw marks can be left on trees by black bears when they have climbed up a tree. Grizzly bears will also leave claw marks on trees and on the ground. Bears will often chew a small tree or a sign-post, so watch for signs of chew marks along the trail.
  - 5.2.7 Hair on trees – Bears will rub against trees, usually trees with rough bark, to scratch themselves. You can find evidence of bears by the hair left in the tree's bark. The higher the hair left on the tree, the bigger the bear. Remember that the bear will often stand on its back legs to scratch its back on the tree.
  - 5.2.8 Daybeds – Bears will be most active in the early morning and in the evening. It would be prudent for field staff to restrict their field activities during the bear's most active foraging times as much as possible. During the heat of the day, bears will rest in daybeds. These can be shallow depressions of piled up leaves in the forest, trampled vegetation, a shallow scrape or a hole. Daybeds are usually located in cool places. Bears will make daybeds along streams and rivers. Daybeds are often associated with feeding places and therefore should be avoided.

### 5.3 Prevention

5.3.1 Your best defense against bears is to actively practice bear avoidance techniques when working in the field. You can prevent chance encounters by taking the following precautions:

- Know the areas and habitats bears use at different times of the year, and attempt to avoid such areas or be extremely cautious if you have to travel through them.
- Contact the local Fish & Wildlife Office to get current information on the bears in the area. Ask what other camps are in the area and if they are following good bear avoidance practices. (i.e., do they keep a clean camp?) If there are nearby human food sources available, e.g., an open dumpsite, the local bears may not be afraid to approach your camp.
- Always be aware of your surroundings. Stay alert. Watch for signs of bears along your route.
- Use binoculars to look around for bears when you are in open terrain.
- Never approach a bear if you see one feeding in the distance.
- Note the behavior of other wildlife in the area. Flocks of ravens can alert you to a possible animal carcass, and perhaps a bear. The area should be avoided. Bird or squirrel alarm calls might be telling you that a bear is near.
- Whenever possible, travel in daylight and try to avoid areas with restricted visibility, e.g., dense brush.
- Make lots of noise, especially when travelling in dense vegetation. Sing, shout, or talk loudly. You can carry portable air horns or cans of rocks. (Please note that bear bells are not effective – they do not make enough noise to warn a bear that you are approaching. You need to be loud so the bear can hear you coming.) Remember that the noise you make can be masked by loud natural sounds such as the wind or water. Therefore it is possible that the noise you make can go unnoticed by a bear whose attention is focused on feeding. You must make every attempt not to surprise a bear. In areas of loud natural noise, be louder!
- Stay together and travel in groups. Bears are less likely to attack groups of people. When travelling in groups, stay close together. Being in a group doesn't help if the individuals have spread apart along the trail.
- Pets should not accompany you when you are travelling in bear country. If you must take your pet, keep the animal on a short leash at all times. Unleashed dogs will harass bears and once scared, run back to their owner with an angry bear in pursuit.
- Do not wear perfumes or cosmetic products when you are travelling in bear country. Do not mask your human scent.
- All sanitary products should be stored in a similar fashion as food (stored at least 10 feet [3 meters] above site).
- Children should be kept very close by in bear country.
- Carry bear deterrents and know their limitations. Be familiar with how to use the deterrents, how to transport the deterrent safely and under what conditions it is most effective. Carry the deterrent in a belt, out in front and ready to grab at a moment's notice, never in your backpack.

### 5.4 Field Worker Precautions in Bear Country

5.4.1 Field workers should take extra precautions when working in bear country:

- Make every effort to go out into the field with another person; you should not be working alone in the field. One person can act as a lookout for the other. Keep watch for bear signs.
- Never approach a bear.
- Report where you are going and when you will return every time you leave camp. Have a plan of action if someone does not report back to camp at a specified time.

- Bears do get used to a camp's schedule and you will have fewer surprise encounters if everyone in the camp comes and goes at the same time every day.
- Take a two-way radio with you when you go out into the field.
- Always carry bear deterrents with you in the field and understand each deterrent's limitations. Carry your deterrents on a belt, out in front and ready to use instantly. Do not carry your deterrents in your backpack.
- Keep any food that you take with you sealed in odor-proof/bear-proof containers. Make every attempt to take odorless food with you, not something with a heavy scent.
- Pack out any garbage in odor-proof containers and burn once you return to camp.
- The noise of an ATV or skidoo can scare off a bear. Starting the machine and revving it up can scare off a curious bear. **DO NOT CHASE A BEAR WITH AN ATV OR SKIDOO.** You may need to drive the ATV around in circles to scare off the bear, but do not chase the bear.
- Take extra precautions when travelling along lakes or stream beds; bears use streams and river beds as travel routes. Be sure to carry noise makers.
- Limit your workday so you are not out in the early morning or evening when bears are most likely to be foraging.
- All **employees** should be proficient in First Aid. Do not go out into the field without first aid training.
- All field camps should have a First Aid Kit.
- All field camps should have means of communication with local ambulance or air ambulance personnel.
- A person's best defense against bears is to avoid them. If this is not possible, then being heard, smelled, or seen may lessen your chances of surprising a bear and/or provoking an attack.
- All wildlife should be respected, avoided, and not harassed at any time.
- Cooking in remote areas should be avoided. Any food should be stored in airtight containers and all garbage should be managed appropriately: "pack it in, pack it out".
- A bear in camp or within human structures is not a chance encounter. If this bear challenges you, you must fight, scream, and do whatever is necessary to live, no matter what species the bear is!
- In general, there are two types of bear encounters: Defensive and Non-defensive for grizzly bears and black bears. Your response will vary based on your assessment of the situation (your training will help you in identifying these situations and the appropriate response).

## 6.0 Encounters

### 6.1 General Recommendations When Encountering a Bear

- Consider your surroundings and assess the situation before you act.
- Remain calm. Do not turn your back to a bear.
- **DO NOT RUN** – Running may trigger the bear's natural pursuit response. Bears are able to reach speeds of 25 miles per hour [40 kilometers per hour], much faster than Olympic sprinters. Bears are also excellent swimmers.

### 6.2 Bear Encounters in the Field

- 6.2.1 Your response will depend upon the type of encounter.

- 6.2.2 Bears are more predictable than once believed and you can determine your best course of action in a confrontation by understanding the bear's characteristics and motivation. There are two pieces of information you should be aware of in any bear encounter:
  - The type of bear you are dealing with, and
  - The reason for the encounter.
- 6.2.3 Some people believe that when you stand your ground against a predatory black bear attack, the bear will feel threatened and leave. This has been effective in some cases. HOWEVER, it is not effective against a grizzly bear predatory attack and it is very difficult to know when it will be effective against black bears. Polar bears do not follow the same behavioral patterns as grizzly and black bears; polar bears are almost always aggressive and will not back down. Special considerations must be given to projects where polar bear encounters are anticipated.
- 6.3 If you can leave undetected:
  - 6.3.1 Leave the area quietly in the same direction that you came from.
  - 6.3.2 Move while the bear's head is down. Stop moving when the bear lifts its head to check its surroundings.
  - 6.3.3 Stay downwind so the bear will not pick up your scent.
  - 6.3.4 When you have moved a safe distance away, you can either watch and wait until the bear leaves or make a wide detour around the bear.
  - 6.3.5 If the bear is unaware of you and approaching, allow the bear the right of way.
- 6.4 If you cannot leave undetected:
  - 6.4.1 Let the bear know that you are present by smell first; therefore move upwind so they can pick up your scent.
  - 6.4.2 If it is possible, try to keep the bear in your sight. Watch to see if the bear leaves when it smells that a person is nearby.
  - 6.4.3 Attempt to move out of the way without being noticed by the bear. If you cannot do this, talk loudly to let the bear know where you are.
- 6.5 If the bear is aware of you but in the distance:
  - Remain calm.
  - Continue walking slowly in the same general direction, but head away from the bear.
  - DO NOT RUN.
  - If the bear begins to follow you, drop your pack or some article, (not food) to distract the bear. This may distract the bear long enough for you to escape. If you drop food for the bear – you will help the bear associate food with humans and teach it that aggressive behaviour will be rewarded with food.
  - If it is a grizzly following you, climb a tree if there is a large tree around. Proper escape up a tree would require scrambling at least 33 feet (10 m), however this is applicable only to Grizzly encounters. Black bears are excellent climbers. Tree climbing should be last resort.
- 6.6 If the bear is aware of you and close:
  - A bear will feel threatened in a close confrontation. The bear's natural tendency will be to reduce or to remove the threat. Assist the bear by acting as non-threatening as possible.
  - Do not make direct eye contact with the bear.
  - Do not make any sudden moves.
  - Do not run!

- The bear needs to identify you as a person, so talk in low tones and slowly wave your arms over your head.
- Attempt to give the bear an opportunity to leave. Be sure the bear has an open escape route. Do not corner a wild animal.
- Try to back away slowly and/or climb a tree if appropriate.
- Attempt to deter the bear if you are in a safe position.

6.7 If the bear is close and threatening:

- If you have a deterrent such as a bear banger or bear spray, be prepared to use it depending on how close the bear is. Try to scare the bear off.
- If you do not have a deterrent, or if using the deterrent is not successful, act as non-threatening as possible.
- Talk to the bear in a calm authoritative tone of voice.
- Do not startle or provoke the bear by making sudden moves.
- Never imitate the bear's aggressive sounds, signals or posture. The bear is attempting to establish dominance and imitating its moves is a challenge to its dominance.
- Back slowly away from the bear and drop a pack or some other article in order to distract the bear momentarily.
- Remember that the bear may be defending cubs that you have not yet seen or they have a food cache nearby. Attempt to look as non-threatening as possible.

6.8 If the bear is very close and approaching:

- A distance of less than 164 feet (50 meters) in an open area and closer in a forested area.
- If the bear continues to approach, use your deterrent.
- If the bear does not respond to the deterrent you must now **STAND YOUR GROUND!**
- If the bear continues to approach and is acting aggressive, **YOU MAY HAVE TO SHOOT** if you are carrying a firearm.

6.9 If the Bear Charges:

- A bear will charge you at high speed down on all four legs and often crouched low to the ground.
- Bears do not charge when standing up on the hind legs.
- Many charges are bluffs and the bear will often stop or veer off just at the last minute. It is difficult to know if the bear is bluff charging or not until it gets very close.
- When faced with a charging bear you have two options:
  - Use your bear deterrent; or
  - Roll into a ball and cover your neck and head with your arms if you are unarmed and have no other choice.

**Small Mammals****S3AM-313-ATT11****1.0 Hazard**

- 1.1 Working in the field either directly or indirectly with small mammals has inherent risks of injury or exposure to zoonotic diseases (infectious diseases that can be transmitted from animals to humans) that all field staff need to protect themselves against.
- 1.2 The risks are usually higher when there is direct contact with a wild animal, either through a break in the skin (blood), saliva, or excrement; however, there are also risks through air-borne diseases (e.g., Hantavirus).
- 1.3 Obviously, 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.

**2.0 Personal Protective Equipment**

- 2.1 Full-length clothing (long sleeves and pants)
- 2.2 Insect repellent
- 2.3 Respiratory equipment (when directly handling wildlife)
- 2.4 Gloves (when directly handling wildlife)

**3.0 References**

- 3.1 None.

**4.0 Restrictions**

- 4.1 Wildlife handling must only be completed under direct supervision of an experienced individual.

**5.0 Training**

- 5.1 Any staff that will be handling wildlife must be adequately trained and/or supervised by a wildlife biologist experienced in the job task.

**6.0 Safe Work Practice**

- 6.1 Wild animals can carry a variety of diseases that humans can contract: viral, parasitic, bacterial, and protozoal. Basic Personal Protective Equipment such as full-length clothing, gloves and a respiratory mask will greatly reduce the risk of exposure.
- 6.2 Treat unknown dogs encountered in field activities in the same manner as a wild animal. Be conscious of behaviors that seem to indicate anxiety (tail under the belly), defensiveness or aggressiveness, and attempt to leave the area if these are identified.
- 6.3 Whenever a wild animal must be handled, the procedure must be accomplished as safely and quickly as possible.
- 6.4 Proper techniques must be employed to avoid or minimize the risk of personal injury while, at the same time, avoiding or minimizing injury to the animal.
- 6.5 Gloves, catch sticks, caging, and other appropriate equipment may be necessary when handling a wild animal. Most of these animals will be extremely stressed, resisting every restraint attempt.

- 6.6 In the unfortunate circumstance that a person is bitten or scratched, he or she should cleanse the wound thoroughly with soap and flush with water immediately, providing for a mechanical removal of potentially infective organisms. This should be followed by cleansing under medical supervision and consultation with a physician to consider the potential exposure to the rabies virus.

## **7.0 Rabies**

- 7.1 You will not be able to accurately determine if an animal has rabies simply by observation as traditional symptoms of rabies (foaming at the mouth, biting, etc.) do not occur in all animals nor at all stages. There are some mammals that are at a higher risk than others for the rabies virus, such as raccoons, skunks, stray cats and dogs, foxes, coyotes, rodents, and bats; however, any mammal can contract the virus.
- 7.2 Rabies is contracted by contact of an infected animal's saliva with an open wound – a bite or a scratch.
- 7.3 Symptoms of rabies in humans usually do not present themselves for a minimum of 10 days to a year or longer (the average is 30 to 50 days). Symptoms are typical of a flu, including malaise, loss of appetite, fatigue, headache, and fever. Over half of all patients have pain (sometimes itching) or numbness at the site of exposure. They may complain of insomnia or depression. Two to ten days later, signs of nervous system damage appear; these include hyperactivity and hypersensitivity, disorientation, hallucinations, seizures, and paralysis.
- 7.4 Because rabies is so difficult to detect and positively identify, it is very important to consult a physician immediately. If rabies is a possibility, begin treatment with the rabies vaccine as soon as possible (unlike other vaccines, rabies vaccination begins after exposure because the virus takes a comparatively long time to induce disease).

## **8.0 Hantavirus**

- 8.1 Rodents can carry a variety of diseases; of notable concern is the North American hantavirus which can cause Hantavirus Pulmonary Syndrome (HPS).
- 8.2 A common host of the hantavirus is deer mouse and related species (*Peromyscus* spp.), which are common throughout much of North America.
- 8.3 Although infection is rare, it can be fatal and, therefore, it is necessary that risk of exposure be minimized. Infection can be spread to humans when they:
  - 8.3.1 Breathe air contaminated by deer mouse saliva, urine or feces containing infectious hantaviruses; or
  - 8.3.2 Accidentally rub eyes, mouth or broken skin with hantavirus-infected deer mouse saliva, urine or feces.
- 8.4 The following precautions will be taken for all field operations:
  - 8.4.1 Limit exposure to soils handling and use gloves where appropriate.
  - 8.4.2 Wash or sanitize hands often throughout the day and before meals.
  - 8.4.3 Equipment bags, storage areas, and vehicles will be inspected daily for signs of deer mouse infestation.
  - 8.4.4 Rodent-proof storage containers will be used when practical.
  - 8.4.5 Do not enter buildings infested with deer mice without adequate respiratory protection.
  - 8.4.6 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.
- 8.5 If flu-like symptoms develop three days to six weeks after exposure to rodents, a doctor should be contacted immediately (mechanical ventilation is the primary method of treatment).



## **9.0 Bubonic Plague**

- 9.1 The bacteria that cause plague, *Yersinia pestis*, maintain their existence in a cycle involving rodents and their fleas.
- 9.1.1 In urban areas or places with dense rat infestations, the plague bacteria can cycle between rats and their fleas.
- 9.1.2 Humans may contract the plague bacteria through:
- Infected flea bites.
  - Contact with contaminated fluid or tissue of a plague infected animal.
  - Infectious droplets from an infected person coughing into the air (very uncommon in the United States, but relatively frequent in developing countries).
- 9.1.3 Individuals infected develop sudden onset of fever, headache, chills, and weakness and one or more swollen, tender and painful lymph nodes (called buboes).
- 9.1.4 Immediate medical attention is necessary to prevent complications or death.
- 9.1.5 Rodent control measures should be employed at AECOM locations.
- 9.1.6 Wear gloves if handling potentially infected animals to prevent contact between skin and the plague bacteria. Contact the local health department with any questions about disposal of dead animals.
- 9.1.7 Repellent shall be used if there is potential exposure to rodent fleas. Products containing DEET can be applied to the skin as well as clothing and products containing permethrin can be applied to clothing (always follow instructions on the label).

## Snakes & Scorpions

S3AM-313-ATT12

### 1.0 Hazard

- 1.1 Snakes have the ability to inject venom. A bite from a venomous snake, which may inject varying degrees of toxic venom, is rarely fatal but should always be considered a medical emergency.

### 2.0 Personal Protective Equipment

- 2.1 Long pants and shirts
- 2.2 Heavy gloves if staff will be handling debris or be close to the ground
- 2.3 Rubber boots, or boots that fully cover the foot (not sandals!) and preferably are at least 10 inches (25 centimeters) high
- 2.4 Snake Chaps that cover at least the shin
- 2.5 Personal first aid kit

### 3.0 Restrictions

- 3.1 Staff must not work alone in areas where the risk of a snake encounter is high.

### 4.0 Safe Work Practice




- 4.1 Prior to going into the field, staff should research the area and identify what species are present. Once confirmed, staff should contact local hospitals to identify which carry anti-venom and include that information into the SH&E Plan and THA.
- 4.2 Staff working in areas known to be inhabited by venomous snakes should take extra precautions, be able to identify the local snake species, and understand the best practices for administering first aid.
- 4.3 Most snakes in Canada are non-venomous; and most snake bites are not fatal, only painful. Learning to identify snake species will assist you in responding appropriately to an encounter, and will assist medical professionals in determining if antivenin needs to be administered if anyone is bit.
- 4.4 Most snakes are non-aggressive and will only attack if immediately threatened.
- 4.5 Prevention
  - 4.5.1 Before venturing out into the wilderness, familiarize yourself with the snakes in your area, both venomous and non-venomous species.
  - 4.5.2 Learn which habitats the venomous species in your region are likely to be encountered in, and use caution when in those habitats.
  - 4.5.3 Try as much as possible not to take a snake by surprise.
  - 4.5.4 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, or when collecting firewood. Take care when overturning any objects on the ground when in snake country.
  - 4.5.5 If you see a snake, give it as much room as possible. Most snakes have a strike distance that is only half the length of their body.
  - 4.5.6 If you get very close to a rattlesnake, hold very still until it calms down and starts to move away. Then slowly move backwards until you are at least one snake-body length away.

#### 4.6 Treatment


- 4.6.1 A bite from a venomous snake should be considered a major medical emergency. Emergency services should be contacted immediately and staff should follow the direction of the medical responders.
- 4.6.2 Try to keep the snakebite victim still, as movement helps the venom spread through the body.
- 4.6.3 Keep the injured body part motionless and just below heart level.
- 4.6.4 Keep the victim warm, calm, and at rest, and transport him or her immediately to medical care.
- 4.6.5 Do not allow him to eat or drink anything.
- 4.6.6 If medical care is more than half an hour away, wrap a bandage a few inches above the bite, keeping it loose enough to enable blood flow (you should be able to fit a finger beneath it). Do not cut off blood flow with a tight tourniquet. Leave the bandage in place until reaching medical care.
- 4.6.7 Identify the snake that caused the bite to determine if it is venomous, and if antivenin needs to be administered. Do not waste time or endanger yourself trying to capture or kill it. Note the shape and color of the snake's head.
- 4.6.8 If you are alone and on foot, start walking slowly toward help, exerting the injured area as little as possible.
  - Note that there are several species of snakes that superficially resemble rattlesnakes. Several species, including Bull, Milk, Fox, and Rat Snakes will even rattle their tails when startled.
  - Massasauga Rattlesnake is recognized as a Threatened Species in Ontario and it is an offence to harass, or destroy the habitat of this species.
- 4.6.9 Workers in scorpion habitat have the potential to be stung.
  - 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.
  - Scorpions are found in Southern and Southwestern United States.
  - One scorpion species, the Northern Scorpion (*Paruroctonus boreus*) occurs in semi-arid areas of southern British Columbia, Alberta, and Saskatchewan. It carries a stinger on the end of its tail. The sting is painful but not life threatening unless there is an allergic reaction.
  - Workers should wear long sleeves and pants. Clothing and shoes should be shaken out before put on.
  - Symptoms of a scorpion sting may include:
    - A stinging or burning sensation at the injection site (very little swelling or inflammation)
    - Convulsions
    - Staggering gait
    - Slurred speech
    - Drooling
    - Muscle twitches
    - Abdominal pain and cramps
  - Scorpion stings may be painful, but most are harmless. In the United States, only the Bark Scorpion has venom that can potentially cause severe symptoms.
  - Scorpions capable of lethal stings are found predominantly in Mexico and South America.
  - If there is any question as to what type of scorpion caused the sting, contact medical services immediately.



## 5.0 Species

### 5.1 Venomous Snakes in Canada

<p>Eastern Massasauga Rattlesnake (<i>Sistrurus catenatus</i>) found around Wainfleet, Windsor, Bruce Peninsula and eastern Georgian Bay in Ontario.</p>	 <p>Eastern Massasauga Rattlesnake picture by Michael Redmer/Courtesy Lincoln Park Zoo</p>
<p>Northern Pacific Rattlesnake (<i>Crotalus viridis</i>) found primarily in Okanagan and Thompson River valleys of southern British Columbia.</p>	 <p>LANCE TANNAHILL 2000</p>
<p>Prairie Rattlesnake (<i>Crotalus viridis</i>) found in south eastern Alberta, and south western Saskatchewan.</p>	

### 5.2 Venomous snakes in the United States

<p>Rattlesnake(<i>Crotalus cerastes</i>) found mostly concentrated in the southwestern United States, they extend north, east and south in diminishing numbers and varieties. Every contiguous state has one or more varieties of rattlesnake.</p> <p>The rattlesnake is found in many different biomes ranging from along the coast at sea level, the inland prairies and desert areas to the mountains at elevations of more than 10,000 feet.</p> <p>Species include: Sidewinder, Santa Catalina, Western,</p>	 <p>Western Rattlesnake</p>
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<p>Mojave, Red Diamond, Western Diamond, Ridge Nosed, Eastern Diamondback, and Pigmy.</p>	 <p>Eastern Diamondback</p>
<p>Copperhead (<i>Agkistrodon contortrix</i>) is the most common venomous snake found in the eastern United States. It can be found in the states of Texas, Oklahoma, Kansas, Missouri, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, South Carolina, North Carolina, Tennessee, Kentucky, Virginia, Illinois, Indiana, Ohio, Iowa, Pennsylvania, Maryland, New Jersey, Delaware, New York, Connecticut, and Massachusetts.</p>	
<p>Cottonmouths (water moccasins) (<i>Agkistrodon piscivorus</i>) found in the eastern United States from Virginia, south through the Florida peninsula and west to Arkansas, eastern and southern Oklahoma, and east and central Texas.</p>	
<p>Coral Snake (<i>Micrurus sp.</i>) found in the southern range of many temperate United States including North Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, Arkansas, Kentucky, Arizona, and New Mexico.</p>	 <p>Eastern Coral Snake, <i>Micrurus fulvius</i></p>

## Drilling, Boring & Direct Push Probing

S3AM-321-PR1

### 1.0 Purpose and Scope

- 1.1 This document provides procedures designed to help prevent injuries to personnel working on the project and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with drilling, boring and direct-push probing. These hazards include, but are not limited to, encountering underground utilities, subsurface installations, rotating equipment and potential overhead hazards.
- 1.2 This procedure provides the minimum requirements to be followed when drilling, boring, and probing work are performed.
- 1.3 This procedure applies to all Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.
- 1.4 The Manager is responsible for meeting all the requirements in this procedure.
- 1.5 AECOM's clients may have specific procedures which shall be followed to identify and map utility and subsurface structures on their properties or facilities. Provided the client's procedures meet or exceed those of AECOM, approval shall be obtained from the Manager and the SH&E Manager to follow the client's procedures.

### 2.0 Terms and Definitions

- 2.1 **Underground Utilities** – All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling, and communications, etc.
- 2.2 **Ground Disturbance (GD)** – Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work that results in the penetration of the ground.
- 2.3 **Intrusive Activities** – Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits / trenches or other man-made cuts, cavity, trench, or depression in an earth surface formed by earth removal.
- 2.4 **Subsurface Installations** – Examples: Subterranean tunnels, underground parking garages, and other structures beneath the surface.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-118-PR1 Hearing Conservation
- 3.3 S3AM-208-PR1 Personal Protection Equipment
- 3.4 S3AM-209-PR1 Risk Assessment & Management
- 3.5 S3AM-213-PR1 Subcontractor Management
- 3.6 S3AM-305-PR1 Hand & Power Tools
- 3.7 S3AM-306-PR1 Highway and Road Work
- 3.8 S3AM-322-PR1 Overhead Lines
- 3.9 S3AM-322-FM1 Overhead Electrical Lines Acknowledgement
- 3.10 S3AM-325-PR1 Lockout Tagout
- 3.11 S3AM-326-PR1 Machine Guarding
- 3.12 S3AM-331-PR1 Underground Utilities

3.13 S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist

## 4.0 Procedure

### 4.1 Roles and Responsibilities

#### 4.1.1 Manager

- Confirm the development of the project SH&E Plan and compliance with this procedure.
- Confirm the appropriate equipment and materials are available to conduct the drilling, boring or direct-push operations.
- Confirm compliance with *S3AM-331-PR1 Underground Utilities*.
- Review the *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* prior to authorizing work to proceed.
- Confirm that employees conducting drilling, boring or direct-push probing possess any required training, registrations or certifications.
- Confirm all employees involved and affected by the task review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Provide authorization (with the concurrence of the Site Supervisor and SH&E Manager) for work to resume if interrupted due to unexpected conditions or events.

#### 4.1.2 Safety, Health & Environment (SH&E) Manager

- Assist AECOM management as needed by providing guidance and clarification as to issues that may arise.
- Review the project SH&E Plan to confirm compliance with jurisdictional regulations. Provide technical guidance as needed when a variance is pursued related to this procedure. Confirm variance process meets requirements identified in *S2-001-SM1 Global SH&E Management System Manual*.

#### 4.1.3 Employees

- Maintain training as appropriate to the work to be completed (e.g., ground disturbance, lockout tagout, equipment operation, etc.). Refer to *S3AM-003-PR1 SH&E Training*.
- Review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- As appropriate to the anticipated or encountered hazards and as addressed in the applicable planning documentation, utilize appropriate personal protective equipment (PPE) and applicable training, practices and operating procedures.
- Immediately notify the Manager of any unanticipated conditions or events. If assigned equipment, perform appropriate inspections and confirmations of maintenance and / or repairs.

### 4.2 Training

- 4.2.1 All on-site employees involved with drilling, boring, and direct-push probing shall be trained, at a minimum, in these procedures and in the procedures of *S3AM-331-PR1 Underground Utilities*.
- 4.2.2 All operators and assistants shall have the appropriate safety training based on the SH&E Training Matrix and any additional training assessments developed at the business group, and be versed in the equipment to be utilized.
- Refer to *S3AM-003-PR1 SH&E Training*.

- This training may include, but is not limited to, Excavation / Trenching (Ground Disturbance), HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and H2S Alive as appropriate.
  - Only qualified personnel shall operate and inspect equipment.
- 4.2.3 All on-site Employees involved with drilling, boring, and direct-push probing activities shall be provided with on-site orientation of the drill rig and its operation.
- 4.2.4 All Employees involved with drilling, boring and direct-push probing activities at a client site shall receive the applicable client-required training.
- 4.3 Planning
- 4.3.1 SH&E Plan – At a minimum, a SH&E plan that includes a pre-job hazard assessment shall be prepared and communicated to all involved personnel prior to any drilling, boring, and direct-push probing activities. Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- Assessment shall include both overhead and subsurface utilities and installations. Refer to *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities*.
  - The SH&E Plan will address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
  - All SH&E Plan requirements will be followed by the project team.
  - The location specific emergency response plan shall be in place, contain procedures applicable to the potential emergencies presented by the operations, and be reviewed with all personnel potentially affected.
- 4.3.2 A Task Hazard Assessment (THA) shall be completed before every assigned task at the work location. The focus of the analysis shall be on the specific assigned task and the evaluation of risks and assignment of control measures based on actual work conditions.
- 4.3.3 *S3AM-321- ATT2 Pre-Drilling, Boring & Direct-Push Probing Flow Chart* summarizes the key Pre-Drilling, Boring, and Direct-push probing requirements addressed in this procedure.
- 4.3.4 Procedures and documentation as detailed in *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities* shall be completed prior to any intrusive subsurface work.
- The locations of subsurface and overhead utilities and subsurface installations will be investigated, documented, mapped on a site plan and evidenced with appropriate surface markings.
  - A site walk shall be conducted by the project team / site Manager and any other appropriate personnel, with the objectives of reviewing all planned intrusive activity locations, the locations of subsurface and overhead utilities and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.
  - All proposed subsurface activities will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.
  - Appropriate clearance activities shall confirm location(s) of identified underground utilities and subsurface structures. Review the applicable completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.
  - Site Walks should be repeated as necessary following the clearance of subsurface utilities and installations to confirm hazards are clearly identified.
- 4.3.5 Confirm drilling location(s) and / or bore entry and bore exit points are adequately identified on the worksite to enable appropriate equipment positioning.
- 4.4 Permits, Notifications and Access Agreements



- 4.4.1 Any required notifications shall be provided within the appropriate timeframe to the applicable organization (e.g. owner, agency, governing body, etc.).
- 4.4.2 All applicable permits (e.g. client, government, working near rail road, etc.) will be identified, obtained, and adhered to.
- 4.4.3 Access agreements will be obtained and adhered to as necessary.
- 4.5 Pre-Qualifying and Re-Qualifying Drilling Subcontractors
  - 4.5.1 All drilling subcontractors will be properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management*.
  - 4.5.2 The qualifications of the drilling crew performing the work will be evaluated prior to each mobilization and each day by AECOM's on-site representative to assure that their safety performance, training, qualifications, equipment, processes, and approaches reflect AECOM standards for excellence.
  - 4.5.3 All drilling subcontractor equipment will be properly maintained and properly equipped, and the drilling subcontractor will verify their equipment is fully functional as a normal part of their daily and pre-work routine. Refer to *S3AM-321-FM1 Daily Drilling, Boring & Direct Push Equipment Inspection*.
- 4.6 General Health and Safety
  - 4.6.1 Personal Protective Equipment – Refer to the *S3AM-208-PR1 Personal Protection Equipment* for best practices. These requirements may be modified or expanded in the SH&E Plan. Clothing shall be close fitting and comfortable without loose ends, straps, draw strings, belts, or otherwise unfastened parts that might catch on some rotating or translating component of the rig.
    - Depending upon the hazards present, additional PPE may be required such as fire retardant clothing, specific hearing protection, respiratory protective equipment and chemical protective clothing.
    - If the location has potential for underground electrical utilities to be present, workers shall ensure footwear has additional protection of shock resistant soles required (white rectangle with omega symbol).
  - 4.6.2 Hearing Conservation – Hearing conservation program requirements may apply when working around operating equipment. Refer to *S3AM-118-PR1 Hearing Conservation*.
    - Each worker shall wear noise-reducing ear protectors around operating equipment or during elevated noise levels. Distance from the elevated noise level is the primary measure of control for non-essential drilling personnel.
- 4.7 Drilling, Boring and Direct Push Equipment Maintenance and Inspections
  - 4.7.1 All equipment will be inspected prior to the initiation of operations and daily during operations using the *S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection*. This inspection is the responsibility of the operator who will provide written documentation of the inspection prior to the start of drilling each day.
    - Equipment that is deemed defective will immediately be repaired by a qualified person, or, if repair is not practicable, tagged "Out of Service" and sent for repairs or discarded.
  - 4.7.2 Managers shall confirm an accurate inventory of the equipment within their operation requiring scheduled maintenance is developed. Using applicable regulations, industry standards, best practices, and manufacturer's recommendations, a maintenance schedule shall be developed with defined responsibility, required actions, and frequency. Refer to *S3AM-321-FM2 Drilling, Boring, & Direct-Push Equipment Maintenance Inventory*.
  - 4.7.3 The maintenance program for equipment shall:

- Adhere to applicable regulations, standards, and manufacturers' specifications;
- Provide for service by appropriately qualified maintenance personnel; and,
- Require maintenance schedules and records of maintenance.

4.7.4 Employees or operators who are assigned equipment are required to review maintenance schedules for that equipment and will confirm that required maintenance has occurred or see that it is undertaken.

#### 4.8 General Requirements

4.8.1 Excluding geoprobe activities, set up any sample tables and general work areas for employees at a safe distance from the rig.

- The recommended safe distance is the height of the fully extended mast plus 5 feet (1.5 meters), and no less than 30 feet (9.1 meters) from the rig.
- An increase to this distance may be required due to noise exposure hazards. Refer to *S3AM-118-PR1Hearing Conservation*.

4.8.2 Operation of the drilling, boring or direct-push equipment shall be restricted to the designated operator except to activate the emergency shut-off as required.

- All rotary drilling equipment shall have an emergency shut off / kill switch. The location of the switch and operation should be reviewed with all involved Employees.

4.8.3 Sit-on direct push rigs are not permitted on AECOM worksites unless the rig has been modified (in accordance with manufacturer's requirements) to be operated by remote control or the rig has been manufactured with a rollover protection system and seat belt.

4.8.4 Consult jurisdictional regulations as use of J-hooks and cat-heads may be prohibited. Examples:

- 29 CFR 1926 requires derricks and cranes to use hooks with self-closing latches and permits the use of J-hooks only for a task unrelated to this procedure (setting trusses).
- British Columbia and Saskatchewan prohibit the use of friction cat-heads.

#### 4.9 Identifying the Work Area

4.9.1 Ensure the work area is adequately identified:

- Including zone around the drilling, boring, or direct push equipment, as well as fluid equipment, entry point, exit point and any excavated areas.
- Utilize barricades, signage, pylons, snow fence, etc. as appropriate.
- Implement traffic control as necessary.
- Coordinate with concurrent operations to identify their associated hazards and controls, and communicate those associated with AECOM tasks.

4.9.2 When operating near public vehicular and pedestrian traffic, the on-site personnel shall take every precaution necessary to see that the work zone is properly established, identified, and isolated from both moving traffic and passer-by pedestrians (refer to *S3AM-306-PR1 Highway and Road Work*).

4.9.3 All traffic control devices shall be installed, placed, and maintained in accordance with a Traffic Control Plan, client specifications, and / or the Manual of Uniform Traffic Control Devices and Manual of Uniform Traffic Control Devices for Canada in Canada. Traffic control devices shall consist of and not be limited to

- Directional and informational signage;
- High visibility barricades, cones, or barrels;
- Lighting; and
- Other equipment and devices as required.

#### 4.10 Clearing Work Areas

- 4.10.1 In addition to any minimum requirements the drilling subcontractor may have, prior to set up, adequate site clearing and leveling shall be performed to accommodate the rig and supplies and provide a safe working area.
- 4.10.2 Clearing the site includes clearing the intended drilling area obstacles and of underground utilities in accordance with *S3AM-331-PR1 Underground Utilities*.
- 4.10.3 Drilling or probing shall not commence when tree limbs, unstable ground, or site obstructions cause unsafe tool handling conditions.
  - The cleared / levelled area should be large enough to accommodate the rig and supplies.
  - If the rig is positioned on a steep grade and levelling of the ground is impossible or impractical, the wheel of the transport vehicle shall be blocked and other means employed of preventing the rig from moving or toppling over.
- 4.11 Drilling Activities
  - 4.11.1 Federal / State / Provincial / Territorial regulations that govern drill rig operations and exposed moving parts shall be adhered to.
  - 4.11.2 All applicable client on-site safety procedures shall be understood and adhered to.
  - 4.11.3 Minimum approach distances (MAD) from subsurface and overhead utilities and subsurface installations will 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 further depending on line voltage). These approach distances are a minimum; government regulations and utility requirements may dictate a greater set back distance and should be confirmed.
  - 4.11.4 Verify that equipment / energy is isolated when lockout is required:
    - Refer to operator's manual and *S3AM-325-PR1 Lockout Tagout*.
    - Ensure stop switch is activated.
    - Driller is out of the seat.
    - Test controls to ensure they do not engage.
  - 4.11.5 In addition to any identified minimum requirements (as applicable, client, drilling subcontractor), the following safety measures shall be taken during drilling, boring or probing operations on site:
    - The operator and helper shall be present during all active rig operations.
    - Site personnel shall remain within visual contact of the rig operator.
    - Hard hats, approved safety boots, safety glasses, and hearing protection shall be worn in the work zone (minimum, the radius around the rig equal to the height of the drill rig mast) of a rig.
    - Gas monitoring shall be conducted as appropriate.
    - Hands, feet and other body parts shall be kept away from moving parts, (e.g. hoisted, rotating, pushing, etc.) including augers, drill rods and reamers.
    - When observing drilling, stand upwind of the drill rig to prevent potential exposure to vapors that may be emitted from the borehole.
    - The emergency shut-off switch on the rig shall be identified to site personnel and tested on a daily basis by the operator.
    - Unauthorized personnel shall be kept outside of the established work zone.
    - Rig crew and other worksite personnel shall not use a cell phone while operating the drill rig or other equipment or within the rig work zone.
    - Do not drive the rig from hole to hole with the mast (derrick) in the raised position.
    - Before raising the mast (derrick) look up to check for overhead obstructions. Refer to *S3AM-322-PR1 Overhead Lines*.

- Before raising the mast (derrick), all rig personnel (with the exception of the operator) and visitors should be cleared from the areas immediately to the rear and the sides of the mast. All rig personnel and visitors should be informed that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig shall be first levelled and stabilized with levelling jacks and / or solid cribbing.
  - The drill rig shall be releveled if it settles after initial set up.
  - Lower the mast (derrick) only when the levelling jacks are down, and do not raise the levelling jack pads until the mast (derrick) is lowered completely.
- After the rig has been positioned to begin drilling, all brakes and / or locks shall be set before drilling begins.
- The operator of a rig shall only operate a drill rig from the position of the controls. The rig shall not be in operation if the operator of the rig leaves the area of the controls.
- Throwing or dropping tools shall not be permitted. All tools shall be carefully passed by hand between personnel or a hoist line should be used.
- If it is necessary to operate the rig within an enclosed area, make certain that exhaust fumes are conducted out of the area.
  - Exhaust fumes can be toxic and some cannot be detected by smell.
  - Air monitoring and, as necessary, noise monitoring shall be conducted.
- Clean mud and grease from boots before mounting a rig platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.
- During freezing weather, do not touch any metal parts of the rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- All unattended bore holes shall be adequately covered or otherwise protected to prevent rig personnel, site visitors, or animals from stepping or falling into the hole. All open bore holes shall be covered, protected, or backfilled adequately and according to Federal / State / Provincial / Territorial or local regulations on completion of the drilling project.
- When using a ladder on a rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending and descending. Always use adequate fall protection and a full body harness when climbing above 6 feet (1.8 meters) of the ground. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool "bucket" or a safety hook to raise or lower hand tools.

#### 4.12 Drilling Fluid

- 4.12.1 Ensure drilling fluid is appropriate to the soil type and conditions to be encountered to enable smooth drilling.
- 4.12.2 Drilling fluid used in the boring process shall be contained at the entry and, as applicable, exit locations until recycled or removed from the site.
- 4.12.3 Confirm drilling fluid does not enter roadways, streams, municipal storm or sanitary sewer lines, and / or any other drainage system or body of water.
- 4.12.4 Monitor drilling equipment and fluid equipment for any leakage or spills. Confirm appropriate containment is in place and adequate spill response supplies are available.
- 4.12.5 It is important to monitor fluid flow and pressure gauges when drilling with any tooling, but it is essential when drilling with a mud motor (pump placed in the drill string to provide additional power to the bit while drilling).

#### 4.13 Unanticipated Concrete / Debris or Void

- 4.13.1 The presence of subsurface installations and utilities requires special care when obstructions / refusal and voids are encountered and when unexpected absence of soil recovery occurs during

drilling operations. Other indicators of subsurface installations and utilities are the presence of warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks) and any departure from native soil or backfill.

- 4.13.2 If unanticipated concrete / debris is encountered and / or if a void is encountered, drilling will be immediately discontinued and the Manager notified. Drilling may only proceed with Manager or SH&E Manager approval.

#### 4.14 Use of Manual Slide Hammer

- 4.14.1 The following health and safety procedures should be followed when using a manual slide hammer to install shallow injection points, drive point piezometers, and drill tools:

- Only use a manual slide hammer that either attaches directly to the point / piezometer being driven or that incorporates a cap on the point / piezometer / drill tool that prevents the slide hammer from slipping off the point / piezometer / drill tool.
- Always grasp the manual slide hammer (handles if equipped with handles) with both hands while driving the point / piezometer / drill tool.
- Never allow hands or feet to get between the manual slide hammer and the drive plate or anvil.

#### 4.15 Use of Augers

- 4.15.1 The following general health and safety procedures should be followed when supervising borings with continuous flight hollow-stem augers:

- Never place hands or fingers under the bottom of an auger section when it is being hoisted over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When augers are rotating, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.
- Use a long-handled shovel to move auger cuttings away from a rotating auger. Never use hands or feet to move cuttings away from a rotating auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.
- Loud noises may occur while driving split spoons. At minimum hearing protection shall be worn when driving split spoons.
- When pulling / lifting augers, a clevis pin or other closed device shall be used. Use of J-hooks is prohibited.

#### 4.16 Attaching and Breaking Rods

- 4.16.1 Do not use manual tools (e.g., pipe wrenches) in combination with rotation of the drill stem. Manual tools are not designed for the load, and may break.

- The use of such tools creates a significant impact hazard for those in the work area, because they rotate with the drill stem. Manual tool use in combination with a rotating drill stem to attach or break rods is therefore prohibited.
- Manual tools may be used if the drill stem is isolated / positively disengaged.
- Mechanical means of rod separation that are permitted include:
  - Opposing hydraulic controls.
  - Rod locking devices or machine's power vice.
  - Hydraulic breakout tools.
  - Hydraulic foot clamps.

- 4.16.2 Rod box changes present severe crushing hazards. Operators shall ensure all crew members are clear of the machine and hoisting equipment while they are changing rod boxes.

#### 4.17 Rotary, Sonic and Core Drilling

- 4.17.1 In addition to the health and safety procedures identified above, the following general health and safety procedures should be followed when supervising borings with rotary, sonic and core drilling:
- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws. Drill rods should not be held or lowered into the hole with pipe wrenches.
  - If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
  - When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
  - When drill rods are rotating, stay clear of the rotating components of the drill rig. Never reach behind or around a rotating drill rod for any reason.
  - Use a long-handled shovel to move cuttings away from the top of the borehole. Never use hands or feet to move cuttings away from the borehole.
  - If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
  - Keep away from area where drill rods are being moved or raised to the rig. Do not stand in the area where a drill rod will fall or slide if it should be dropped.
  - Loud noises may occur during drilling. Hearing protection shall be worn.

#### 4.18 Direct-push

- 4.18.1 The following general health and safety procedures should be followed when supervising drilling borings with direct-push drilling:
- Loud noise may occur during direct-push drilling. Appropriate hearing protection shall be worn.
  - When drill rods are hoisted from the hole, they should be cleaned for safe handling with a suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
  - If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
  - Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

#### 4.19 Horizontal Directional Drilling

- 4.19.1 During surface to surface operations a 16.4' (5 meters) safe zone shall be established and identified at both the entry and exit locations; no personnel are permitted to be within this zone unless the drill is locked out and the operator is out of the seat.
- 4.19.2 Machine shall be locked out before entering an excavation, changing tools, adding or removing drill stem or doing any other work on tools or the drill stem at the exit end of the bore.
- 4.19.3 A tracking head shall be installed on the drill stem:
- 4.19.4 Assemble drill head using components appropriate to the soil conditions to be encountered (e.g. nozzle, bit, beacon housing, etc.).
- 4.19.5 Ensure all personnel are clear of the bore entry point (outside of identified work zone).

- 4.19.6 At all times two way communication will be maintained at entrance and exit points using two way radios or equally effective communication means. If at any time communication is lost, all work will be stopped until communication is re-established
- 4.19.7 Locate drill head with tracking device at least every half-length of pipe. Adjust direction as necessary to follow the intended bore path.
- 4.19.8 Any drilling fluid returning to the surface shall be cleaned up promptly.
- 4.19.9 Drill pipe should exit the bore at an angle of 5 to 10° from the ground surface.
- 4.19.10 Turn off fluid flow as soon as drill head emerges.
- 4.19.11 Lockout machine and remove drill head using appropriate breakout tools.
- 4.19.12 Select and attach a reamer that allows the return of drilling fluids and cuttings, to reduce frictional pullback forces, and to allow for bend radius of the pipe. Reamer shall be:
  - The smaller of 1.5 times the outside diameter (O.D.) or 12 inches (300mm) larger than the diameter of the product pipe.
  - A diameter less than 1.5 times the diameter of the product may be necessary in collapsing soil formations.
  - Reamed diameter may need to be increased by up to 25% if substantial swelling of the soil is expected to occur.
- 4.19.13 All personnel shall clear the trench or the designated surface zone (16.4 feet [5 meters]) once the reamer is attached. Operator shall only reverse lockout and commence pullback when communication is received from personnel on exit hole side and operator has confirmed the message.
- 4.19.14 Personnel on exit hole side shall ensure reamer is pulled the entire way back to the exit hole.
  - If rotation is started when drill rod and reamer are away from the exit hole, very fast sideways movement of the rod and reamer can occur.
  - Larger reamers and longer lengths of exposed drill rod increase the speed and distance of this movement.
- 4.19.15 If working with trailing drill stem, swivels shall be verified as lubricated and rotating freely by hand prior to use:
  - A freely moving swivel prevents trailing drill stem or product from rotating / whipping.
  - If the swivel does not move freely by hand it shall be removed from service and repaired or replaced.
  - Only use swivels with limited articulation to prevent whipping or cranking action between the reamer and trailing drill pipe or product.
- 4.19.16 It is important to clean and lubricate the tool and drill stem joint threads before each use.
- 4.19.17 Any individual drill pipes that are bent or damaged shall be immediately taken out of service.
- 4.19.18 Occasionally change the order of the lead drill pipe (i.e. move the lead pipe to the end of the stem, or other pipe rotation procedures) to extend drill stem life.
- 4.19.19 Operator should avoid stalling the pipe rotation to avoid stress damage from shock loading.
- 4.20 Drilling at Potential MEC / UXO Sites
  - 4.20.1 If the project site is suspected of containing munitions and explosives of concern (MEC) or unexploded ordnance (UXO), the UXO team will conduct a reconnaissance and MEC / UXO avoidance to provide clear access routes to each site before drilling crews enter the area. The following procedures will be implemented:

- Drilling operations on an MEC / UXO site will not be conducted until a complete plan for the site is prepared and approved by the AECOM UXO Safety Officer. MEC / UXO avoidance shall be conducted during drilling operations on known or suspect MEC / UXO sites.
- The UXO team will identify and distinctly mark the boundaries of a clear approach path for the drilling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the widest vehicle. No personnel will be allowed outside any marked boundary.
- If MEC / UXO is encountered on the ground surface, the UXO team will clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.
- The UXO team will conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC / UXO that may be in the subsurface. If a magnetic anomaly is encountered, it will be assumed to be MEC / UXO, and the approach path will be diverted around the anomaly. UXO personnel only will operate the appropriate geophysical instrument and identify MEC / UXO.
- An incremental geophysical survey of the drill-hole location(s) will be initially accomplished by the UXO team using a hand auger to install a pilot hole. If MEC / UXO is encountered or an anomaly cannot be positively identified as inert material, Hazardous, Toxic, and Radioactive Waste (HTRW) sampling personnel will select a new drill-hole location.
- Once the surface of a drilling site has been cleared and a pilot hole established as described above, the drilling contractor will be notified that the site is available for subsurface drilling.

#### 4.21 Movement and Transport of Drilling, Boring or Direct-Push Equipment

- 4.21.1 Personnel transporting equipment shall be properly licensed and shall operate the vehicle according to Federal / State / Provincial / Territorial, and local regulations. Refer to *S3AM-005-PR1 Driving* and *S3AM-320-PR1 Commercial Motor Vehicles*.
- 4.21.2 Confirm the traveling height (overhead clearance), width, length and weight of the equipment with the carrier. Identify highway and bridge load, width and overhead limits, to confirm these limits are not exceeded and with adequate margin.
- 4.21.3 Allow for overhang of any drilling, boring or direct-push equipment when cornering or approaching other vehicles or structures.
- 4.21.4 Be aware that the canopies of service stations and motels are often too low for equipment loaded on a trailer to clear
- 4.21.5 Watch for low hanging electrical lines, particularly at the entrances to drilling sites or restaurants, motels, other commercial sites.
- 4.21.6 Never travel on a street, road, or highway with any part of the drilling, boring or direct-push equipment in a raised or partially raised position.
- 4.21.7 Remove all ignition keys if rig is left unattended unless client requirements specify that the keys remain in the ignition switch at all times.
- 4.21.8 Before moving a rig on location, the operator shall do the following:
  - To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.
  - Check the brakes of the truck / carrier, especially if the terrain along the route of travel is rough or sloped.
  - Discharge all passengers before moving on rough or steep terrain.
- 4.21.9 Engage the front axle (on 4x4, 6x6, etc., vehicles) before traversing rough or steep terrain
- 4.21.10 Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator shall conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility shall be considered that the presence of



drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

- 4.21.11 Logs, ditches, road curbs, and other long and horizontal obstacles should be approached and driven over squarely, not at an angle.
- 4.21.12 When close lateral or overhead clearance is encountered, or when backing up, the driver of the rig shall be guided by another person on the ground.
- 4.21.13 Loads on the drill rig and truck shall be properly stored while the truck is moving, and the mast shall be in the fully lowered position.
- 4.22 Loading and Unloading
  - 4.22.1 Consult applicable manufacturer's recommendations for loading and unloading of the equipment.
  - 4.22.2 Use ramps of adequate design that are solid and substantial enough to bear the weight of the rig with carrier, including tools.
  - 4.22.3 Load and unload on level ground.
  - 4.22.4 Use the assistance of someone on the ground as a guide.
  - 4.22.5 Check the brakes on the rig carrier before approaching loading ramps.
  - 4.22.6 Distribute the weight of the rig, carrier, and tools on the trailer so that the center of weight is approximately on the centerline of the trailer and so that some of the trailer load is transferred to the height of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.
  - 4.22.7 The rig and tools should be secured to the hauling vehicle with ties, chains, and / or load binders of adequate capacity.

## **5.0 Records**

- 5.1 All employee training files shall be maintained in accordance with *S3AM-003PR1 SH&E Training*.
- 5.2 Completed inspections and maintenance inventories shall be maintained the site or project files.

## **6.0 Attachments**

- 6.1 [S3AM-321-ATT1 Core Drilling Machine](#)
- 6.2 [S3AM-321-ATT2 Pre-Drilling, Boring, & Direct-Push Probing Flow Chart](#)
- 6.3 [S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection](#)
- 6.4 [S3AM-321-FM2 Drilling, Boring & Direct-Push Equipment Maintenance Inventory](#)

## Americas

**Core Drilling Machine**

S3AM-321-ATT1

**1.0 Objective / Overview**

- 1.1 Core drilling machines are used on all types of jobs. They can be electrical or gas powered and come with a stand or can be hand held. Caution should be used when operating such a machine. It may look harmless and easy to run, but drilling machines have many hazards.
- 1.2 Prior to coring activities the location should be checked for buried utilities in accordance with S3AM-331-PR1 *Underground Utilities*.

**2.0 Safe Operating Guidelines**

- 2.1 Clean the flanges before mounting the blade.
- 2.2 Make sure the blade is correct for the material being cut and that the arrow on the blade corresponds with the direction of rotation of the machine spindle.
- 2.3 Use built-in vacuum or bolt-down anchors depending on the type of surface to be cored. Do not bypass anchoring system.
- 2.4 Properly manage power cable for electric units to prevent slips, trips or falls by the operator or those nearby.
- 2.5 Avoid tilting the blade when cutting.
- 2.6 Use only the machines that have an approved safety guard.
- 2.7 Remove the diamond blade from the machine during transit to prevent accidental damage.
- 2.8 Inspect the blades frequently to detect cracks or undercutting of the steel center.
- 2.9 Do not let excessive heat be generated at the cutting edge of the blade.
- 2.10 Use adequate water supply to both sides of the blade.
- 2.11 Follow the manufacturers recommended pulley sizes and operating speeds for specific blade diameters.
- 2.12 Make sure to tighten drive belts to ensure full available power.
- 2.13 Don't force the blade on the blade shaft or mount blade on an undersized spindle.

**3.0 Potential Hazards**

- 3.1 Utilities
- 3.2 Electricity
- 3.3 Flying debris
- 3.4 Noise exposure
- 3.5 Inadequate housekeeping
- 3.6 Fumes or dust
- 3.7 Pinch points
- 3.8 Binding/biting – torque control

**4.0 Training Requirements**

- 4.1 Review of applicable SOPs (e.g., S3AM-305-PR1 *Hand & Power Tools*; S3AM-302-PR1 *Electrical Safety*).

- 4.2 Demonstrated knowledge on the use of a coring machine.
- 4.3 Review and follow manufacturers' operating guidelines.

## **5.0 Personal Protective Equipment (Level D PPE)**

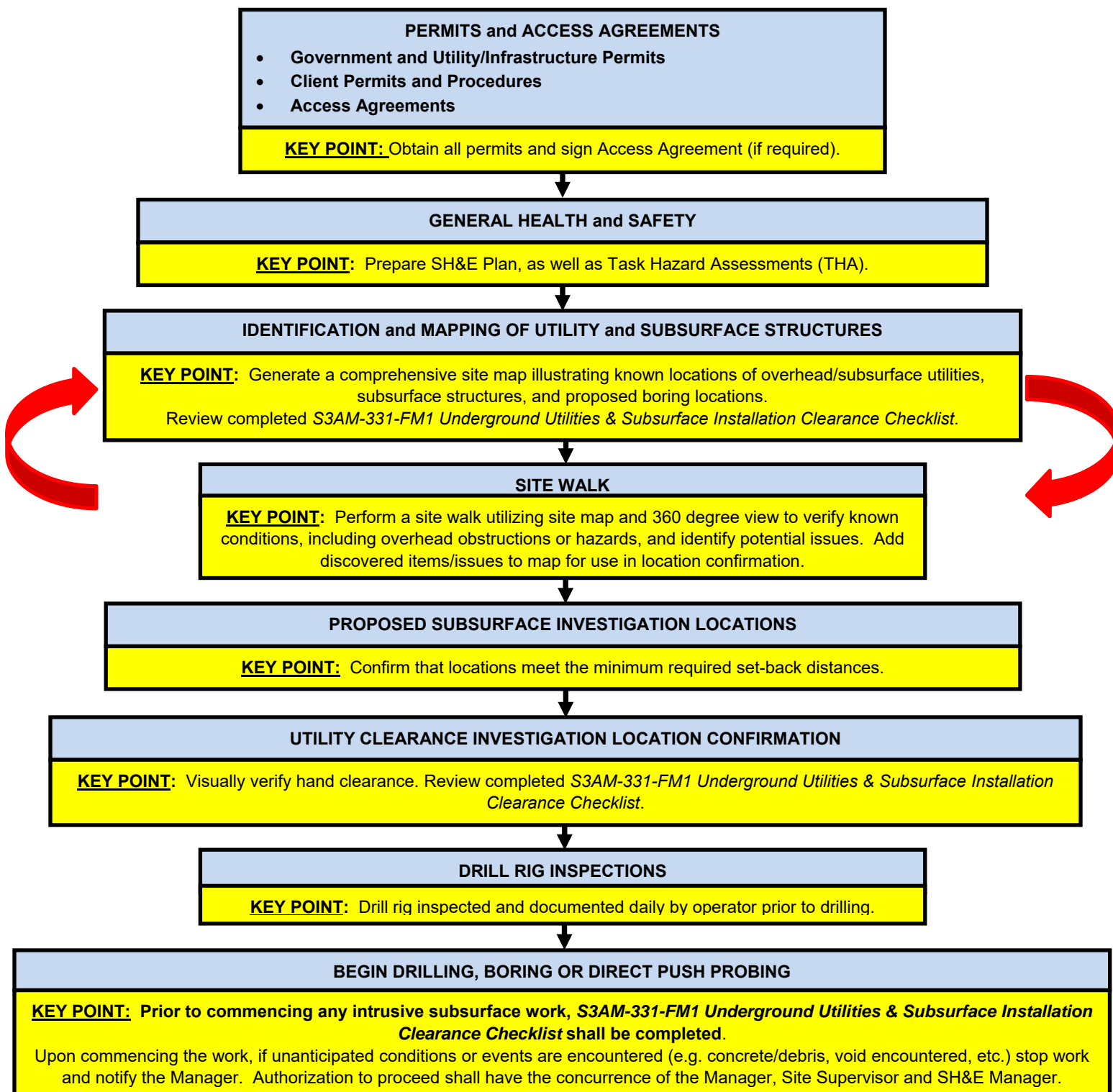
- 5.1 Hard hat
- 5.2 Safety Vest
- 5.3 Leather gloves
- 5.4 Face shield
- 5.5 Steel-toed/composite-toed boots
- 5.6 Hearing protection
- 5.7 Respirator or dust mask (as applicable to the respiratory hazards)

## **6.0 Other Safety Tips**

- 6.1 Keep fingers and hands away from the cutting edge.
- 6.2 Hold handle firmly when operating.
- 6.3 A subsurface utility clearance shall be performed prior to initiating drilling operations.
- 6.4 Stand firmly and apply body weight at anchored side of guarded platform.

## Pre-Drilling, Boring &amp; Direct Push Probing Flow Chart

S3AM-321-ATT2

**Before Any Drilling, Boring and Direct Push Probing Activities**

Americas

# Daily Drilling, Boring & Direct-Push Equipment Inspection

S3AM-321-FM1

Site / Project Name \_\_\_\_\_ Rig Inspector (Name/Company) \_\_\_\_\_

## RIG INFORMATION:

Rig Type	Rotary/Auger Drilling Rig <input type="checkbox"/>	Direct Push Type (DPT) <input type="checkbox"/>
Owner	_____	VIN# _____
Year/Make	_____	Mileage _____
Model	_____	Drill Hrs _____

**INSTRUCTIONS:** Each shift shall inspect all applicable items. If an unsatisfactory condition (fail) is observed, suspend operation of the equipment and report the condition to the site supervisor immediately.

Emergency Equipment / Devices / Switches	
Kill switches are located and accessible to workers on both sides of the rotating stem. NOTE: Location and number of switches depend on the rig manufacturer; please refer to owner's manual (DPT typically has one switch on control panel).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Kill switches installed by the manufacturer, alarms and other devices (e.g. positive air shut-off valve) tested and in operable condition. All workers familiar with location and operation of devices. <b>NEVER BYPASS, DISABLE, OR REMOVE KILL DEVICES.</b>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
First aid kit adequate and on equipment / readily available.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Absorbent materials on equipment / readily available (spill response).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
A fire extinguisher of appropriate size is located on drill rig and readily available/accessible for drilling crew (recommended 20 lbs.).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Protective Guards	
Drive shafts, belts, chain drives, and universal joints are guarded to prevent accidental insertion of hands, fingers, or tools.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables	
Cables on drill rig free of kinks, frayed wires, birdcages, flat spots, grease, and worn or missing sections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables are terminated at the working end with a proper eye splice; either swaged, coupled, or using cable clamps.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cable clamps are installed with the saddle on the live or load side. Clamps are not alternated and are of the correct size and number for the cable size.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Wire ropes are not allowed to bend around sharp edges without cushion material.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Pulleys and Cable Winches	
Pulleys are not bent, cracked, or broken.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Pulleys operate smoothly and freely, without resistance.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Motor is mounted in correct location and tightly secured to drill rig.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Winch capable of being placed in the free spool (unwind smoothly) and locked position correctly, demonstrating that the cable is suitable for lifting during drilling operations.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Safety Latches	
Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Safety latches are functional and completely span the entire throat of the hook and have positive action to close the throat except when manually displaced for connecting or disconnecting a load.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Flights / Augers / Reamers	
Flights / Augers / Reamers are not bent, cracked, or broken. NOTE: Flights / Augers / Reamers failing inspection must be removed from jobsite.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

Flights are blunt to prevent the risks of cuts.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Auger keys are not bent, cracked/fractured, excessively worn, or otherwise damaged.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Auger bolt holes and threads are not damaged.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Inspect flights/augers for metal burns. NOTE: Burrs must be filed to flat surface.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Augers / Reamers lying flat on the ground (avoid stacking).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Augers / Reamers over 50lbs (22.7kg) moved mechanically. (Avoid manual lifting).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Drill String</b>	
Appropriate break out tool(s) available.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Rod box and power vice operating smoothly and freely.	
Drill string are not bent and do not have any cracks/fractures.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Drill string connections (e.g. pins, threads, couplers) are of the proper type, are not bent, have no cracks/fractures, and are not excessively worn.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Swivel connectors (for trailing horizontal drill stem) lubricated and freely rotating.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Mast</b>	
Mast is free of bends, cracks, or broken sections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
All mounting hardware (pins, bolts, etc.) in place.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
No moving of drill rig or maintenance/repairs while mast is in vertical position.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Hammering Device</b>	
Hammer free of cracks, fatigue, or other signs of excessive wear.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hammer connections are secure.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Leveling Devices</b>	
Outriggers move in/out and up/down smoothly and freely while using controls on drill rig, with no hydraulics leaks.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Outriggers are extended prior to and whenever the mast is raised off its cradle. Outriggers must maintain pressure to continuously support and stabilize the drill rig (even while unattended).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Outriggers are properly supported on the ground surface to prevent setting into the soil (use of outrigger support pads).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Controls</b>	
Controls are intact, properly labeled, have freedom of movement, and have no loose wiring or connections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Controls are not blocked or locked into an operating position.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Installed lights, signals, gauges, and alarms operate properly.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Lifting Devices</b>	
Slings, chokers, and lifting devices (straps, not chains) inspected before using and are in proper working order. NOTE: Damaged units are labeled and removed from jobsite.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Shackles/Clevises are in proper working order with pins/screws in place that is to be used while lifting.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables and lifting devices are not operated erratically or with a jerking action to overcome resistance.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Hydraulic System</b>	
Hydraulic lines are secure, in good condition with no signs of excessive wear, and not leaking. NOTE: Check while pressurized.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hydraulic lines are not in a bent or pinched position causing additional fluid restrictions/pressures.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hydraulic oil reservoir has appropriate amount of oil and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Documentation available to confirm that pressure relief valve was checked during shop maintenance activity and noted on maintenance log.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Pump Lines (water, grout, etc)</b>	
Suction/Discharge hoses, pipes, valves, and fittings are secured and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
High pressure hoses have a safety chain, cable, or strap at each end to prevent whipping in the event of a failure.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

<b>Ladders</b>	
Drill rig has a permanently attached or proper portable ladder to be used for access to drilling platform.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Ladders and platforms not to be used for tool storage- keep ladders and operator platforms clear during drilling.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Tires / Tracks</b>	
Tires / Tracks on rig are not excessively worn and free of any debris or foreign material.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>General</b>	
General condition – exterior (no structural damage, no loose bolts, platform tidy, etc.)	
General condition – interior (cab clean, tidy)	
Drill rig meets regulations for transport on state/federal highways (inspection sticker, license plate, etc.).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Rig is of appropriate size to meet job requirements.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Maintenance log available for previous 3 months to confirm proper maintenance/inspection.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Exhaust</b>	
Exhaust system is free from defect and routes engine exhaust away from drill rig workers.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Fuels</b>	
Fuel stored in an approved and properly labeled container.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Fuel transfer lines free from signs of excessive wear and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Refueling and transferring of fuel is performed in an approved area with sufficient containment to prevent spillage.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Exclusion/Work Zones</b>	
The exclusion/work zone is centered over the borehole (and if applicable, bore exit point) and the radius equal to or greater than the height of the mast (measured from ground level).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
The exclusion/work zone is clear of tripping hazards or the hazards are documented with appropriate controls on the Task Hazard Assessment.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
The exclusion/work zone communicated to concurrent/adjacent operations to prevent overlap of work zones or line of fire.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Subsurface Utilities / Installations and Overhead Obstructions</b>	
Subsurface utilities / installations have been confirmed as identified and cleared through site observation and review of the completed <i>S3AM-331-FM1 Underground Utilities &amp; Subsurface Installation Clearance Checklist</i> .	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Except where electrical distribution and transmission lines have been de-energized and visibly grounded, drill rigs will be operated proximate to under, by, or near power lines in accordance with the Minimum Approach Distance (MAD).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Rig Repairs</b>	
Repairs, when possible, are conducted offsite to reduce the risk of any onsite incidents.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
<b>Specialized PPE</b>	
When working at elevated heights, workers are to wear a fall restraining device attached in a manner to restrict falls to less than six feet (1.83 meters).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
When working in wet/slippery conditions, all workers have a lug-type sole or similar slip resistant sole, on their safety footwear to prevent slipping.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

<b>Comments:</b>

Signature of Inspector: \_\_\_\_\_ Date: \_\_\_\_\_





Americas

**Drilling, Boring & Direct-Push Equipment Maintenance Inventory**

S3AM-321-FM2

EQUIPMENT (MAKE, MODEL, SERIAL #)	EQUIPMENT OWNER	EQUIPMENT STATUS ( <i>On Hire, Active, Decommissioned</i> )	FREQUENCY OF SERVICE	SERVICE TYPE	MANUFACTURER'S STANDARDS	INDUSTRY STANDARDS	LEGISLATED REQUIREMENTS	LOCATION OF EQUIPMENT

## Overhead Lines & Obstructions

S3AM-322-PR1

### 1.0 Purpose and Scope

- 1.1 Provides the safe work requirements to be observed where overhead obstructions (e.g., cable trays, pipe racks, etc.), overhead utilities, or other lines are present at a work location, including, but not limited to electric power lines, electrical apparatus, or any energized (exposed or insulated) parts, communication wires, or any other overhead wire or cable.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

### 2.0 Terms and Definitions

- 2.1 **Arc Flash Hazard** – A dangerous condition associated with the possible release of energy caused by and electric arc. Arc flash is the light and heat produced from an electric arc supplied with sufficient electrical energy to cause substantial damage, harm, fire, or injury.
- 2.2 **Electrical Hazard** – A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or blast.
- 2.3 **Minimum Approach Distance (MAD)** – The MAD is the closest distance any employee or any part of the operating equipment is permitted to approach an energized or a grounded object.
- 2.4 **Qualified Person (Electrical Transmission and Distribution)** – A person trained and knowledgeable in the construction and operation of electrical transmission and distribution equipment or a specific work method, and has been trained to recognize and avoid electrical hazards that might be present with respect to that equipment or work method.
- 2.5 **Types of Overhead Lines / Obstructions (examples):**
  - Overhead electric power lines
  - Structural cable supports
  - Guy wires
  - Cable television / communication lines
  - Cable Trays
  - Pipe Racks
  - Low Clearance Overpasses

### 3.0 References

- 3.1 S3AM-004 PR1 Incident Reporting, Notifications & Investigation
- 3.2 S3AM-010-PR1 Emergency Response Planning
- 3.3 S3AM-209-PR1 Risk Assessment & Management
- 3.4 S3AM-302-PR1 Electrical Safety
- 3.5 S3AM-303-PR1 Excavation

## 4.0 Procedure

### 4.1 Roles & Responsibilities

#### 4.1.1 Manager

- Identify conditions where overhead electric power lines and other overhead obstructions may be present and outline what is required in the SH&E Plan and Task Hazard Assessments. Refer to the *S3AM-209-PR1 Risk Assessment & Management*.
- Confirm electrical and communication lines, and as appropriate other overhead obstructions, are identified on all site and project drawings.
- Coordinate and communicate with overhead electrical line owner or operator to identify and implement appropriate control measures.
  - Provide adequate advance notification to the Overhead Electrical Line Owner / Operator to allow for insulation or isolation and grounding of the line(s) if required.
  - Confirm the Overhead Electrical Line Owner / Operator(s) are fully informed as to when the operations are to begin, end and when any location changes are planned if applicable.
- Confirm Employees are trained as required for the scope of work and associated hazards.
- Coordinate and communicate with subcontractors or employees working around overhead electric power lines and as applicable, other overhead obstructions.
- Confirm the *S3AM-322-FM1 Overhead Electric power lines Acknowledgement* is completed by concurrent operations working around overhead electric power lines on the worksite.

#### 4.1.2 Safety Health & Environment (SH&E) Manager

- Assist and support the Manager in planning and responding to concerns regarding the exposure to overhead electric power lines.

#### 4.1.3 Employees

- Maintain current training required for the scope of work and associated hazards.
- Inform the Manager of location conditions that may expose risks to overhead electric power lines.
- Comply with established minimum approach distances.

### 4.2 Training

4.2.1 The Manager shall confirm all Employees are oriented to the SH&E Plan and Task Hazard Assessment (THA) process, in accordance with *S3AM-209-PR1 Risk Assessment & Management*.

4.2.2 Confirm training requirements were met prior to work starting.

- 
- Employee orientation shall include the Location Specific Emergency Response Plan.
- Proof of training and orientation shall be documented and retained in the project files.

4.2.3 Managers shall confirm that each Employee has received training required for the scope of work and associated hazards in accordance with *S3AM-003-PR1 SH&E Training*.

4.2.4 Additional training requirements may include, but are not limited to:

- The limitations of an insulating link / device, proximity alarm, and range control (and similar) device, if used.

- Grounding and bonding procedures.
- Client specific requirements

#### 4.3 General Requirements

- 4.3.1 The AECOM Manager or supervisor and employees shall perform a walk-thru of the work site and / or review of the work area / travel route to identify the overhead electric power lines and any other overhead obstructions that could be impacted by the work. Consider high profile equipment, equipment in transport, swing radius of equipment, potential for shifting loads, etc. AECOM personnel may be accompanied by other applicable personnel (e.g. client representatives, contractors operating concurrently, etc.).
- 4.3.2 The location or project specific SH&E Plan shall identify all overhead line hazards and provide suitable methods of elimination or control. All involved or affected workers shall review the SH&E Plan to confirm proper communication of the overhead line hazards and awareness of the control measures associated with their work.
- 4.3.3 Assess applicable factors such as, but not limited to:
  - Scope of work (e.g. hoisting materials, excavation, grubbing, etc.).
  - Transportation route.
  - Hoisting, excavating, or other equipment to be operated.
  - Height, placement, and reach of equipment.
  - Equipment or material loading / unloading.
  - Location(s) of electric power lines, communication lines, guy wires, etc.
  - Worker training and experience.
  - Soil or ground condition and environmental conditions.
  - Interruptions to electrical services.
  - Hazard to public.
  - Use of ladders.
  - Pipe and other conducting materials.
  - Notification of electric utility owner.
  - Changing conditions.
  - Communication of all hazards to all workers including contractors, sub-contractors, and concurrent operations.
- 4.3.4 Task Hazards Assessments (THAs) shall be completed to record the hazards and control measures specific to the task, including those related to overhead line and obstructions hazards, prior to undertaking assigned tasks. THAs shall be reviewed and signed by all workers involved in the specific task.
- 4.3.5 Should adverse weather conditions cause the work associated with overhead lines to be unsafe, the activities shall be discontinued.
- 4.3.6 Managers or designated employees shall formally notify all concurrent operations, or any others who may not have had reason to review and sign the related SH&E Plan or THAs, of work that is to be done in the vicinity of overhead lines at distances less than 50 feet (15.25 meters), and for non-electrical obstructions, at distances less than 10 feet (3.05 meters) if appropriate to the obstruction's potential hazards, and obtain the operator's assistance in protecting workers involved.

- Formal notification may be accomplished through a review of the SH&E Plan or THAs by the concurrent operator and associated personnel, as evidenced by signing the respective document's acknowledgement.
  - Alternately, the concurrent operations may acknowledge having reviewed AECOM's procedures with a separate acknowledgment form. *S3AM-322-FM1 Overhead Electric Power Lines Acknowledgement Form* or equivalent may be used.
  - Prior to equipment operation within 10 feet (3.05 meters) of non-electrical obstructions, as appropriate to potential hazards associated with the obstruction, the Owner/Operator should be contacted to obtain specific details regarding the obstruction such as piping or tray contents,
- 4.3.7 Overhead lines are presumed to be energized unless the Overhead Electrical Line Owner / Operator confirms that the overhead line has been, and continues to be de-energized and visibly grounded at the worksite.
- 4.3.8 Overhead lines are presumed to be uninsulated unless the Overhead Electrical Line Owner / Operator or a registered Professional Engineer who is a Qualified Person with respect to electrical power transmission and distribution confirms that a line is insulated.
- 4.3.9 Confirm accurate measurement of load heights, maximum equipment radius and height or reach of any other equipment that could potentially encroach on the safe limit of approach for the overhead electrical line, guy wires, or other applicable overhead obstructions.
- The height of all applicable overhead lines and obstructions that pose contact or encroachment potential shall be determined prior to work commencing.
  - The height of electric power lines may only be determined by the client, utility company professional, or by using an approved electronic measuring device.
  - Awareness shall be maintained for any elements that could affect clearance (e.g. snow pack, ice or snow weighing down lines, excessive heat causing sag, etc.).
  - Caution shall be exercised when working or travelling near overhead lines having long spans, since they tend to be more prone to lateral swing in response to the wind and can present a contact hazard.
  - All low hanging communication lines in close proximity to energized lines shall be clearly identified as *Encroaching on Energized Lines*.
- 4.3.10 Managers shall contact the overhead owner/operator (i.e. local utility company) if work is to be done or before equipment is operated within 50 feet (15.25 meters) of an energized overhead line, to determine the voltage of the overhead line and establish the appropriate MAD.
- All inquiries regarding electric utilities shall be made in writing and a written confirmation of the outage / isolation shall be received by the appropriate AECOM Manager prior to the start of the task that may impact the utility.
- 4.3.11 Until the voltage of the overhead electrical line is known and the MAD established, an exclusion zone shall be created at ground level beneath and 50 feet (15 meters) perpendicular to the overhead electric power lines on each side.
- The exclusion zone shall be demarcated with visual indicators (e.g., signage, flagging, paint, cones). No equipment shall enter the exclusion zone without approval from AECOM management.
  - Unqualified employees shall maintain a safe clearance distance in accordance with the established MAD when working in an elevated position near energized overhead lines. For additional information associated with Qualified Employees refer to *S3AM-302-PR1 Electrical Safety*.

- 4.3.12 The Minimum Approach Distance (MAD) as it relates to Voltage varies from jurisdiction to jurisdiction. The MAD or the regulatory minimum distance requirements, whichever is more stringent, shall be maintained. The below chart shows the Phase-to-Phase voltage rating voltages in kilovolts and the MADs applicable to all AECOM operations:

**Minimum Approach Distances (MAD)**

Voltage Range (Kilovolts) (Phase-to-Phase)	Minimum Approach Distance (MAD) in Feet (Meters)
<b>Personnel shall allow for equipment movement and electrical line swaying when establishing a M.A.D.</b>	
0 – 50 KV	10 (3)
Over 50 – 200 KV	15 (5)
Over 200 – 350 KV	20 (6)
Over 350 – 500 KV	25 (8)
Over 500 – 750 KV	35 (11)
Over 750 – 1,000 KV	45 (14)
<b>Note: This requirement shall apply except where client, local, or governmental regulations are more stringent.</b>	

Source: American National Standards Institute, Publication B30.5.

- 4.3.13 An appropriate distance shall be kept between equipment, its occupants, their tools and energized overhead lines, electrical apparatus, or any energized parts.
- 4.3.14 These minimum approach distances do not apply to a load, equipment, or building that is transported under energized overhead power lines if the total height, including equipment transporting it, is less than 13.5 feet (4.15 meters).
- If the travelling equipment, including load, is over 4.15m (13.62ft) a transportation permit shall be acquired from the appropriate jurisdiction to travel on any public road or highway.
    - Consult local jurisdiction as some US states may use heights of up to 4.45m (14.6ft).
    - Notification of appropriate utility companies may be required in conjunction with the transportation permit. Jurisdictional requirements shall be verified prior to transport.
    - Route shall be checked for clearance of overhead electrical and communication lines prior to transport.
    - A designated signaler will be utilized when the height of the equipment, buildings, tractor / trailers or any other transport equipment travelling under an overhead electrical line is greater than 4.15m (13.62ft).
- 4.3.15 Employees shall not place earth or other material under or beside an electrical overhead line if doing so reduces the safe clearance to less than 50 feet (15.25 meters) or, if appropriate to potential hazards associated with other types of overhead obstruction, less than 10 feet (3.05 meters). To maintain a safe distance:
- Install warning devices and signs (hang a sign from and mark all guy wires to warn traffic of low clearance; provide warning signage for all overhead services).
  - Install telescopic, nonconductive posts and flagging across right-of-way at the minimum allowable clearance as allowed by regulations for the line voltage.
  - Position signs or other devices to determine the "Danger Zone".

- Inform all job site personnel of the danger zone and the safe distances required.
  - Beware of atmospheric conditions, such as temperature, humidity, and wind that may dictate more stringent safety procedures.
- 4.3.16 If employees are to climb or perform work on poles or towers, the structures shall be confirmed as capable of withstanding the weight and activity without failure.
- 4.3.17 If holes are dug for poles or foundations for structures, appropriate measures shall be taken to prevent inadvertent entry by personnel or equipment. Refer to *S3AM-303-PR1 Excavation*.
- 4.3.18 Operation of heavy equipment and cranes in areas with overhead lines represents a significant arc flash and electrical hazard to all personnel on the job site.
- Accidental contact with an energized overhead line or arcing between a high power line and grounded equipment, can cause harm to nearby equipment operators or ground personnel and damage to power transmission systems and / or operating equipment.
  - Equipment will be repositioned and blocked so that no part, including cables, can come within the established minimum clearances.
- 4.3.19 Gravel trucks, cranes, boom trucks, etc. shall retract, stow and lower boxes, outriggers, booms, etc. to the travel position prior to entering municipal and client owned roads (e.g. leaving plant sites, work over rig sites, battery sites, and storage yards) and any time travel may put the equipment within the MAD of an electrical line.
- 4.3.20 When a signal person is required, the individual shall wear reflective striping (coveralls or vest) and carry an air horn or other appropriate means of emergency communication.
- 4.3.21 The signal person shall be aware of the potential electrical line hazards, be verified as competent by their supervisor and not have any other duties while acting as the signal person.
- 4.3.22 The signal person shall remain outside the MAD and in a position that allows for monitoring of equipment or loads to prevent encroachment on the MAD.
- 4.3.23 Signs, pylons, high visibility tape and / or signalers shall not be removed until the last piece of AECOM equipment has traveled under the overhead electrical line.
- 4.4 Minimum Approach Distance (MAD) Reduction
- 4.4.1 Where any work task will not allow the MAD to be maintained, an alternate means of protection shall be implemented by the Manager and approved by the SH&E Manager. In order of preference, acceptable procedures are:
- De-energize the overhead line(s) / lockout by local utility authorities; or
  - Implement alternative procedures as identified by the Overhead Electrical Line Owner / Operator or a registered professional engineer.
- 4.4.2 De-energize Overhead Lines
- Elimination of electrical power provides the most acceptable means of ensuring safety of personnel. While temporary site overhead lines are often under the control of the site manager (and can be de-energized locally), electrical distribution and transmission lines can be de-energized only by the Overhead Electrical Line Owner / Operator. De-energizing of an overhead line often requires advance coordination with the Overhead Electrical Line Owner / Operator. At least one week advance notice should be provided.
  - Managers shall confirm with the utility Overhead Electrical Line Owner / Operator that the overhead line has been de-energized and visibly grounded at the job site.
- 4.4.3 Alternative Procedures

- Managers may implement alternative procedures to prevent arc flash and electrical contact. These procedures shall be identified by the Overhead Electrical Line Owner / Operator or a registered Professional Engineer who is a Qualified Person with respect to electrical power transmission and distribution.
- A planning meeting with the Manager, SH&E Manager and the Overhead Electrical Line Owner / Operator (or registered Professional Engineer) shall be held to determine the most effective alternative procedures.
- Alternative procedures shall meet all client, local and governmental regulatory requirements.
- The work will be conducted by qualified and competent individuals, following the alternative written safe work procedures. All others are restricted from entering the MAD.
- Insulating Barriers shall be rated for the voltage line being guarded. These barriers may not be part of or attached to the equipment. The MAD shall only be reduced within the designed working dimensions of the insulating barrier. This determination shall be made by a Qualified Person in accordance with local or governmental requirements for work practices near energized equipment.
- Consult *S3AM-302-PR1 Electrical Safety* procedures to properly ground equipment and for limitations of grounding.
- Dedicated Line Spotters shall be trained to enable them to effectively perform their task, including training on the applicable local and governmental regulations.
- No work that encroaches on an energized power line will be completed outside of daylight hours.

#### 4.5 Additional Safety Measures.

- 4.5.1 When equipment shall repeatedly travel beneath electric power lines, a route shall be plainly marked and “rider poles” of non-conductive material shall be erected on each side to confirm equipment structures are lowered into a safe position.
- 20" X 28" (50.8cm X 71.12cm) Danger Overhead Power Lines signs, which are highly visible, shall be erected at a height of 1.8 meters (6ft) on each side of the electrical line. A combination of pylons and high visibility tape shall be placed underneath the electrical line.
  - These signs shall be in plain view of equipment traveling in either direction, but no closer than the MAD.
  - If physical guards (i.e. goal posts, rider poles) are used, the guards shall be of non-conductive material and consist of a pole on each side of the approach connected by a rope.
  - The poles will be placed at the MAD from and on each side of the electrical line. The ropes will be set at a height, which will maintain the MAD from the electrical line.
- 4.5.2 Watch for uneven ground that may cause vehicles and equipment to weave, bob, or bounce.
- 4.5.3 The following additional safety measures shall be implemented as needed when working around energized power lines:
- Provide equipment with proximity warning devices. These provide an audible alarm if any part of the equipment gets too close to a line.
  - Install ground safety stops. These prevent vehicles from accidentally entering hazardous areas.
  - Equip cranes with a boom-cage guard. This prevents the boom from becoming energized if an electrical line is contacted.



- Utilize insulated links and polypropylene tag lines. These prevent the transmission of electricity to loads or tag line handlers if an electrical line is contacted.

NOTE: These additional safeguards are intended as supplemental protection. Use of these measures is not permissible as a substitute for maintaining the safe working distance or implementation of the procedures outlined in this document.

#### 4.6 Emergency Planning

4.6.1 Managers shall complete a location specific emergency response plan as part of their location or project specific SH&E Plan for all operations during which equipment is operated within 50 feet (15.25 meters) of an energized overhead electrical line or conductor. Refer to *S3AM-010-PR1 Emergency Response Planning*. This plan shall identify the following information:

- The importance to the operator's safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.
- The safest means of evacuating from equipment that may be energized.
- The potentially energized zone around the equipment.
- The need for crew in the area to avoid approaching or touching the equipment and the load.
- The means to de-energize the electrical line or live conductor.
- The contact information for the utility Overhead Electrical Line Owner / Operator and emergency services.

4.6.2 In the event of an incident, the Employee shall report it in accordance with *S3AM-004 PR1 Incident Reporting, Notifications & Investigation*.

4.6.3 All damaged utilities shall be repaired by a qualified and / or licensed professional.

### 5.0 Records

5.1 Retain the Overhead Electric power lines Acknowledgement forms and any document related to requests of and confirmation from the Overhead Electrical Line Owner / Operator in the project files. Documentation of employee training completed shall be retained in accordance with *S3AM-003-PR1 SH&E Training*.

### 6.0 Attachments

6.1 [S3AM-322-FM1 Overhead Electric Power Lines Acknowledgement Form](#)

Americas

# Overhead Electrical Lines Acknowledgment

S3AM-322-FM1

Company Information		
Name of Employer or Contracting Operation:		
Address:		
City:	Province:	Postal Code:
Telephone:	Fax:	
Project / Location Name:		
AECOM Contact Name:		
Acknowledgement		
<p>I acknowledge that I have received a copy of <i>S3AM-322-PR1 Overhead Lines</i> and any other AECOM documentation related to the overhead electrical lines.</p> <p>List any additional documentation received:</p> <p>I understand that this worksite may have Overhead Electrical Hazards, and I have discussed the received documentation with all of our company staff who will be on this site.</p>		
Name & Title (Print)	Signature	Date

## Underground Utilities

S3AM-331-PR1

### 1.0 Purpose and Scope

- 1.1 Provides procedures designed to help prevent injuries to personnel working on the location and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with encountering underground utilities, subsurface installations, and potential overhead hazards.
- 1.2 Provides the minimum requirements to be followed for underground work (e.g., excavations, drilling, boring, and probing work) to ensure that underground installations, and subsurface structures, are identified properly before work commences.
- 1.3 This procedure applies to all Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.
- 1.4 The Manager is responsible for meeting all the requirements in this procedure.
- 1.5 AECOM's clients may have specific procedures which shall be followed to identify and map utility and subsurface structures on their properties or facilities. Provided the client's procedures meet or exceed those of AECOM, approval shall be obtained from the Manager and the SH&E Manager to follow the client's procedures.

### 2.0 Terms and Definitions

- 2.1 **Underground Utilities** – All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling and communications, etc.
- 2.2 **Clearance** – includes the following:
  - The positive locating of underground utilities or subsurface installations in or near the work area.
  - 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.
- 2.3 **Ground Disturbance (GD)** – Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work that results in the penetration of the ground.
- 2.4 **Hand Clearance Zone** – The area on either side of the locate marks of a utility that shall be maintained in order to expose the utility through the use of non-destructive ground disturbance techniques acceptable to the owner of the buried utility. Visual exposure is required before mechanical excavation equipment may be used.
- 2.5 **Intrusive Activities** – Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits/trenches or other man-made cuts, cavity, trench or depression in an earth surface formed by earth removal.
- 2.6 **Non-Destructive Ground Disturbance Technique** – A safe and acceptable 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:
  - Hand digging.
  - Use of non-conductive tools.
  - Hydro-vacuum.
- 2.7 **Subsurface Installation** – Examples: Subterranean tunnels, underground parking garages and other structures beneath the surface.
- 2.8 **Utility Strikes** – Unplanned contact with utilities resulting in damage to the utility or its protective coating.

### 3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-303-PR1 Excavation
- 3.3 S3AM-321-PR1 Drilling, Boring & Direct-Push Probing

### 4.0 Procedure

#### 4.1 Roles and Responsibilities

##### 4.1.1 Manager

- Administer this procedure and the development of the SH&E Plan.
- Confirm the appropriate equipment and materials are available to conduct the underground utility and/or subsurface installation clearance.
- Confirm all employees involved and affected by the task review the SH&E Plan and Task Hazard Assessment (THA) prior to work commencing
- Authorize work to proceed using the *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist*.
- Confirm that employees conducting underground utilities and subsurface clearance processes possess all required training, registrations or certifications.
- Provide authorization (with the concurrence of the Site Supervisor and SH&E Manager) for work to resume if interrupted due to unexpected conditions or events.

##### 4.1.2 Safety, Health & Environment (SH&E) Manager

- Assist AECOM management as needed by providing guidance and clarification as to issues that may arise.
- Review the SH&E Plan to confirm compliance with jurisdictional regulations. Provide technical guidance as needed when a variance is pursued related to this procedure.

##### 4.1.3 Employees

- Maintain training as appropriate to the work to be completed (e.g. ground disturbance, lockout tagout, equipment operation, etc.). Refer to *S3AM-003-PR1 SH&E Training*.
- Review the SH&E Plan and Task Hazard Assessment (THA) prior to work commencing.
- As appropriate to the anticipated or encountered hazards and as addressed in the applicable planning documentation, utilize appropriate personal protective equipment (PPE) and applicable training, practices and operating procedures.
- Immediately notify the Manager of any unanticipated conditions or events. If assigned equipment, perform appropriate inspections and confirmations of maintenance and/or repairs.

#### 4.2 Training

4.2.1 All on-site employees involved with the underground utility and subsurface identification and associated clearance process shall be trained, at a minimum, in these procedures.

4.2.2 Employees shall complete all required training associated with their tasks in accordance with the SH&E Training Matrix and any training assessments developed at the business group.

- Refer to *S3AM-003-PR1 SH&E Training*.
- This training may include, but is not limited to, Excavation / Trenching (Ground Disturbance), HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and H2S Alive as appropriate.

4.2.3 As applicable, employees shall receive client-required training.

#### 4.3 Planning

4.3.1 Health and Safety Plan – At a minimum, a SH&E Plan and task hazard assessments (THAs) shall be prepared prior to any underground utilities and subsurface installations clearance activities.

- The SH&E Plan will address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
- Employees shall comply with all SH&E Plan requirements.
- The location specific emergency response plan shall be in place, contain procedures applicable to the potential emergencies presented by the operations, and be reviewed with all personnel potentially affected.

4.3.2 *S3AM-331-ATT2 Underground Utilities & Subsurface Installation Clearance Flow Chart* provides a summary of the key requirements addressed in this procedure.

4.3.3 Underground utilities and subsurface installations shall be investigated as being present, including the following, but not limited to:

- Steam, gas and electric.
- Sewer and water.
- Subterranean tunnels.
- Fibre optics (note: routine geophysical surveys will not identify fibre optic cables).
- Traffic control cables.

4.3.4 Location of underground utilities and subsurface installations will be confirmed by cross-referencing available information:

- Maps, as-built drawings and issued for construction (IFC) drawings.
- Plot plans, permits, crossing/encroachment agreements.
- One-Call information, locator and provided surveys.
- Private utility information, locator and provided surveys (e.g. ground penetrating radar (GPR), electromagnetic, etc.).
- Owner supplied documentation.
- Site walks.

4.3.5 As applicable, emergency shut-off locations of utilities shall be verified before work activities commence.

4.3.6 Jurisdictional, land owner, client and utility owner requirements shall be consulted to determine the minimum search zone dimensions and appropriate clearance distances.

4.3.7 As necessary and if possible, adjust locations of excavations or intrusive subsurface work away from subsurface utilities and installations

4.3.8 Prior to any excavation or intrusive subsurface work, the *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist* shall be completed. The form shall be reviewed and signed by the Manager.

- If the answer to any question in Part 1 of the checklist is “No” or “N/A”, no ground disturbance may take place without review by the Manager, in consultation with SH&E Manager, of the circumstances related to the particular item. The Manager shall initial beside each “No” or “N/A” item to indicate review and authorization.

#### 4.4 Permits, Notifications and Access Agreements

- 4.4.1 Any required notifications shall be provided within the appropriate timeframe to the applicable organization (e.g. owner, utility company, agency, governing body, etc.).
- 4.4.2 All applicable permits (e.g. client, government, working near rail road, etc.) will be identified, obtained, and adhered to.
- 4.4.3 All access agreements will be obtained and adhered to.
- 4.5 Locating Underground Utilities and Subsurface Installations
  - 4.5.1 Utilize the appropriate call/click-before-you-dig provider. Refer to *S3AM-331-ATT1 One-Call System*.
  - 4.5.2 Federal/State/Provincial/Territorial and other “One Call” providers shall be contacted at least two working days and no more than ten working days prior to commencing the ground disturbance. Jurisdictional requirements shall be consulted to verify the appropriate advance notice. (e.g. 24 hours, two full working days, three to ten business days, etc.).
  - 4.5.3 If the location of proposed excavation or intrusive subsurface work cannot be clearly and adequately identified, the route and/or area of the proposed ground disturbance shall be identified using white flags, paint or stakes prior to the arrival of the locator. Consult jurisdictional requirements as white-lining may be a mandatory requirement on all ground disturbances.
  - 4.5.4 One Call providers shall appropriately identify and mark the subsurface utilities or installations, or otherwise provide written notification they do not have any facilities near the proposed subsurface/intrusive locations.
  - 4.5.5 Confirm all circuits were on during subsurface checks if the checks were for identifying energized lines (e.g. circuits on timers or light sensing switches).
  - 4.5.6 Areas that have a high density of sub-surface facilities may require a secondary locate by another independent locator to verify locations identified by the first locator.
- 4.6 Private Utility Locating
  - 4.6.1 One Call services may not be available in various non-urban locations. Private utility locating companies shall be utilized to identify and located any underground utilities or subsurface installations.
  - 4.6.2 Be aware urban areas (e.g. city or town) may have subsurface installations (e.g. underground garages) and utilities (e.g. public water, sewer, and gas pipelines) that are not covered by one-call systems.
    - These subsurface installations and utilities require additional investigation and diligence beyond the one-call system.
    - Additional investigation and diligence beyond the one-call system is also recommended for non-urban areas.
  - 4.6.3 In urban areas, private utility locating companies shall be called to identify and locate, through geophysical surveys and other means, the presence of private utilities installed by the property owner (e.g. irrigation systems) and to verify the presence of public utilities on the properties.
    - Hand clearing is required in urban areas.
  - 4.6.4 Hand clearing is also recommended for non-urban areas and may be required by the given jurisdiction.
  - 4.6.5 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 the presence of subsurface installations and utilities.
- 4.7 Surface Markings

- 4.7.1 Once the underground installation has been identified, proper surface markings shall be made in accordance with the guidelines from the One-Call System (refer to S3AM-331-ATT1 ), guidance contained in this procedure or as contract-specified.
- 4.7.2 Color-coded surface marks (paints or similar coatings) shall be used to indicate the type, location, and route of buried installations. Additionally, to increase visibility, color-coded vertical markers (temporary stakes or flags) shall supplement surface marks.
- 4.7.3 All marks and markers shall indicate the name, initials, or logo of the company that owns or operates the installation and the width of the installation if it is greater than 2 inches.
- 4.7.4 If the surface over the buried installation is to be removed, supplemental offset marking shall be used. Offset markings shall be on a uniform alignment and shall clearly indicate that the actual installation is a specific distance away.
- 4.7.5 Locate marks shall be re-verified as per jurisdictional requirements or no later than 14 days after the previous locate was completed, whichever interval is shorter. These locate time intervals shall be maintained for the duration of the ground disturbance.
  - If the work is interrupted during the determined lifespan or work does not commence during the applicable lifespan, a new locate shall be performed.
  - Jurisdictional provisions may allow for an extension to the lifespan of the locate marks, however certain conditions may need to be met. (e.g. activities uninterrupted)
  - If locate marks are moved or destroyed the location of the buried facilities shall be re-established.

#### 4.8 Uniform Color Coding

- 4.8.1 The colors and corresponding installation type are as follows unless otherwise contract-specified:

AMERICAN PUBLIC WORKS ASSOCIATION – APWA  
Color Coding for Marking of Buried Facilities

<b>White</b>	<b>Proposed Ground Disturbance Area</b>
<b>Pink</b>	<b>Temporary Survey Markings</b>
<b>Red</b>	<b>Electric Power Lines, Cables, Conduit and Lighting Cables</b>
<b>Yellow</b>	<b>Gas, Oil, Steam, Petroleum Lines or Gaseous Materials</b>
<b>Orange</b>	<b>Conduit, Cable, Communication, Alarm or Signal Lines</b>
<b>Blue</b>	<b>Potable Water</b>
<b>Green</b>	<b>Sewer, Storm Sewer and Drain Lines</b>
<b>Purple</b>	<b>Reclaimed Water, Irrigation and Slurry Lines (non-potable)</b>

Canadian Association of Geophysical Contractors



#### 4.9 Identification and Mapping of Utility and Subsurface Structures

- 4.9.1 The locations of subsurface utilities and subsurface installations shall be investigated, documented, and shown on a site plan (a scaled site plan shall be used when feasible). Refer to *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.
- 4.9.2 Documentation of utility and subsurface installation identification (calling one call, responses from utilities) along with the scaled site plan shall be available on the worksite at all times of intrusive activities.

#### 4.10 Site Walk

- 4.10.1 A site walk shall be conducted by the AECOM Manager and any other appropriate personnel with the objectives of reviewing all planned intrusive activity locations, the locations 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.
- Walk the area at least 50 feet (15.2 meters) from perimeter of the site to observe physical hazards.
  - Walk the area of at least 50 feet (15.2 meters) radius from each proposed subsurface intrusion location.
  - If possible, particularly at urban and industrial sites, the client/property owner or an individual knowledgeable about the site and site utilities will attend the site walk.
  - Add discovered items/issues to map for use in location confirmation.
- 4.10.2 The Site Walk further supplements the Identification and Mapping of Utility and Subsurface Structures procedure. Site Walks should be repeated as necessary following the Identification and Mapping of Utility and Subsurface Structures as visual verification of the hazards. Examples include:
- Proposed location(s) does not lie on a line connecting two similar manhole covers (e.g. sanitary sewer or storm drain).
  - Proposed subsurface location(s) has not subsided, been excavated and patched, nor gives the appearance it may be covering a former trench (e.g. linear cracks, sagging curbs, linear re-pavements, etc.).
  - Proposed subsurface location(s) does not lie on a line with any water, gas, electrical meters, utility cleanouts, or other utility boxes in the surrounding areas.



#### 4.11 Proposed Subsurface Investigation Locations

- 4.11.1 All proposed subsurface locations will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.
- 4.11.2 Minimum set back distances from subsurface and overhead utilities and subsurface installations will 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 further depending on line voltage). These set back distances are a minimum; government regulations and utility requirements may dictate a greater set back distance.

#### 4.12 Utility Clearance Investigation Location Confirmation

- 4.12.1 As applicable, all client on-site safety procedures shall be understood and adhered to.
- 4.12.2 Hand exposure or non-destructive ground disturbance techniques to expose an underground utility or subsurface installation are necessary to accurately determine size, location and alignment prior to mechanical excavation or intrusive subsurface work in the vicinity of that utility or installation.
- 4.12.3 Non-destructive ground disturbance techniques shall be acceptable to the owner of the buried utility (i.e. hydro-vacuum temperature or pressure).
- 4.12.4 Hydro-vacuum or air-knife require proper grounding equipment at sites where the subsurface may contain flammable gases, liquids, or vapors
- 4.12.5 Jurisdictional, land owner, client and utility owner requirements shall be consulted to determine the distance of the hand exposure zone, and what requirements, when met, may allow mechanical excavation within these zones.
- 4.12.6 At a minimum, all underground utilities and subsurface installations within a 5 feet (1.5 meter) radius of the work site shall be identified and physically located (seen) before use of mechanical excavation equipment is permitted. Jurisdictional, client, land owner and utility owner requirements shall be consulted as the required hand exposure radius may be larger.
- 4.12.7 In urban areas, proposed subsurface locations will be hand cleared to 5 feet (1.5 meters) (soil borings and wells) or 12 inches (30 centimeters) (soil gas sampling probes) using non-mechanical methods.
  - In non-urban areas, hand clearing should be conducted if possible and shall be conducted as required by the given jurisdiction.
  - Hand clearance should be extended if locations of deep utilities and structures are not known.
  - Hand exposure or non-destructive ground disturbance techniques should extend a minimum of 24 inches (60 centimeters) below the intended ground disturbance depth to minimize the hazard of mechanical equipment contact with any utility or installation.
- 4.12.8 Mechanical equipment and attachment dimensions shall be considered when establishing the zone in which all underground utilities and subsurface installations are physically located (seen) prior to the use of that equipment. The radius may require expanding to maintain safe distances when using large equipment.

#### 4.13 Utility Strikes

- 4.13.1 Utility strikes shall be reported in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*.
- 4.13.2 All damaged utilities shall be repaired by a qualified and/or licensed professional.

## 5.0 Records

- 5.1 Retain completed *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist* and documents related the clearance process (e.g. Utility Owner communication, etc.) in the site or project files.

- 5.2 Documentation of employee training completed shall be retained in accordance with S3AM-003-PR1 SH&E Training.

## **6.0 Attachments**

- 6.1 [S3AM-331-ATT1](#) [One-Call System](#)
- 6.2 [S3AM-331-ATT2](#) [Underground Utilities & Subsurface Installation Flow Chart](#)
- 6.3 [S3AM-331-FM1](#) [Underground Utility & Subsurface Installation Clearance Checklist](#)

## Americas

**One-Call System**

S3AM-331-ATT1

**1.0 What Is It?**

- 1.1 One-call systems are established across the Americas to provide one telephone number for excavating contractors and the general public to call for notification of their intent to use equipment for excavating, tunneling, demolition, or any other similar work. This one-call system provides the participating members an opportunity to identify and locate their underground facilities.
- 1.2 As described on their web site (<http://www.call811.com>), Common Ground Alliance (CGA) was “created specifically to work with all industry stakeholders in an effort to prevent damage to underground utility infrastructure and ensure public safety and environmental protection.” CGA also serves as an organization to continuously update best practices amongst the growing underground industry. The CGA web site provides current one-call information for all states and provinces.

**2.0 Why Is It Needed?**

- 2.1 Damage to underground facilities increased considerably following the building boom of the 1950s, 1960s, and early 1970s when the trend was to go underground with utilities. Thousands of miles of underground facilities are vulnerable to excavating machines such as backhoes, and the resulting damage can interrupt utility service and threaten life, health, and property.

**3.0 How to Get It**

- 3.1 In the United States 811 is the Federally-mandated national “Call Before Your Dig” number that connects directly to the local one-call center. Each state has different rules and regulations governing digging, some stricter than others. The CGA web site provides current contact information to find state-specific information as well as links to submit an online digging request where available. Canadian one-call numbers vary by jurisdiction. One-call services are not available in Canada’s Atlantic provinces (New Brunswick, Newfoundland, Nova Scotia) or in the three Northern Territories (Nunavut, Northwest Territories, Yukon).

**4.0 Disclaimer**

- 4.1 The purpose of this directory is to illustrate the extent of one-call service available. Some jurisdictions have a list of “Tier 1” subscriber utilities notified by 811, and a “Tier 2” list that the excavator/contractor is responsible for contacting directly. Users shall verify information is current including the extent and limit of service from local sources.

Province/State		One-Call Agency	Number
Canada		<a href="http://www.clickbeforeyoudig.com">www.clickbeforeyoudig.com</a>	
Alberta	Alberta One Call	<a href="http://www.albertaonecall.com">www.albertaonecall.com</a>	1.800.242.3447
British Columbia	BC One Call	<a href="http://www.bconeall.bc.ca">www.bconeall.bc.ca</a>	1.800.474.6886
Manitoba	Click Before You Dig	<a href="http://www.clickbeforeyoudigmb.com">www.clickbeforeyoudigmb.com</a>	Various – see website
Ontario	Ontario One Call	<a href="http://www.on1call.com">www.on1call.com</a>	1.800.400.2255
Québec	Info Excavation	<a href="http://www.info-ex.com">www.info-ex.com</a>	1.800.663.9228
Saskatchewan	Sask 1 <sup>st</sup> Call	<a href="http://www.sask1stcall.com">www.sask1stcall.com</a>	1.866.828.4888

United States		www.call811.com	811
Alabama	Alabama 811		1.800.292.8525
Alaska	Alaska Digline, Inc.		1.800.478.3121
Arizona	Arizona 811		1.800.782.5348
Arkansas	Arkansas One Call		1.800.482.8998
California	(North & Central) USA North 811		1.800.227.2600
	(South) Dig Alert		1.800.227.2600
Colorado	Colorado 811		1.800.922.1987
Connecticut	Call Before You Dig		1.800.922.4455
Delaware	Miss Utility of Delmarva		1.800.282.8555
District of Columbia	District One Call		1.202.265.7177
Florida	Sunshine 811		1.800.432.4770
Georgia	Georgia 811		1.800.282.7411
Hawaii	Hawaii One Call		1.866.423.7287
Idaho	Dig Line, Inc.		1.800.342.1585
	(Bonner/Boundary) Pass Word		1.800.626.4950
	(Kootenai County) Pass Word		1.800.428.4950
	(Shoshone-Benewah) Pass Word		1.800.398.3285
Illinois	(Chicago) Digger -Chicago Utility Alert Network		312.744.7000
	(Outside of Chicago) JULIE		1.800.892.0123
Indiana	Indiana 811		1.800.382.5544
Iowa	Iowa One Call		1.800.292.8989
Kansas	Kansas 811		1.800.344.7233
Kentucky	Kentucky 811		1.800.752.6007
Louisiana	LA One Call		1.800.272.3020
Maine	Dig Safe		1.888.344.7233
Maryland	(West of Chesapeake Bay) Miss Utility of Maryland		1.800.257.7777
	(East of Chesapeake Bay) Miss Utility of Delmarva		1.800.282.8555
Massachusetts	Dig Safe System, Inc.		1.888.344.7233
Michigan	Miss Dig		1.800.482.7171
Minnesota	Gopher State One Call		1.800.252.1166
Mississippi	Mississippi 811		1.800.227.6477

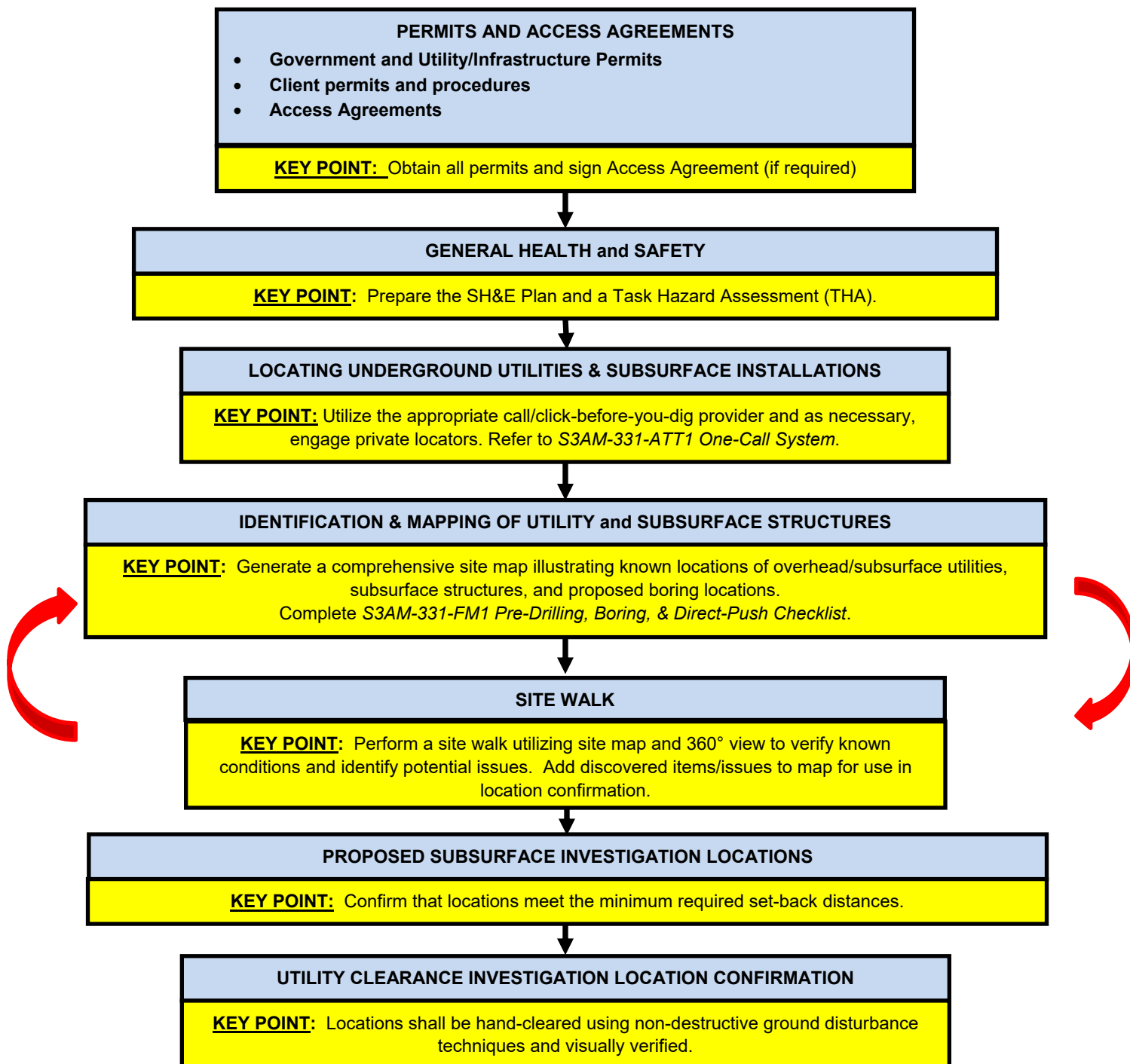
Missouri	Missouri One Call System	1.800.344.7483
Montana	Montana 811	1.800.424.5555
	(Flathead and Lincoln Counties) Montana One Call Center	1.800.551.8344
Nebraska	Nebraska 811	1.800.331.5666
Nevada	USA North 811	1.800.227.2600
New Hampshire	Dig Safe System, Inc.	1.888.344.7233
New Jersey	New Jersey One Call	1.800.272.1000
New Mexico	New Mexico 811	1.800.321.2537
New York	(North of 5 Boroughs) Dig Safely New York	1.800.962.7962
	(5 Boroughs and Long Island) New York 811, Inc.	1.800.272.4480
North Carolina	North Carolina 811	1.800.632.4949
North Dakota	North Dakota One Call	1.800.795.0555
Ohio	Ohio Utilities Protection Service	1.800.362.2764
Oklahoma	Call Okie	1.800.522.6543
Oregon	Oregon Utilities Notification Center	1.800.332.2344
Pennsylvania	Pennsylvania One Call System, Inc.	1.800.242.1776
Puerto Rico	Puerto Rico Public Service Commission 811	
Rhode Island	Dig Safe System, Inc.	1.888.344.7233
South Carolina	South Carolina 811	1.888.721.7877
South Dakota	South Dakota One Call	1.800.781.7474
Tennessee	Tennessee 811	1.800.351.1111
Texas	Texas 811	1.800.545.6005
	Lone Star 811	1.800.669.8344
Utah	Blue Stakes of Utah	1.800.662.4111
Vermont	Dig Safe System, Inc.	1.888.344.7233
Virginia	Virginia 811	1.800.552.7001
Washington	Utility Notification Center	1.800.424.5555
West Virginia	WV 811	1.800.245.4848
Wisconsin	Diggers Hotline	1.800.242.8511
Wyoming	One-Call Of Wyoming	1.800.849.2476

Americas

## Underground Utilities & Subsurface Installation Clearance Flow Chart

S3AM-331-PR1

### Before Any Underground Utilities and Subsurface Installation Clearance



Americas

# Underground Utilities & Subsurface Installation Clearance Checklist

S3AM-331-FM1

Location:	Project #:	Date & Time:
Manager:	Contractor (if applicable):	Weather:
Client:	Inspector:	
Notes:		

## Part 1

Part 1 and Part 2 shall be completed prior to any intrusive subsurface work. DO NOT DISTURB GROUND if a "No" or "N/A" answer to any of the Part 1 questions has not been initialed as authorized by the AECOM Manager.

Any variance from these procedures requires approval of the Vice President of the applicable business group.

	Yes	No	N/A
<b>I. Permits and Access Agreements</b>			
1. Have all appropriate permits and agreements been identified and obtained (e.g. client, drilling, encroachment, working near railroads, etc.)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Have all client requirements been identified and obtained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. If working off-site is (are) site access agreement(s) executed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>II. General Health and Safety</b>			
1. Has a Health and Safety Plan (HASP) been prepared for AECOM employees?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Do on-site personnel have required-level PPE?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Do on-site personnel have required-level of training?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is appropriate monitoring equipment as specified in HASP/THAs available at each clearance location?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Has the field screening equipment been calibrated as required by the HASP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Are calibration gases available at the site?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>III. Identification and Mapping of Utility and Subsurface Structures</b>			
1. Is a Site Plan showing proposed subsurface locations and utility locations attached to this check list?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Have above/below ground utilities & subsurface installations been investigated (Part 2 of this form)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Have all Federal/State/Provincial/Territorial and other "One Call" providers marked their facilities or otherwise notified they do not have any facilities near the proposed subsurface/intrusive locations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Have Federal/State/Provincial/Territorial or other "One Call" providers identified what utilities and underground structures are <u>not</u> included in their provider system (e.g. underground structures)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. As noted in the exception at the bottom of Section VI of this checklist, has a utility locating contractor performed geophysical and/or other surveys of the proposed subsurface/intrusive locations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Visual verification that each of the proposed locations does not lie on a line connecting two similar manhole covers (e.g. sanitary sewer or storm drain)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Visual verification that the ground in the vicinity of each of the proposed subsurface locations has not subsided, been excavated and patched, give 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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 1 and Part 2 shall be completed prior to any intrusive subsurface work. DO NOT DISTURB GROUND if a "No" or "N/A" answer to any of the Part 1 questions has not been initialed as authorized by the AECOM Manager.

Any variance from these procedures requires approval of the Vice President of the applicable business group.

	Yes	No	N/A
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#### IV. Site Walk

1. Has a site walk been performed that includes the following:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. Reviewing all planned intrusive locations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Adjusting locations away from subsurface utilities and installations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Determining the appropriate utility clearance activities for each location?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Determining the presence and location of overhead utilities and obstructions?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Walk around perimeter of the site to observe physical hazards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Includes 50 feet (15.2 meters) from perimeter of the site to observe physical hazards and 50 feet (15.2 meters) radius from each proposed subsurface location?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### V. Proposed Subsurface Investigation Locations\*

1. Are all of the proposed subsurface locations at least 5 feet (1.5 meters) from any identified subsurface utility?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. 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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Are all of the proposed subsurface locations at least 5 feet (1.5 meters) from any subsurface utilities shown on the Public Right-of-Way street improvements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\* These set back distances are a minimum; government regulations and utility requirements may dictate a greater set back distance.

#### VI. Utility Clearance Investigation Location Confirmation\*

1. Have subsurface locations been hand cleared as follows? Hand 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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a. For soil borings/monitoring wells; excavated to a minimum of 5 feet (1.5 meters) below ground surface using non-mechanical methods?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. For soil gas sampling; excavated to 2 foot (0.6 meter) below grade or below the bottom of a concrete floor prior to the installation of soil gas sample probe points?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\* Exceptions to requirements of the utility clearance process, as permitted by the applicable jurisdiction, include the following:

- Sites where extensive utility mapping (e.g. geophysical survey) has been completed and/or where extensive activities have already been performed.
- Locations where facility layout is well documented and understood.
- Sites or portions of large sites where utilities are known not to exist currently or to not have ever existed throughout the life of the facility, property or site.

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 shall 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 (OneCall)			Prior Locate Ticket #	
Date Called:		Called By:		Valid Until:
Ticket Number:		Area Requested To Be Cleared:		
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:				
OneCall Utilities			Field Observation	
Utility	Notified by	Comments	Marked (mains & services)	
Electric (Red)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Gas/Petroleum Pipeline (Yellow)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Sewer/Drainage (Green)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Water (Blue)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Communications (Orange)	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Other	<input type="checkbox"/> OneCall <input type="checkbox"/> Other		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
Were all circuits on during subsurface checks if the checks were for identifying energized lines (e.g., circuits on timers or light sensing switches)?			<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Utilities Not Identified By OneCall (Includes both Public and Private along with Regional and Site Utilities)			Field Observation	
Utility (Colors may vary)	Owner / Contact / Phone #	Notified	Marked	
<b>Communications:</b> (Orange) TV, computer, phone, cell towers, site communication, cameras, security, etc.		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
<b>Electricity:</b> (Red) Mains / Supplies / Interior / Exterior (signs, fuel pumps, low voltage security perimeters, gates, property light posts, equipment, substations, etc.)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
<b>Gas:</b> (Yellow) Mains / Supplies / Equipment / Pipelines (Natural, Process, Oil, Crude, Refined (Gas, Diesel, Jet), etc.)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
<b>Steam:</b> (Yellow)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
<b>Structures:</b> Possible horizontally installed facilities, vaults, basements, tunnels, sub-grade structures, foundations, overhead obstructions, etc.		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
<b>UST Systems</b> (Tanks / piping / electric)		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Sewer:</b> (Green) Sanitary, storm, combined, septic, drainage (parking, buildings, fields), irrigation		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>Water:</b> (Blue) Process, Plant, potable, well, cooling, return/makeup, fire, sprinkler, landscape irrigation, reclaim (Purple) other		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	
<b>Other:</b> Abandoned lines, invisible dog fences, shopping cart perimeter monitoring, traffic lights		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Above	

Manager:

Print

Sign

Date

## **Compressed Air Systems & Testing**

S3AM-337-PR1

### **1.0 Purpose and Scope**

- 1.1 The purpose of this procedure is to require the safe use of compressed air systems, including air compressors, during both normal operations and when used as a tool in the pneumatic testing of constructed piping systems.
- 1.2 This procedure applies to AECOM Americas employees and any other entity and its personnel contractually required to comply with this document's content on construction projects where air compressors are used or pneumatic testing with compressed air is performed.

### **2.0 Definitions**

- 2.1 None

### **3.0 References**

- 3.1 None

### **4.0 Procedure**

- 4.1 Implementation of this procedure is the responsibility of the manager directing activities of the facility, site, or project location.
- 4.2 Air Compressor Safety
  - 4.2.1 Do not modify air compressors without prior written authorization from the manufacturer.
  - 4.2.2 Confirm air receivers of air compressor systems are equipped with a functional and readily visible pressure gauge, as well as one or more spring-loaded safety valves capable of preventing the maximum allowable working pressure of the receiver from being exceeded by more than 10% or as specified by the applicable jurisdiction.
  - 4.2.3 Check couplings daily before use. Use only couplings designed for compressed air services. All hose couplings shall be provided with a positive locking device (whip checks between hoses and on all couplers).
  - 4.2.4 Check hoses daily before use. When using compressed air, use only hoses designed for compressed air service. Take precautions that include the following:
    - Check all hoses for cuts, breaks, and loose connections before assembling the system.
    - Do not crimp, couple, or uncouple hoses while pressurized.
    - Unless the equipment has quick-change connectors (with internal check valves), shut off air at the air supply valve ahead of the hose before breaking the connection.
    - When possible, route airlines and hoses through areas with little or no vehicular or pedestrian traffic. Do not lay air hoses across roadways unless they are protected from traffic.
    - Suspend airlines and hoses crossing pedestrian walkways at least 7 feet (2.13 meters) above the ground or floor, or provide trip protection.
    - Provide all hoses exceeding ½ inch (1.25 cm) inside diameter with a safety device (an excess flow valve) at the source of supply or branch line to reduce pressure in case of hose failure. Equip all air hose connections over 1 inch (2.54 centimeters) in diameter with safety chains or an equivalent restraint that is secured when the connection is made.
    - Hoses equipped with special connections require special tightening techniques or equipment. One example is hammer union connection, which will be tightened with a hammer. Another

example is spanner wrench connections, which will be tightened with a spanner wrench. Do not tighten these or similar connections by hand.

- Secure hose connections before turning on air valves.
- Do not direct air hoses at personnel
- Confirm that air hose connections that are designed to accept a pin are securely pinned in the holes provided to prevent disconnection.
- When hanging an air hose in the vertical position, support hose connections above and below the connections to prevent the weight of the hose from pulling the connection apart, or pulling the connection out of the hose.

- 4.2.5 Compressed air for cleaning will not exceed 30 pounds per square inch (psi) [2.11 kilograms per square centimeter (kg/cm<sup>2</sup>). Use monogoggles or a face shield over safety glasses when cleaning with compressed air. Do not use compressed air to clean harmful dust or fibers that could be dispersed such as lead or asbestos.
- 4.2.6 Equip blowguns with an automatic shut off so that if the operator releases the blowgun, it shuts off (e.g., kill switch, dead man switch).
- 4.2.7 Equip each compressor with a properly sized relief valve maintained according to local, state, and federal regulations.
- 4.2.8 Open drain valves on air receivers in accordance with manufacturer's recommendations and at appropriate intervals to prevent excessive accumulation of liquid in the air receiver.
- 4.2.9 Provide and wear hearing protection if the air compressor and/or the compressed air create a noise level over 85 decibels.
- 4.2.10 Shut off air compressors and provide a fire extinguisher shall be accessible during refueling.

#### 4.3 Pneumatic Testing with Compressed Air

- 4.3.1 Pneumatic testing of constructed systems uses pressurized air. At pressures most frequently encountered on AECOM locations, the amount of energy contained in air is more than 1,000 times the energy contained in water at the same pressure and volume. For this reason, hydraulic pressure testing is by far the safest method and should be used whenever possible. Pneumatic testing is potentially dangerous and should be carried out only in circumstances where the use of this method is unavoidable, and when the testing procedure has been approved by the SH&E Manager.
- 4.3.2 This document is intended to provide advice on the precautions necessary during pneumatic testing to avoid conditions likely to result in danger to personnel in the field. The advice given, however, is limited to general principles and does not attempt to cover in detail the wide range of conditions that may arise. The test system volume, test pressure, the type of components, test temperature, and the materials of construction are factors that have a bearing on the degree of danger involved, and the precise nature of the precautions to be taken.
- 4.3.3 Where practical, take steps to reduce to a minimum the internal volume of the system to be tested. This has the effect of reducing the energy stored in the system while under pressure, thereby reducing the consequences in the event of component failure. This can often be achieved by breaking a large system down into smaller systems. Care should be taken to confirm that openings in the test unit or system are adequately secured and sealed before starting a test.
- 4.3.4 Approval
  - Approval for pneumatic testing will be based on a review of the submitted test documents to determine the dangers involved in each test. In most cases, the SH&E manager will need to examine the proposed test installation before approving a pneumatic test.
  - The SH&E manager may stipulate additional safety requirements for a test that is not covered by this procedure, or for any special site conditions that may be encountered.

- If test pressure is greater than 200 pounds per square inch gauge (psig) (14.1 kilograms per square centimeter gauge [kg/cm<sup>2</sup>g]), test shall not be performed without the approval of both the Project Engineer and the SH&E manager.

#### 4.4 Notification

4.4.1 The SH&E manager shall be notified by the Test Engineer prior to any pending pneumatic test(s), and sufficiently in advance of the proposed test to allow familiarization with the test conditions in each circumstance, and to expedite timely approval. The test package will be reviewed by the SH&E manager or his designee. Each test package will contain the following:

- Type of components being tested
- Materials of construction
- Test system volume
- Test pressure (full and reduced for examination; should be less than 200 psig (14.1 kg/cm<sup>2</sup>g))
- Test temperature (ambient at test unit maximum and minimum)
- Testing medium
- Test location
- Any applicable special site conditions and/or circumstances that might be applicable to the particular package.

#### 4.4.2 Codes and Specifications

- Perform pneumatic testing in accordance with American Society of Mechanical Engineers (ASME) B31.3, Compressed Gas Association (CGA) C10, and the project specifications.

#### 4.4.3 Responsibility for Monitoring Safety Procedures

- Designate a Test Engineer to coordinate and monitor each pneumatic test or group of tests. The Test Engineer will also be responsible for, but not limited to, the following:
  - Coordinating test personnel.
  - Making personnel aware of the test before it begins, and the hazards involved in conducting the test.
  - Obtaining approval of the necessary testing documents.
  - Ensuring that all safety devices and test instruments have been properly sized and calibrated, and are in place for the test.
  - Reviewing and implementation of the required safety procedures for each test.
  - Notifying all required witnesses in time for the test.
  - Verifying that QA/QC has accepted the welds on the system.
  - Protecting adjacent circuits designed for lower pressure from possible over-pressure.
  - Checking the material used to connect the test medium to the circuit being tested.
  - Maintaining an accurate record of the test and obtaining signatures of the test witnesses.

#### 4.5 Limits for Pneumatic Testing

4.5.1 The safety limits for pneumatic testing are difficult to define because the magnitude of a catastrophic failure is indefinable in exact terms until after it has occurred. The extreme cautions necessary to provide complete protection to personnel and property during a pneumatic test are generally not practical (i.e., build special test bunkers around the test unit, or not allowing personnel within 10,000 feet [3,050 meters] of the test, etc.). Some compromises may be necessary in conducting a pneumatic test while providing maximum protection to life and property without causing project costs and schedules to become unreasonable.

4.5.2 Discussion by all the parties involved based on good judgment and some reasonable guidelines is mandatory prior to undertaking any pneumatic test. It should be remembered that the degree of

hazard in pressure systems is proportional to the amount of energy stored, not the amount of pressure present. Therefore, low-pressure, high- volume systems can be as hazardous to personnel as high- pressure systems.

#### 4.5.3 Pressure-Relieving Devices

- The Test Engineer shall confirm that a pressure relief valve (with the discharge directed away from personnel) is fitted in the supply line between the test assembly and the compressor. The valve shall relieve at a pressure approximately 10 percent greater than the test pressure.
- The Test Engineer, prior to the test, shall verify the relief valve set point. The inlet diameter of the relief valve shall be at least 5 percent greater than the diameter of the pressure line from the compressor to the test unit or assembly. A properly designed rupture disk for the appropriate pressure may be used in place of the relief valve, using the same restrictions as noted above.

#### 4.5.4 Testing Procedure

- Pneumatic test below 50,000 P.V. limit (pressure [P] in pounds per square inch gauge [psig] times volume [V] in cubic feet) and less than 200 psig (14.1 kg/cm<sup>2</sup>g) can be completed during the work shift with the following precautions:
  - Notify work crews in the area of the test.
  - Do not allow welding or burning within 2 feet (0.61 meter) of the line under pressure.
  - Place "DO NOT OPERATE" tags on all boundary valves.
  - Place red barricade tape (DANGER – DO NOT ENTER) at test station areas, secondary gauge area, and "high traffic" areas. After the test is complete and the pressure is removed from the test system, remove the signs and barricade.
- Tests that have a pressure greater than 200 psig and below 50,000 P.V. will require the following precautions:
  - The SH&E manager will walk the system before the 200 psig (14.1 kg/cm<sup>2</sup>g) limit is exceeded. The walk-down will be with a representative of the test crew and will include, but not be limited to, checks for tags, blinds, proper instruments and their placement, employees working in the area, and flagging or barricades.
  - Place "DO NOT OPERATE" tags on all boundary valves.
  - Place red barricade tape (DANGER – DO NOT ENTER) a minimum of 50 feet (15 meters) from the test area with signs signifying pneumatic testing.
  - No one, except the test crew checking the system and the SH&E manager or his designee, will be allowed to violate a pneumatic test barricade.
  - Use monitors, as necessary, to confirm the barricades are not violated.

## 5.0 Records

5.1 The following documentation will be maintained in the location or project file:

- 5.1.1 Tests of safety valves on air receivers.
- 5.1.2 Test packages indicating components being tested, materials of construction, and test conditions.
- 5.1.3 Written approvals for pneumatic testing by SH&E manager and Test Engineer (if test pressure greater than 200 psig (14.1 kg/cm<sup>2</sup>g) is used).
- 5.1.4 Test record and results, including signatures of test witnesses.

## 6.0 Attachments

6.1 None

# ATTACHMENT **D**

## Stretch and Flex Poster

# AECOM

## Stretch & Flex Program

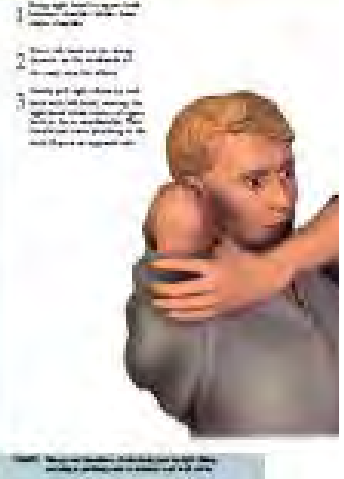
### SHOULDER STRETCH WITH NECK STRETCH



### NECK STRETCH



### TRAP STRETCH



### UPPER TRUNK STRETCH



### LOWER TRUNK STRETCH



### TRUNK STRETCH



# ATTACHMENT **E**

## Site Orientation



## E-1: SITE ORIENTATION INSTRUCTIONS AND CHECKLIST

AECOM will conduct a site safety briefing for a person's initial visit to the site. The briefing will be conducted:

- Prior to the start of work;
- For any new AECOM or subconsultant personnel; and
- At each mobilization, or whenever there is a change in task or significant change in task location.

All personnel working on the project who have received the site briefing (including the HASP review) will sign the Personal Acknowledgement located at the end of the HASP. Visitors may receive a shortened version to address the hazards specific to their visit.

The following items, at minimum, will be discussed during the site safety briefing:

- Contents of this HASP;
- The Emergency Response Plan;
- Contractor SH&E Management expectations;
- Injury management, including notification and hospital and occupational clinic locations;
- The AECOM 4-Sight program;
- Stop Work authority;
- The THAs (**Attachment B**) for the tasks that will be performed on a given project;
- Types of hazards at the site and means for minimizing exposure to them;
- Instructions for new operations to be conducted, and safe work practices;
- PPE that must be used;
- Lone worker check-in procedures;
- Emergency evacuation routes, muster points, and tornado/storm shelters; and
- Location and use of emergency equipment.

These meetings must be documented and maintained in the project files.

# ATTACHMENT **F**

## **Safety Data Sheets**

## SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Version 5.0 Revision Date 29.10.2012

Print Date 19.04.2017

GENERIC EU MSDS - NO COUNTRY SPECIFIC DATA - NO OEL DATA

### 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

#### 1.1 Product identifiers

Product name : Arsenic

Product Number : 267961  
Brand : Aldrich  
Index-No. : 033-001-00-X  
CAS-No. : 7440-38-2

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

Identified uses : Laboratory chemicals, Manufacture of substances

#### 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Israel Ltd.  
3 PARK RABIN, PLAUT  
7670603 REHOVOT  
ISRAEL

Telephone : +972 8948-4222  
Fax : +972 8948-4200

#### 1.4 Emergency telephone number

Emergency Phone # : +972 (8) 948-4222

### 2. HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture

##### Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]

Acute aquatic toxicity (Category 1)  
Chronic aquatic toxicity (Category 1)  
Acute toxicity, Inhalation (Category 3)  
Acute toxicity, Oral (Category 3)

##### Classification according to EU Directives 67/548/EEC or 1999/45/EC

Toxic by inhalation and if swallowed. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

#### 2.2 Label elements

##### Labelling according Regulation (EC) No 1272/2008 [CLP]

Pictogram



Signal word : Danger

Hazard statement(s)

H301 : Toxic if swallowed.  
H331 : Toxic if inhaled.  
H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261 : Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.  
P273 : Avoid release to the environment.  
P301 + P310 : IF SWALLOWED: Immediately call a POISON CENTER or doctor/

P311 physician.  
P501 Call a POISON CENTER or doctor/ physician.  
Dispose of contents/ container to an approved waste disposal plant.

Supplemental Hazard Statements none

**According to European Directive 67/548/EEC as amended.**

Hazard symbol(s)



R-phrases(s)

R23/25

R50/53

Toxic by inhalation and if swallowed.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

S-phrases(s)

S20/21

S28

S45

When using do not eat, drink or smoke.

After contact with skin, wash immediately with plenty of soap and water.

In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S60

S61

This material and its container must be disposed of as hazardous waste.

Avoid release to the environment. Refer to special instructions/ Safety data sheets.

**2.3 Other hazards - none**

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**3. COMPOSITION/INFORMATION ON INGREDIENTS**

**3.1 Substances**

Formula : As  
Molecular Weight : 74,92 g/mol

Component		Concentration
<b>Arsenic</b>		
CAS-No.	7440-38-2	-
EC-No.	231-148-6	
Index-No.	033-001-00-X	

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**4. FIRST AID MEASURES**

**4.1 Description of first aid measures**

**General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance.

**If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

**In case of eye contact**

Flush eyes with water as a precaution.

**If swallowed**

Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**4.2 Most important symptoms and effects, both acute and delayed**

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer.

**4.3 Indication of any immediate medical attention and special treatment needed**

no data available

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## **5. FIREFIGHTING MEASURES**

### **5.1 Extinguishing media**

#### **Suitable extinguishing media**

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

### **5.2 Special hazards arising from the substance or mixture**

Arsenic oxides

### **5.3 Advice for firefighters**

Wear self contained breathing apparatus for fire fighting if necessary.

### **5.4 Further information**

no data available

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## **6. ACCIDENTAL RELEASE MEASURES**

### **6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

### **6.2 Environmental precautions**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

### **6.3 Methods and materials for containment and cleaning up**

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

### **6.4 Reference to other sections**

For disposal see section 13.

---

## **7. HANDLING AND STORAGE**

### **7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.

### **7.2 Conditions for safe storage, including any incompatibilities**

Store in cool place. Keep container tightly closed in a dry and well-ventilated place.

### **7.3 Specific end uses**

no data available

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## **8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

### **8.1 Control parameters**

#### **Components with workplace control parameters**

### **8.2 Exposure controls**

#### **Appropriate engineering controls**

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

#### **Personal protective equipment**

##### **Eye/face protection**

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

##### **Skin protection**

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.

The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Immersion protection

Material: Nitrile rubber

Minimum layer thickness: 0,11 mm

Break through time: > 480 min

Material tested: Dermatril® (Aldrich Z677272, Size M)

Splash protection

Material: Nitrile rubber

Minimum layer thickness: 0,11 mm

Break through time: > 30 min

Material tested: Dermatril® (Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 873000, e-mail sales@kcl.de, test method: EN374

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 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.

### **Body Protection**

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

### **Respiratory protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |                                    |
|---|------------------------------------|
| a) Appearance                                   | Form: powder<br>Colour: grey       |
| b) Odour  | no data available                  |
| c) Odour Threshold                              | no data available                  |
| d) pH   | no data available                  |
| e) Melting point/freezing point                 | Melting point/range: 817 °C - lit. |
| f) Initial boiling point and boiling range      | 613 °C - lit.                      |
| g) Flash point                                  | not applicable                     |
| h) Evaporation rate                             | no data available                  |
| i) Flammability (solid, gas)                    | no data available                  |
| j) Upper/lower flammability or explosive limits | no data available                  |
| k) Vapour pressure                              | no data available                  |
| l) Vapour density                               | no data available                  |
| m) Relative density                             | 5,727 g/mL at 25 °C                |
| n) Water solubility                             | no data available                  |
| o) Partition coefficient: n-octanol/water       | no data available                  |

- |    |                           |                   |
|----|---------------------------|-------------------|
| p) | Autoignition temperature  | no data available |
| q) | Decomposition temperature | no data available |
| r) | Viscosity                 | no data available |
| s) | Explosive properties      | no data available |
| t) | Oxidizing properties      | no data available |

## 9.2 Other safety information

no data available

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## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

no data available

### 10.2 Chemical stability

no data available

### 10.3 Possibility of hazardous reactions

no data available

### 10.4 Conditions to avoid

Heat. Exposure to air may affect product quality.

### 10.5 Incompatible materials

Oxidizing agents, Halogens, Palladium undergoes a violent reaction with arsenic, Zinc, Platinum oxide, Nitrogen trichloride, Bromine azide

### 10.6 Hazardous decomposition products

Other decomposition products - no data available

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## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - rat - 763 mg/kg

Remarks: Behavioral:Ataxia. Diarrhoea

LD50 Oral - mouse - 145 mg/kg

Remarks: Behavioral:Ataxia. Diarrhoea

Inhalation: 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

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

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

#### 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

**Potential health effects**

<b>Inhalation</b>	Toxic if inhaled. May cause respiratory tract irritation.
<b>Ingestion</b>	Harmful if swallowed.
<b>Skin</b>	May be harmful if absorbed through skin. May cause skin irritation.
<b>Eyes</b>	May cause eye irritation.

**Signs and Symptoms of Exposure**

Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer.

**Additional Information**

RTECS: CG0525000

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**12. ECOLOGICAL INFORMATION****12.1 Toxicity**

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 9,9 mg/l - 96,0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 3,8 mg/l - 48 h

**12.2 Persistence and degradability**

no data available

**12.3 Bioaccumulative potential**

no data available

**12.4 Mobility in soil**

no data available

**12.5 Results of PBT and vPvB assessment**

no data available

**12.6 Other adverse effects**

Very toxic to aquatic life with long lasting effects.

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**13. DISPOSAL CONSIDERATIONS****13.1 Waste treatment methods****Product**

Offer surplus and non-recyclable solutions to a licensed disposal company. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Contaminated packaging**

Dispose of as unused product.

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**14. TRANSPORT INFORMATION****14.1 UN number**

ADR/RID: 1558

IMDG: 1558

IATA: 1558

**14.2 UN proper shipping name**

ADR/RID: ARSENIC

IMDG: ARSENIC

IATA: Arsenic



<b>14.3 Transport hazard class(es)</b>		
ADR/RID: 6.1	IMDG: 6.1	IATA: 6.1
<b>14.4 Packaging group</b>		
ADR/RID: II	IMDG: II	IATA: II
<b>14.5 Environmental hazards</b>		
ADR/RID: yes	IMDG Marine pollutant: yes	IATA: no
<b>14.6 Special precautions for user</b>		
no data available		

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## 15. REGULATORY INFORMATION

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**  
no data available

**15.2 Chemical Safety Assessment**  
no data available

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## 16. OTHER INFORMATION

### Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://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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# SAFETY DATA SHEET

Benzene

**Airgas**  
an Air Liquide company

## Section 1. Identification

<b>GHS product identifier</b>	: Benzene
<b>Chemical name</b>	: benzene
<b>Other means of identification</b>	: benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol
<b>Product type</b>	: Liquid.
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol
<b>SDS #</b>	: 001062
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>24-hour telephone</b>	: 1-866-734-3438

## Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2A GERM CELL MUTAGENICITY - Category 1 CARCINOGENICITY - Category 1 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1

### GHS label elements

#### **Hazard pictograms**



#### **Signal word**

: Danger

#### **Hazard statements**

: Highly flammable liquid and vapor.  
Causes skin irritation.  
Causes serious eye irritation.  
May cause genetic defects.  
May cause cancer.  
Causes damage to organs through prolonged or repeated exposure.  
May form explosive mixtures with air.

### Precautionary statements

#### **General**

: Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

#### **Prevention**

: Obtain special instructions before use. Wear protective gloves. Wear protective clothing. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating or lighting equipment. Use non-sparking tools. Take action to prevent static discharges. Keep container tightly closed. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash thoroughly after handling.

## Section 2. Hazards identification

<b>Response</b>	: IF exposed or concerned: Get medical advice or attention. Take off contaminated clothing and wash it before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice or attention.
<b>Storage</b>	: Store locked up. Store in a well-ventilated place. Keep cool.
<b>Disposal</b>	: Dispose of contents and container in accordance with all local, regional, national and international regulations.
<b>Hazards not otherwise classified</b>	: None known.

## Section 3. Composition/information on ingredients

<b>Substance/mixture</b>	: Substance
<b>Chemical name</b>	: benzene
<b>Other means of identification</b>	: benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol
<b>Product code</b>	: 001062

### CAS number/other identifiers

**CAS number** : 71-43-2

<b>Ingredient name</b>	<b>%</b>	<b>CAS number</b>
benzene	100	71-43-2

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

<b>Eye contact</b>	: 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.
<b>Inhalation</b>	: 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 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.
<b>Skin contact</b>	: 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. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
<b>Ingestion</b>	: Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. 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.

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

## Section 4. First aid measures

- Eye contact** : Causes serious eye irritation.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Causes skin irritation.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Ingestion** : No known significant effects or critical hazards.

### Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following: pain or irritation, watering, redness
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following: irritation, redness
- Ingestion** : No specific data.

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

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.
- 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 dry chemical, CO<sub>2</sub>, water spray (fog) or foam.
- Unsuitable extinguishing media** : Do not use water jet.

- Specific hazards arising from the chemical** : Highly flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. 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. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. 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 touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. 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 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** : 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** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. 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). 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. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Do not ingest. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. 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 vapor or mist. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood.
- 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 in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Store locked up. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

## Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
benzene	<p><b>ACGIH TLV (United States, 3/2019).</b>  <b>Absorbed through skin.</b>            STEL: 8 mg/m<sup>3</sup> 15 minutes.            STEL: 2.5 ppm 15 minutes.            TWA: 1.6 mg/m<sup>3</sup> 8 hours.            TWA: 0.5 ppm 8 hours.</p> <p><b>NIOSH REL (United States, 10/2016).</b>            STEL: 1 ppm 15 minutes.            TWA: 0.1 ppm 10 hours.</p> <p><b>OSHA PEL (United States, 5/2018).</b>            STEL: 5 ppm 15 minutes.            TWA: 1 ppm 8 hours.</p> <p><b>OSHA PEL 1989 (United States, 3/1989).</b>            STEL: 5 ppm 15 minutes.            TWA: 1 ppm 8 hours.</p> <p><b>OSHA PEL Z2 (United States, 2/2013).</b>            AMP: 50 ppm 10 minutes.            CEIL: 25 ppm            TWA: 10 ppm 8 hours.</p>

### Appropriate engineering controls

- : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

### Environmental exposure controls

- : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

### Individual protection measures

#### Hygiene measures

- : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

#### Eye/face protection

- : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

#### 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. 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.

## Section 8. Exposure controls/personal protection

- 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.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Liquid. [Watery liquid.]
- Color** : Colorless. Yellowish.
- Odor** : Characteristic.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : 5.49°C (41.9°F)
- Boiling point** : 80.09°C (176.2°F)
- Critical temperature** : 288.95°C (552.1°F)
- Flash point** : Closed cup: -11°C (12.2°F)
- Evaporation rate** : 3.5 (butyl acetate = 1)
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Lower: 1.2%  
Upper: 7.8%
- Vapor pressure** : 10 kPa (75.01 mm Hg) [room temperature]
- Vapor density** : 2.7 (Air = 1)
- Specific Volume (ft<sup>3</sup>/lb)** : 1.1403
- Gas Density (lb/ft<sup>3</sup>)** : 0.877 (20°C / 68 to °F)
- Relative density** : 0.88
- Solubility** : Not available.
- Solubility in water** : 1.88 g/l
- Partition coefficient: n-octanol/water** : 2.13
- Auto-ignition temperature** : 498°C (928.4°F)
- Decomposition temperature** : Not available.
- Viscosity** : Dynamic (room temperature): 0.6 mPa·s (0.6 cP)
- Flow time (ISO 2431)** : Not available.
- Molecular weight** : 78.12 g/mole
- ### Aerosol product
- Heat of combustion** : -40611960 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 vapor to accumulate in low or confined areas.
- Incompatible materials** : Reactive or incompatible with the following materials:  
oxidizing materials



## Section 10. Stability and reactivity

**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
benzene	LC50 Inhalation Gas. LD50 Oral	Rat Rat	10000 ppm 930 mg/kg	7 hours -

#### Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
benzene	Eyes - Moderate irritant	Rabbit	-	88 mg	-
	Eyes - Severe irritant	Rabbit	-	24 hours 2 mg	-
	Skin - Mild irritant	Rat	-	8 hours 60 UI	-
	Skin - Mild irritant	Rabbit	-	24 hours 15 mg	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 mg	-

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

#### Classification

Product/ingredient name	OSHA	IARC	NTP
benzene	+	1	Known to be a human carcinogen.

#### 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
benzene	Category 1	-	-

#### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.



## Section 11. Toxicological information

### Potential acute health effects

<b>Eye contact</b>	: Causes serious eye irritation.
<b>Inhalation</b>	: No known significant effects or critical hazards.
<b>Skin contact</b>	: Causes skin irritation.
<b>Ingestion</b>	: No known significant effects or critical hazards.

### Symptoms related to the physical, chemical and toxicological characteristics

<b>Eye contact</b>	: Adverse symptoms may include the following: pain or irritation, watering, redness
<b>Inhalation</b>	: No specific data.
<b>Skin contact</b>	: Adverse symptoms may include the following: irritation, redness
<b>Ingestion</b>	: No specific data.

### Delayed and immediate effects and also chronic effects from short and long term exposure

#### Short term exposure

<b>Potential immediate effects</b>	: Not available.
<b>Potential delayed effects</b>	: Not available.

#### Long term exposure

<b>Potential immediate effects</b>	: Not available.
<b>Potential delayed effects</b>	: Not available.

### Potential chronic health effects

Not available.

<b>General</b>	: Causes damage to organs through prolonged or repeated exposure.
<b>Carcinogenicity</b>	: May cause cancer. Risk of cancer depends on duration and level of exposure.
<b>Mutagenicity</b>	: May cause genetic defects.
<b>Teratogenicity</b>	: No known significant effects or critical hazards.
<b>Developmental effects</b>	: No known significant effects or critical hazards.
<b>Fertility effects</b>	: 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
benzene	Acute EC50 29000 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 1600000 µg/l Fresh water	Algae - Selenastrum sp.	96 hours
	Acute EC50 9.23 mg/l Fresh water	Daphnia - Daphnia magna - Neonate	48 hours
	Acute LC50 21 mg/l Marine water	Crustaceans - Artemia salina	48 hours
	Acute LC50 5.28 ul/L Fresh water	Fish - Oncorhynchus gorbuscha - Fry	96 hours
	Chronic EC10 >1360 mg/l Fresh water	Algae - Scenedesmus subspicatus	96 hours
	Chronic NOEC 98 mg/l Fresh water	Daphnia - Daphnia magna	21 days
	Chronic NOEC 1.5 to 5.4 ul/L Marine water	Fish - Morone saxatilis - Juvenile (Fledgling, Hatchling, Weanling)	4 weeks

## Section 12. Ecological information

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
benzene	2.13	11	low

### Mobility in soil

Soil/water partition coefficient (K<sub>oc</sub>) : 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. 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. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

### United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Benzene (I,T)	71-43-2	Listed	U019

## Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1114	UN1114	UN1114	UN1114	UN1114
UN proper shipping name	BENZENE	BENZENE	BENZENE	BENZENE	BENZENE
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	II	II	II	II	II
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.”

## Section 14. Transport information

### Additional information

- DOT Classification** : **Reportable quantity** 10 lbs / 4.54 kg [1.3675 gal / 5.1767 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.  
**Limited quantity** Yes.  
**Quantity limitation** Passenger aircraft/rail: 5 L. Cargo aircraft: 60 L.
- TDG Classification** : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3).  
**Explosive Limit and Limited Quantity Index** 1  
**Passenger Carrying Road or Rail Index** 5
- IATA** : **Quantity limitation** Passenger and Cargo Aircraft: 5 L. Cargo Aircraft Only: 60 L.  
 Limited Quantities - Passenger Aircraft: 1 L.

**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:** benzene  
**Clean Water Act (CWA) 311:** benzene

**Clean Air Act Section 112** : Listed

**(b) Hazardous Air Pollutants (HAPs)**

**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	benzene	71-43-2	100
Supplier notification	benzene	71-43-2	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.

## Section 15. Regulatory information

**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 Benzene, which is 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](http://www.P65Warnings.ca.gov).

<b>Ingredient name</b>	<b>No significant risk level</b>	<b>Maximum acceptable dosage level</b>
Benzene	Yes.	Yes.

### 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

Not listed.

### Inventory list

**Australia** : This material is listed or exempted.

**Canada** : This material is listed or exempted.

**China** : This material is listed or exempted.

**Europe** : This material is listed or exempted.

**Japan** : **Japan inventory (ENCS):** This material is listed or exempted.  
**Japan inventory (ISHL):** 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** : Not determined.

**Turkey** : This material is listed or exempted.

**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.)

<b>Health</b>	<b>*</b>	<b>2</b>
<b>Flammability</b>		<b>3</b>
<b>Physical hazards</b>		<b>0</b>

## 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
FLAMMABLE LIQUIDS - Category 2	Expert judgment
SKIN IRRITATION - Category 2	Expert judgment
EYE IRRITATION - Category 2A	Expert judgment
GERM CELL MUTAGENICITY - Category 1	Expert judgment
CARCINOGENICITY - Category 1	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1	Expert judgment

### History

**Date of printing** : 6/1/2020

**Date of issue/Date of revision** : 6/1/2020

**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.

### 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

Revision Date 24-Feb-2020

Revision Number 2

### 1. Identification

**Product Name** Coal tar solution

**Cat No. :** 43671

**Synonyms** No information available

**Recommended Use** Laboratory chemicals.

**Uses advised against** Food, drug, pesticide or biocidal product use.

**Details of the supplier of the safety data sheet**

**Company**

Alfa Aesar  
Thermo Fisher Scientific Chemicals, Inc.  
30 Bond Street  
Ward Hill, MA 01835-8099  
Tel: 800-343-0660  
Fax: 800-322-4757  
**Email:** tech@alfa.com  
www.alfa.com

**Emergency Telephone Number**

During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.  
After normal business hours, call Carechem 24 at (866) 928-0789.

### 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 1A

**Label Elements**

**Signal Word**

Danger

**Hazard Statements**

Highly flammable liquid and vapor  
Causes serious eye irritation  
May cause cancer

**Precautionary Statements****Prevention**

Obtain special instructions before use  
Do not handle until all safety precautions have been read and understood  
Use personal protective equipment as required  
Wash face, hands and any exposed skin thoroughly after handling  
Wear eye/face protection  
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

**Response**

IF exposed or concerned: Get medical attention/advice

**Skin**

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

**Eyes**

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

If eye irritation persists: Get medical advice/attention

**Fire**

In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction

**Storage**

Store locked up  
Store in a well-ventilated place. Keep cool

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

None identified

WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

### 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Ethyl alcohol	64-17-5	86
Coal tar	8007-45-2	14.00

### 4. First-aid measures

**General Advice**

If symptoms persist, call a physician.

**Eye Contact**

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

**Skin Contact**

Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

**Inhalation**

Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

<b>Ingestion</b>	Clean mouth with water and drink afterwards plenty of water.
<b>Most important symptoms and effects</b>	Difficulty in breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
<b>Notes to Physician</b>	Treat symptomatically

## 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Carbon dioxide (CO <sub>2</sub> ). Powder. Water spray. Water mist may be used to cool closed containers.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	13 °C / 55.4 °F
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	No information available
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

### Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

### Hazardous Combustion Products

None known.

### Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

### NFPA

**Health**  
2

**Flammability**  
3

**Instability**  
0

**Physical hazards**  
-

## 6. Accidental release measures

<b>Personal Precautions</b>	Ensure adequate ventilation. Use personal protective equipment as required. Remove all sources of ignition. Take precautionary measures against static discharges.
<b>Environmental Precautions</b>	Should not be released into the environment. See Section 12 for additional Ecological Information.
<b>Methods for Containment and Clean Up</b>	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

<b>Handling</b>	Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.
<b>Storage</b>	Keep away from heat, sparks and flame. Keep container tightly closed in a dry and well-ventilated place.



## 8. Exposure controls / personal protection

### Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Ethyl alcohol	STEL: 1000 ppm	(Vacated) TWA: 1000 ppm (Vacated) TWA: 1900 mg/m <sup>3</sup> TWA: 1000 ppm TWA: 1900 mg/m <sup>3</sup>	IDLH: 3300 ppm TWA: 1000 ppm TWA: 1900 mg/m <sup>3</sup>	STEL: 1000 ppm
Coal tar			TWA: 0.2 mg/m <sup>3</sup>	

### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

### Engineering Measures

Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

### Personal Protective Equipment

#### Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

#### Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

#### Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

#### Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical and chemical properties

Physical State	Liquid Viscous liquid
Appearance	Dark brown
Odor	Alcohol
Odor Threshold	No information available
pH	No information available
Melting Point/Range	No data available
Boiling Point/Range	No information available
Flash Point	13 °C / 55.4 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	<=1100 hPa @ 50 °C
Vapor Density	No information available
Specific Gravity	No information available
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available

## 10. Stability and reactivity

<b>Reactive Hazard</b>	None known, based on information available
<b>Stability</b>	Stable under normal conditions.
<b>Conditions to Avoid</b>	Keep away from open flames, hot surfaces and sources of ignition.
<b>Incompatible Materials</b>	Water, Oxidizing agent
<b>Hazardous Decomposition Products</b>	None under normal use conditions
<b>Hazardous Polymerization</b>	Hazardous polymerization does not occur.
<b>Hazardous Reactions</b>	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### Product Information

##### Oral LD50

Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

##### Dermal LD50

Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

##### Vapor LC50

Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

#### Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethyl alcohol	LD50 = 10470 mg/kg OCED 401 (Rat) 3450 mg/kg ( Mouse )	Not listed	LC50 = 117-125 mg/l (4h) OECD 403 (rat) 20000 ppm/10H (rat)
Coal tar	LD50 = 1700 mg/kg ( Rat )	LD50 = 15800 mg/kg ( Rabbit )	Not listed

#### Toxicologically Synergistic Products

No information available

#### Delayed and immediate effects as well as chronic effects from short and long-term exposure

#### Irritation

No information available

#### Sensitization

No information available

#### Carcinogenicity

The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Ethyl alcohol	64-17-5	Group 1	Known	A3	X	A3
Coal tar	8007-45-2	Group 1	Known	Not listed	X	Not listed

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

ACGIH: (American Conference of Governmental Industrial Hygienists)

#### Mutagenic Effects

No information available

#### Reproductive Effects

No information available.

#### Developmental Effects

No information available.

#### Teratogenicity

No information available.

<b>STOT - single exposure</b>	None known
<b>STOT - repeated exposure</b>	None known
<b>Aspiration hazard</b>	No information available
<b>Symptoms / effects, both acute and delayed</b>	Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
<b>Endocrine Disruptor Information</b>	No information available
<b>Other Adverse Effects</b>	The toxicological properties have not been fully investigated.

## 12. Ecological information

### Ecotoxicity

Contains a substance which is: Toxic to aquatic organisms. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Ethyl alcohol	EC50 (72h) = 275 mg/l (Chlorella vulgaris)	Fathead minnow (Pimephales promelas) LC50 = 14200 mg/l/96h	Photobacterium phosphoreum: EC50 = 34634 mg/L/30 min Photobacterium phosphoreum: EC50 = 35470 mg/L/5 min	EC50 = 9268 mg/L/48h EC50 = 10800 mg/L/24h

<b>Persistence and Degradability</b>	Persistence is unlikely
<b>Bioaccumulation/ Accumulation</b>	No information available.
<b>Mobility</b>	Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Ethyl alcohol	-0.32

## 13. Disposal considerations

<b>Waste Disposal Methods</b>	Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.
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## 14. Transport information

### DOT

<b>UN-No</b>	UN1993
<b>Proper Shipping Name</b>	Flammable liquid, n.o.s.
<b>Technical Name</b>	(ETHANOL (ETHYL ALCOHOL))
<b>Hazard Class</b>	3
<b>Packing Group</b>	II

### TDG

<b>UN-No</b>	UN1993
<b>Proper Shipping Name</b>	Flammable liquid, n.o.s.
<b>Hazard Class</b>	3
<b>Packing Group</b>	II

### IATA

<b>UN-No</b>	UN1993
<b>Proper Shipping Name</b>	Flammable liquid, n.o.s.
<b>Hazard Class</b>	3
<b>Packing Group</b>	II

### IMDG/IMO

<b>UN-No</b>	UN1993
<b>Proper Shipping Name</b>	Flammable liquid, n.o.s.
<b>Hazard Class</b>	3

## Packing Group

II

## 15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Ethyl alcohol	64-17-5	X	ACTIVE	-
Coal tar	8007-45-2	X	ACTIVE	SP

**Legend:**

TSCA - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

SP - Indicates a substance that is identified in a proposed SNUR

**TSCA 12(b)** - Notices of Export

Component	CAS-No	TSCA 12(b) - Notices of Export
Coal tar	8007-45-2	Section 5

International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Ethyl alcohol	64-17-5	X	-	200-578-6	X	X	X	X	KE-13217
Coal tar	8007-45-2	X	-	232-361-7	X	X	X	X	KE-06058

U.S. Federal Regulations**SARA 313**

Not applicable

**SARA 311/312 Hazard Categories**

See section 2 for more information

**CWA (Clean Water Act)**

Not applicable

**Clean Air Act**

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Coal tar	X		-

OSHA - Occupational Safety and Health Administration

Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Coal tar	150 µg/m³ TWA	-

**CERCLA**

Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Coal tar	1 lb	-

**California Proposition 65**

This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Ethyl alcohol	64-17-5	Development (alcoholic beverages only) Carcinogen	-	Developmental Carcinogen
Coal tar	8007-45-2	Carcinogen	0.3 µg/day	Carcinogen

**U.S. State Right-to-Know Regulations**

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Ethyl alcohol	X	X	X	X	X

Coal tar	X	X	X	X	X
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**U.S. Department of Transportation**

Reportable Quantity (RQ): N  
DOT Marine Pollutant N  
DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**

This product does not contain any DHS chemicals.

**Other International Regulations**

**Mexico - Grade** No information available

**16. Other information**

**Prepared By** Health, Safety and Environmental Department  
Email: tech@alfa.com  
www.alfa.com

**Revision Date** 24-Feb-2020

**Print Date** 24-Feb-2020

**Revision Summary** SDS authoring systems update, replaces ChemGes SDS No. 195.

**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

**End of SDS**

# Material Safety Data Sheet

## Ethylbenzene

ACC# 00596

### Section 1 - Chemical Product and Company Identification

**MSDS Name:** Ethylbenzene**Catalog Numbers:** AC118080000, AC118080025, AC118080250, AC118080251, AC118085000, 11808-0010, 02751-1**Synonyms:** Ethylbenzol; Phenylethane.**Company Identification:**

Fisher Scientific

1 Reagent Lane

Fair Lawn, NJ 07410

**For information, call:** 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

### Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
100-41-4	Ethylbenzene	>99	202-849-4

### Section 3 - Hazards Identification

#### EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Flash Point: 15 deg C.

**Warning! Flammable liquid and vapor.** Causes eye, skin, and respiratory tract irritation. May be harmful if inhaled. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression.**Target Organs:** Central nervous system.

#### Potential Health Effects

**Eye:** Causes severe eye irritation. Causes redness and pain.**Skin:** Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Causes redness and pain.**Ingestion:** May cause irritation of the digestive tract. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.**Inhalation:** Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.**Chronic:** Chronic inhalation may cause effects similar to those of acute inhalation.

### Section 4 - First Aid Measures

**Eyes:** Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

**Skin:** Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

**Ingestion:** Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

**Inhalation:** Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

**Notes to Physician:** Treat symptomatically and supportively.

## Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

**Extinguishing Media:** Use water spray, dry chemical, carbon dioxide, or appropriate foam.

**Flash Point:** 15 deg C ( 59.00 deg F)

**Autoignition Temperature:** 432 deg C ( 809.60 deg F)

**Explosion Limits, Lower:** 1.2%

**Upper:** 6.8%

**NFPA Rating:** (estimated) Health: 2; Flammability: 3; Instability: 0

## Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:** Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. Control runoff and isolate discharged material for proper disposal. Use water spray to cool and disperse vapors and protect personnel.

## Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Avoid breathing vapor or mist.

**Storage:** Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

## Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

### Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
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Ethylbenzene	100 ppm TWA; 125 ppm STEL	100 ppm TWA; 435 mg/m3 TWA 800 ppm IDLH	100 ppm TWA; 435 mg/m3 TWA
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**OSHA Vacated PELs:** Ethylbenzene: 100 ppm TWA; 435 mg/m3 TWA

**Personal Protective Equipment**

**Eyes:** Wear chemical splash goggles.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

## Section 9 - Physical and Chemical Properties

**Physical State:** Liquid

**Appearance:** clear, colorless

**Odor:** aromatic odor

**pH:** Not available.

**Vapor Pressure:** 9.6 mm Hg @ 25 deg C

**Vapor Density:** 3.7 (air=1)

**Evaporation Rate:** <1 (butyl acetate=1)

**Viscosity:** 0.63 mPa s 20 C

**Boiling Point:** 136 deg C

**Freezing/Melting Point:** -95 deg C

**Decomposition Temperature:** Not available.

**Solubility:** Insoluble.

**Specific Gravity/Density:** 0.86

**Molecular Formula:** C<sub>8</sub>H<sub>10</sub>

**Molecular Weight:** 106.17

## Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures.

**Conditions to Avoid:** Ignition sources, excess heat.

**Incompatibilities with Other Materials:** Strong oxidizing agents.

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide.

**Hazardous Polymerization:** Has not been reported.

## Section 11 - Toxicological Information

**RTECS#:**

**CAS#** 100-41-4: DA0700000

**LD50/LC50:**

CAS# 100-41-4:

Draize test, rabbit, eye: 500 mg Severe;

Inhalation, mouse: LC50 = 35500 mg/m<sup>3</sup>/2H;

Inhalation, rat: LC50 = 55000 mg/m<sup>3</sup>/2H;

Oral, rat: LD50 = 3500 mg/kg;

Oral, rat: LD50 = 3500 mg/kg;

Skin, rabbit: LD50 = 17800 uL/kg;

Inhalation rat LC50: 17.2 mg/l/4H from BASF.

**Carcinogenicity:**

CAS# 100-41-4:



- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 6/11/04
- **NTP:** Not listed.
- **IARC:** Group 2B carcinogen

**Epidemiology:** No information found

**Teratogenicity:** No information found

**Reproductive Effects:** No information found

**Mutagenicity:** Mutation in mammalian somatic cells(Rodent,mouse) Lymphocyte = 80 mg/L.

**Neurotoxicity:** No information found

**Other Studies:**

## Section 12 - Ecological Information

**Ecotoxicity:** Fish: Rainbow trout: LC50 = 14.0 mg/L; 96 Hr.; Static Bioassay Fish: Fathead Minnow: LC50 = 12.1 mg/L; 96 Hr.; Flow-through Bioassay Fish: Bluegill/Sunfish: LC50 = 150.0 mg/L; 96 Hr.; Static Bioassay, pH 6.5-7.9, 21-23 degrees C Water flea EC50 = 2.1 mg/L; 48 Hr.; Static Bioassay Water flea EC50 = 75.0 mg/L; 48 Hr.; Static Bioassay Shrimp (mysidoposis bahia), LC50=87.6 mg/L/96hr. Sheepshead minnow LC50=275 mg/L/96hr. Fathead minnow LC50=42.3 mg/L/96hr in hard water & 48.5 mg/L/96hr in softwater.

**Environmental:** Experimental data on the bioconcentration of ethylbenzene include a log BCF of 1.9 in goldfish and the log BCF of 0.67 for clams exposed to the water-soluble fraction of crude oil. Using its octanol/water partition coefficient (log Kow = 3.15) and using a recommended regression equation, one can calculate a log BCF in fish of 2.16 indicating that ethylbenzene should not significantly bioconcentrate in aquatic organisms. Ethylbenzene has a moderate adsorption for soil. The measured Koc for silt loam was 164

**Physical:** The predominant photochemical reaction of ethylbenzene in the atmosphere is with hydroxyl radicals; the tropospheric half-life for this reaction is 5.5 and 24 hr in the summer and winter, actively. Degradation is somewhat faster under photochemical smog situations. Photooxidation products which have been identified include ethylphenol, benzaldehyde, acetophenone and m- and p-ethylnitrobenzene. Ethylbenzene is resistant to hydrolysis. Ethylbenzene does not significantly absorb light above 290 nm in methanol solution.

**Other:** No information available.

## Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

**RCRA P-Series:** None listed.

**RCRA U-Series:** None listed.

## Section 14 - Transport Information

	US DOT	Canada TDG
<b>Shipping Name:</b>	ETHYLBENZENE	ETHYLBENZENE
<b>Hazard Class:</b>	3	3
<b>UN Number:</b>	UN1175	UN1175
<b>Packing Group:</b>	II	II
<b>Additional Info:</b>		FLASHPOINT 15 C

## Section 15 - Regulatory Information

## US FEDERAL

### TSCA

CAS# 100-41-4 is listed on the TSCA inventory.

### Health & Safety Reporting List

CAS# 100-41-4: Effective 6/19/87, Sunset 6/19/97

### Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

### Section 12b

None of the chemicals are listed under TSCA Section 12b.

### TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

### CERCLA Hazardous Substances and corresponding RQs

CAS# 100-41-4: 1000 lb final RQ; 454 kg final RQ

### SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

### SARA Codes

CAS # 100-41-4: immediate, delayed, fire.

### Section 313

This material contains Ethylbenzene (CAS# 100-41-4, >99%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

### Clean Air Act:

CAS# 100-41-4 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

### Clean Water Act:

CAS# 100-41-4 is listed as a Hazardous Substance under the CWA. CAS# 100-41-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 100-41-4 is listed as a Toxic Pollutant under the Clean Water Act.

### OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

### STATE

CAS# 100-41-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

### California Prop 65

### The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Ethylbenzene, a chemical known to the state of California to cause cancer. California No Significant Risk Level: None of the chemicals in this product are listed.

## European/International Regulations

### European Labeling in Accordance with EC Directives

### Hazard Symbols:

XN F

### Risk Phrases:

R 11 Highly flammable.

R 20 Harmful by inhalation.

### Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

S 24/25 Avoid contact with skin and eyes.

S 29 Do not empty into drains.

### WGK (Water Danger/Protection)

CAS# 100-41-4: 1

### Canada - DSL/NDSL

CAS# 100-41-4 is listed on Canada's DSL List.

### Canada - WHMIS

This product has a WHMIS classification of B2, D2B, D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

**Canadian Ingredient Disclosure List**

CAS# 100-41-4 is listed on the Canadian Ingredient Disclosure List.

<b>Section 16 - Additional Information</b>
--

**MSDS Creation Date:** 4/28/1999

**Revision #6 Date:** 11/29/2007

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.*



## Safety Data Sheet

Material Name: NAPHTHALENE

SDS ID: 00228306

### Section 1 - PRODUCT AND COMPANY IDENTIFICATION

**Material Name**

NAPHTHALENE

**Synonyms**

NAPHTHALENE CRUDE 78 DEGREE; NAPHTHALENE INTERMEDIATE 79 DEGREE; NAPHTHALENE REFINED 80 DEGREE; COAL TAR NAPHTHALENE

**Chemical Family**

polynuclear aromatic hydrocarbons

**Product Use**

Intermediate process chemical.

**Restrictions on Use**

None known.

**Details of the supplier of the safety data sheet**

KOPPERS INC.

436 Seventh Avenue

Pittsburgh, PA 15219-1800

Mfg Contact: 412-227-2001 (SDS Requests: 866-852-5239)

CHEMTREC: 800-424-9300 (Outside USA: +1 703-527-3887)

Emergencies: (Medical in USA): 877-737-9047

Emergencies: (Medical Outside of USA): 651-632-9269

E-mail: naorgmsds@koppers.com

### Section 2 - HAZARDS IDENTIFICATION

**Classification in accordance with paragraph (d) of 29 CFR 1910.1200.**

Flammable Liquids - Category 4

Acute Toxicity - Oral - Category 4

Acute Toxicity - Dermal - Category 4

Skin Corrosion/Irritation - Category 2

Serious Eye Damage/Eye Irritation - Category 2A

Skin Sensitization - Category 1A

Germ Cell Mutagenicity - Category 2

Carcinogenicity - Category 1B

Specific Target Organ Toxicity - Single Exposure - Category 1 ( blood , eyes , respiratory system , Hematopoietic System , Cardiovascular system , Central Nervous System , kidneys , liver )

Specific Target Organ Toxicity - Repeated Exposure - Category 1 ( Hematopoietic System , Cardiovascular system , Central Nervous System , respiratory system , liver , kidneys , bone marrow )

Specific Target Organ Toxicity - Repeated Exposure - Category 2 ( lungs , liver )

Hazardous to the Aquatic Environment - Acute - Category 1

Hazardous to the Aquatic Environment - Chronic - Category 1

**GHS Label Elements**

**Symbol(s)**

## Safety Data Sheet

**Material Name: NAPHTHALENE**

**SDS ID: 00228306**



### Signal Word

Danger

### Hazard Statement(s)

Combustible liquid.  
Harmful if swallowed.  
Harmful in contact with skin.  
Causes skin irritation.  
Causes serious eye irritation.  
May cause an allergic skin reaction.  
Suspected of causing genetic defects.  
May cause cancer.  
Causes damage to organs.  
Causes damage to organs through prolonged or repeated exposure.  
May cause damage to organs through prolonged or repeated exposure.  
Very toxic to aquatic life with long lasting effects.

### Precautionary Statement(s)

#### Prevention

Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Keep away from heat/sparks/open flame/hot surfaces - No smoking.  
Wear protective gloves/protective clothing/eye protection/face protection.  
Do not breathe dust/fume/gas/mist/vapors/spray.  
Wash thoroughly after handling.  
Contaminated work clothing must not be allowed out of the workplace.  
Do not eat, drink or smoke when using this product.  
Avoid release to the environment.  
Wear protective gloves.

#### Response

In case of fire: Use appropriate media to extinguish.  
Collect spillage.  
If exposed: Call a POISON CENTER or doctor/physician.  
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.  
Continue rinsing.  
IF ON SKIN: Wash with plenty of soap and water.  
If skin irritation or rash occurs: Get medical advice/attention.  
Take off contaminated clothing and wash before reuse.  
Rinse mouth.  
Call a POISON CENTER or doctor if you feel unwell.  
Specific treatment (see label).

#### Storage

Store in a well-ventilated place. Keep cool.  
Store locked up.



## Safety Data Sheet

Material Name: NAPHTHALENE

SDS ID: 00228306

### Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

### Other Hazards

Heated material may cause thermal burns.

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component Name	Percent
91-20-3	Naphthalene	94.5-100
95-15-8	Benzo[b]thiophene	1.6-1.9
91-22-5	Quinoline	1.6-1.9
91-57-6	2-Methylnaphthalene	0.1-1.6
1319-77-3	Cresol	0.2-1.2
90-12-0	1-Methylnaphthalene	0.1-0.6
108-68-9	3,5-Xylenol	0.3-0.4
95-13-6	Indene	0.1-0.3

## Section 4 - FIRST AID MEASURES

### Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

### Skin

Wash skin with soap and water or use a waterless handcleaner while removing contaminated clothing and shoes. For thermal burns, cool affected areas as quickly as possible by drenching or immersing in water until material solidifies. Get immediate medical attention.

### Eyes

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Then get immediate medical attention.

### Ingestion

Not a likely route of exposure. If burns occur, treat as thermal burns. Do NOT induce vomiting. If a large amount is swallowed, get medical attention. Do not give anything by mouth to unconscious or convulsive person. If vomiting occurs, keep head lower than hips to help prevent aspiration. Rinse mouth.

### Most Important Symptoms/Effects

#### Acute

Harmful if swallowed Harmful in contact with skin. Causes skin irritation. Causes serious eye irritation. May cause allergic skin reaction. Causes damage to organs.

#### Delayed

Suspected of causing genetic defects. May cause cancer. Causes damage to organs through prolonged or repeated exposure. May cause damage to organs through prolonged or repeated exposure.

**Indication of any immediate medical attention and special treatment needed**



## Safety Data Sheet

**Material Name: NAPHTHALENE**

**SDS ID: 00228306**

Treat symptomatically and supportively.

### Section 5 - FIRE FIGHTING MEASURES

#### **Extinguishing Media**

##### **Suitable Extinguishing Media**

regular dry chemical, carbon dioxide, dry sand, earth, water spray, regular foam, Large fires: Use water spray, fog or regular foam.

##### **Unsuitable Extinguishing Media**

Do not use water jets.

##### **Special Hazards Arising from the Chemical**

Moderate fire hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back.

##### **Hazardous Combustion Products**

oxides of carbon

##### **Fire Fighting Measures**

Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Directly spraying water or foam onto hot burning product may cause frothing. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. Keep unnecessary people away, isolate hazard area and deny entry. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire.

##### **Special Protective Equipment and Precautions for Firefighters**

Wear full protective fire fighting gear including self contained breathing apparatus (SCBA) for protection against possible exposure.

### Section 6 - ACCIDENTAL RELEASE MEASURES

#### **Personal Precautions, Protective Equipment and Emergency Procedures**

Avoid inhalation or contact. Provide adequate ventilation. Wear personal protective clothing and equipment, see Section 8. Avoid release to the environment. Collect spillage.

##### **Methods and Materials for Containment and Cleaning Up**

Eliminate all ignition sources if safe to do so. Do not touch or walk through spilled material. Stop leak if possible without personal risk. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Prevent entry into waterways, sewers, basements, or confined areas. In Canada, report releases to provincial authorities, municipal authorities, or both, as required. If this product is spilled or leaked into the environment, the CERCLA (40 CFR 302.4) reportable quantity is 100 pounds, and requires National Response Center notification.

### Section 7 - HANDLING AND STORAGE

#### **Precautions for Safe Handling**

Keep away from flames and hot surfaces. No smoking. Do not breathe vapor or mist. Avoid breathing vapors of heated materials. Avoid contact with eyes, skin and clothing. Use only in well ventilated area. Wash exposed areas thoroughly with soap and water, or a waterless handcleaner, after skin contact and before eating, drinking, using tobacco products, or restrooms. Contaminated clothing should be removed and laundered before reuse. Wear protective gloves/clothing and eye/face protection. Do not eat, drink, or smoke when using this product. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

##### **Conditions for Safe Storage, Including any Incompatibilities**



## Safety Data Sheet

**Material Name: NAPHTHALENE**

**SDS ID: 00228306**

Store in a well-ventilated place. Keep cool.

Store locked up.

Store and handle in accordance with all current regulations and standards. Label all containers. Keep away from heat, sparks and naked flames. Store in a cool, dry place. Protect from physical damage. Keep separated from incompatible substances.

**Incompatible Materials**

oxidizing materials

### Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

#### Component Exposure Limits

<b>Naphthalene</b>	<b>91-20-3</b>
ACGIH:	10 ppm TWA
	Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA (US):	10 ppm TWA ; 50 mg/m <sup>3</sup> TWA
Mexico:	Skin - potential for cutaneous absorption
<b>2-Methylnaphthalene</b>	<b>91-57-6</b>
Mexico:	0.5 ppm TWA [VLE-PPT ]
	Skin - potential for cutaneous absorption
<b>1-Methylnaphthalene</b>	<b>90-12-0</b>
Mexico:	0.5 ppm TWA [VLE-PPT ]
	Skin - potential for cutaneous absorption
<b>3,5-Xylenol</b>	<b>108-68-9</b>
ACGIH:	1 ppm TWA inhalable fraction and vapor
<b>Indene</b>	<b>95-13-6</b>
ACGIH:	5 ppm TWA
NIOSH:	10 ppm TWA ; 45 mg/m <sup>3</sup> TWA
Mexico:	5 ppm TWA [VLE-PPT ]

#### ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)

##### Naphthalene (91-20-3)

Time: end of shift Parameter: 1-Naphthol with hydrolysis plus 2-Naphthol with hydrolysis (nonquantitative, nonspecific )

##### Engineering Controls





## Safety Data Sheet

**Material Name: NAPHTHALENE**

**SDS ID: 00228306**

Ensure adequate ventilation. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

### **Individual Protection Measures, such as Personal Protective Equipment**

#### **Eye/face protection**

ANSI Z87.1-1989 approved safety glasses with side shields. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. For the molten form: A face shield is recommended.

#### **Skin Protection**

Wear protective clothing to prevent contact. Contaminated clothing should be removed and laundered before reuse. In the molten form: Wear appropriate heat resistant clothing.

#### **Respiratory Protection**

If the applicable TLVs and/or PELs are exceeded, use canister or cartridge respirators, which are MSHA/NIOSH-approved, with organic vapor cartridges and high-efficiency particulate filters.

#### **Glove Recommendations**

Wear appropriate gloves. In the molten form: Wear appropriate heat resistant gloves.

#### **Protective Materials**

chemical resistant material, heat resistant material

### **Section 9 - PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance</b>	forms crystals during cooling	<b>Physical State</b>	liquid
<b>Odor</b>	mothball odor	<b>Color</b>	Not available
<b>Odor Threshold</b>	0.003 ppm	<b>pH</b>	Not available
<b>Melting Point</b>	77 - 80 °C	<b>Boiling Point</b>	218 °C
<b>Boiling Point Range</b>	Not available	<b>Freezing point</b>	Not available
<b>Evaporation Rate</b>	<1 (Ether = 1 )	<b>Flammability (solid, gas)</b>	Not applicable
<b>Autoignition Temperature</b>	526 °C	<b>Flash Point</b>	>80 °C
<b>Lower Explosive Limit</b>	0.9 % (by volume )	<b>Decomposition temperature</b>	Not available
<b>Upper Explosive Limit</b>	5.9 % (by volume )	<b>Vapor Pressure</b>	0.187 mmHg @ 20 °C
<b>Vapor Density (air=1)</b>	4.42	<b>Specific Gravity (water=1)</b>	1.028 at 4 °C
<b>Water Solubility</b>	0.003 wt%	<b>Partition coefficient: n-octanol/water</b>	Not available



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<b>Viscosity</b>	Not available	<b>Kinematic viscosity</b>	Not available
<b>Solubility (Other)</b>	Not available	<b>Density</b>	1.162 g/cc at 4 °C
<b>Log KOW</b>	3.7 at 25 °C	<b>Physical Form</b>	liquid when loaded , solid at room temperature , changes from solid to liquid as temperature increases
<b>Volatility by Volume</b>	>99 %	<b>Molecular Weight</b>	Not available

### Other Information

No additional information is available.

## Section 10 - STABILITY AND REACTIVITY

### Reactivity

No reactivity hazard is expected.

### Chemical Stability

Stable at normal temperatures and pressure.

### Possibility of Hazardous Reactions

Will not polymerize.

### Conditions to Avoid

Avoid heat, flames, sparks and other sources of ignition.

### Incompatible Materials

oxidizing materials

### Hazardous decomposition products

oxides of carbon

## Section 11 - TOXICOLOGICAL INFORMATION

### Information on Likely Routes of Exposure

#### Inhalation

May be harmful if inhaled.

#### Skin Contact

Harmful in contact with skin. Causes skin irritation. May cause allergic skin reaction.

#### Eye Contact

Causes serious eye irritation.

#### Ingestion

Harmful if swallowed.

### Acute and Chronic Toxicity

#### Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

#### Naphthalene (91-20-3)

Oral LD50 Rat 1110 mg/kg

Dermal LD50 Rabbit 1120 mg/kg

Inhalation LC50 Rat >340 mg/m<sup>3</sup> 1 h

#### Quinoline (91-22-5)

Oral LD50 Rat 331 mg/kg



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Dermal LD50 Rabbit 540 µL/kg

### 3,5-Xylenol (108-68-9)

Oral LD50 Rat 608 mg/kg

Dermal LD50 Rabbit 2000 mg/kg

### Product Toxicity Data

#### Acute Toxicity Estimate

Dermal	1110 mg/kg
Oral	1013 mg/kg

### Immediate Effects

Harmful if swallowed. Harmful in contact with skin. Causes skin irritation. Causes serious eye irritation. May cause allergic skin reaction. Causes damage to organs.

### Delayed Effects

Suspected of causing genetic defects. May cause cancer. Causes damage to organs through prolonged or repeated exposure. May cause damage to organs through prolonged or repeated exposure.

### Irritation/Corrosivity Data

Causes skin irritation. Causes serious eye irritation.

### Respiratory Sensitization

No data available.

### Dermal Sensitization

May cause allergic skin reaction.

### Component Carcinogenicity

Naphthalene	91-20-3
ACGIH:	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC:	Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))
NTP:	Reasonably Anticipated To Be A Human Carcinogen
Quinoline	91-22-5
IARC:	Monograph 121 [in preparation] (Group 2B (possibly carcinogenic to humans))
OSHA:	Present
3,5-Xylenol	108-68-9
ACGIH:	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

May cause cancer.

### Germ Cell Mutagenicity

Suspected of causing genetic defects.

### Tumorigenic Data

No data available

### Reproductive Toxicity

No data available for the mixture.

### Specific Target Organ Toxicity - Single Exposure



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blood, eyes, respiratory system, hematopoietic system, cardiovascular system, central nervous system, kidneys, liver.

### **Specific Target Organ Toxicity - Repeated Exposure**

hematopoietic system, cardiovascular system, central nervous system, kidneys, liver, respiratory system, bone marrow, lungs.

### **Aspiration hazard**

No data available.

### **Medical Conditions Aggravated by Exposure**

respiratory disorders, skin disorders, eye disorders, blood system disorders

## **Section 12 - ECOLOGICAL INFORMATION**

### **Ecotoxicity**

Very toxic to aquatic life with long lasting effects.

### **Component Analysis - Aquatic Toxicity**

<b>Naphthalene</b>	<b>91-20-3</b>
Fish:	LC50 96 h Pimephales promelas 5.74 - 6.44 mg/L [flow-through ]; LC50 96 h Oncorhynchus mykiss 1.6 mg/L [flow-through ]; LC50 96 h Oncorhynchus mykiss 0.91 - 2.82 mg/L [static ]; LC50 96 h Pimephales promelas 1.99 mg/L [static ]; LC50 96 h Lepomis macrochirus 31.0265 mg/L [static ]
Invertebrate:	LC50 48 h Daphnia magna 2.16 mg/L IUCLID ; EC50 48 h Daphnia magna 1.96 mg/L [Flow through ] EPA ; EC50 48 h Daphnia magna 1.09 - 3.4 mg/L [Static ] EPA
<b>Quinoline</b>	<b>91-22-5</b>
Fish:	LC50 96 h Pimephales promelas 77.8 mg/L [flow-through ]; LC50 96 h Pimephales promelas 46 mg/L [static ]; LC50 96 h Poecilia reticulata 40 mg/L [static ]
Algae:	EC50 72 h Desmodesmus subspicatus 84 mg/L [static ] EPA ; EC50 96 h Desmodesmus subspicatus 90 mg/L [static ] EPA
Invertebrate:	EC50 48 h Daphnia magna 28.5 mg/L IUCLID ; EC50 48 h Daphnia magna 45.9 - 57.3 mg/L [Static ] EPA

### **Algal Toxicity**

Naphthalene: 0.4 mg/L 72 hours EC50 Skeletonema costatum.

### **Persistence and Degradability**

Biodegradable.

### **Bioaccumulative Potential**

This material is believed not to bioaccumulate due to low water solubility. BCF for fish is 168.

### **Mobility**

The product has poor water-solubility.

### **Other Toxicity**

No data available.

## **Section 13 - DISPOSAL CONSIDERATIONS**

### **Disposal Methods**



## Safety Data Sheet

**Material Name: NAPHTHALENE**

**SDS ID: 00228306**

Dispose in accordance with all applicable regulations.

**Component Waste Numbers**

This product is classified as a Listed Hazardous Waste U165 as Naphthalene, upon disposal. This product may be classified as a Hazardous Waste for Toxicity Code D026 (Cresols) based on TCLP results.

### Section 14 - TRANSPORT INFORMATION

**US DOT Information:**

**Shipping Name:** NAPHTHALENE, MOLTEN

**Hazard Class:** 4.1

**UN/NA #:** UN2304

**Packing Group:** III

**Required Label(s):** 4.1

Marine pollutant

**Further information:** This material contains reportable quantity (RQ) Hazardous Substances. Applicable shipping classification

IATA Information:

Marine pollutant

**Further information:** Air shipment is prohibited.

**TDG Information:**

**Shipping Name:** NAPHTHALENE, MOLTEN

**Hazard Class:** 4.1

**UN#:** UN2304

**Packing Group:** III

**Required Label(s):** 4.1

Marine pollutant

**International Bulk Chemical Code**

This material does not contain any chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

**Further information**

US DOT Reportable Quantities NAPHTHALENE (91-20-3) 100 lbs RQ; 45.4 kg RQ; STCC Code: 2814149 , HAZ STCC: 4917473. ERG# 133

### Section 15 - REGULATORY INFORMATION

**U.S. Federal Regulations**

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), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

Naphthalene	91-20-3
SARA 313:	0.1 % de minimis concentration
CERCLA:	100 lb final RQ ; 45.4 kg final RQ

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<b>Quinoline</b>	<b>91-22-5</b>
SARA 313:	1 % de minimis concentration
CERCLA:	5000 lb final RQ ; 2270 kg final RQ

**SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories**

Flammable; Carcinogenicity; Acute toxicity; Skin Corrosion/Irritation; Respiratory/Skin Sensitization; Serious Eye Damage/Eye Irritation; Specific Target Organ Toxicity; Germ Cell Mutagenicity

**U.S. State Regulations**

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
<b>Naphthalene</b>	<b>91-20-3</b>	Yes	Yes	Yes	Yes	Yes
<b>Quinoline</b>	<b>91-22-5</b>	Yes	Yes	Yes	Yes	Yes
<b>Indene</b>	<b>95-13-6</b>	Yes	Yes	Yes	Yes	Yes

**California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)**



**WARNING**

This product can expose you to chemicals including Naphthalene, Quinoline , which are known to the State of California to cause cancer. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

**Component Analysis - Inventory**

**Naphthalene (91-20-3)**

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	DSL	Yes	Yes	EIN	Yes	Yes	Yes	No

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW	VN (Draft)
No	Yes	Yes	Yes	Yes	Yes	Yes

**Benzo[b]thiophene (95-15-8)**

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	NSL	No	Yes	EIN	No	Yes	No	Yes

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW	VN (Draft)
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Material Name: NAPHTHALENE

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No	No	Yes	No	Yes	Yes	Yes
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### Quinoline (91-22-5)

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	DSL	Yes	Yes	EIN	Yes	Yes	Yes	No

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW	VN (Draft)
Yes	Yes	Yes	Yes	No	Yes	Yes

### 2-Methylnaphthalene (91-57-6)

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	DSL	Yes	Yes	EIN	Yes	Yes	Yes	No

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW	VN (Draft)
No	Yes	Yes	Yes	No	Yes	Yes

### Cresol (1319-77-3)

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	DSL	Yes	Yes	EIN	Yes	Yes	Yes	No

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW	VN (Draft)
Yes	Yes	Yes	Yes	No	Yes	Yes

### 1-Methylnaphthalene (90-12-0)

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	DSL	Yes	Yes	EIN	Yes	Yes	Yes	No

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW	VN (Draft)
No	No	Yes	Yes	Yes	Yes	Yes

### 3,5-Xylenol (108-68-9)



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Material Name: NAPHTHALENE

SDS ID: 00228306

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	DSL	Yes	Yes	EIN	Yes	Yes	Yes	No

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW	VN (Draft)
Yes	No	Yes	Yes	Yes	Yes	Yes

### Indene (95-13-6)

US	CA	AU	CN	EU	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2
Yes	DSL	Yes	Yes	EIN	Yes	Yes	Yes	No

KR - REACH CCA	MX	NZ	PH	TH-TECI	TW	VN (Draft)
No	Yes	Yes	Yes	No	Yes	Yes

### U.S. Inventory (TSCA)

Listed on inventory.

## Section 16 - OTHER INFORMATION

### NFPA Ratings

Health: 2 Fire: 2 Instability: 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

### Summary of Changes

SECTION 2: Hazard identification. SECTION 3: Composition / information on ingredients. SECTION 4: First aid measures. SECTION 11: Toxicological information.

### Preparation Date

7/19/2018

### Revision date

1/3/2020

### Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania\*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC - European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; F - Background (for Venezuela Biological Exposure Indices); IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan





## Safety Data Sheet

**Material Name: NAPHTHALENE**

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Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL) , KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; KR REACH CCA - Korea Registration and Evaluation of Chemical Substances Chemical Control Act; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX – Mexico; Ne- Non-specific; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; Nq - Non-quantitative; NSL – Non-Domestic Substance List (Canada); NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL- Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH- Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; Sc - Semi-quantitative; STEL - Short-term Exposure Limit; TCCA – Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TH-TECI - Thailand - FDA Existing Chemicals Inventory (TECI); TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW – Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); VN (Draft) - Vietnam (Draft); WHMIS - Workplace Hazardous Materials Information System (Canada).

### **Other Information**

#### **Disclaimer:**

The information set forth in this Safety Data Sheet does not purport to be all-inclusive and should be used only as a guide. While the information and recommendations set forth herein are believed to be accurate, the company makes no warranty regarding such information and recommendations and disclaims all liability from reliance thereon.



# SAFETY DATA SHEET

# Phenol

Issuing Date: 27-May-2012

Revision Date: 17-May-2014

Version 3

## 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

<b>Product name</b>	Phenol	
<b>UN/ID No</b>	UN1671	
<b>Synonyms</b>	Phenol	
<b>Molecular Weight</b>	94.11	
<b>Recommended use</b>	Chemical processing. Synthesis of polymers. Process aid for Plastics and Polymers. Laboratory chemicals. Chemical intermediate. Coating compounds. Binding agent. lubricants, greases and release products.	
<b>Manufacturer</b>	Sasol Chemicals (USA) LLC 1914 Haden Road, Houston, TX 77015-6498 Telephone: (713) 428-5400	
<b>Emergency telephone</b>		
<b>Call Center</b>	<b>Region</b>	<b>Number</b>
NCEC	Europe, Israel, Africa, Americas	+44 (0) 2087 628 322
	Middle East, Arabic African Countries (where European languages are spoken)	+44 (0) 1235 239 670
	Middle East/Africa (where Arabic is spoken)	+44 (0) 1235 239 671
	Asia Pacific	+65 3158 1074
	China	+86 10 5100 3039
SCC	Australia	+61 2801 44558
	Southern Africa (Sasol Call Centre)	+27 17 610 4444
		+27 800 112 890
Chemtrec®	North America	+1 800 424 9300
	World Wide	+1 703 527 3887

## 2. HAZARDS IDENTIFICATION

### GHS - Classification

Acute oral toxicity	Category 3
Acute dermal toxicity	Category 3
Acute inhalation toxicity - dust/mist	Category 3
Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1
Germ cell mutagenicity	Category 2
Specific target organ systemic toxicity (repeated exposure)	Category 2
Acute aquatic toxicity	Category 2
Chronic aquatic toxicity	Category 2

GHS Label elements, including precautionary statements



**Signal Word: DANGER**

**Hazard statements**

- Toxic if swallowed
- Toxic in contact with skin
- Toxic if inhaled
- Causes severe skin burns and eye damage
- Suspected of causing genetic defects
- May cause damage to organs through prolonged or repeated exposure
- Toxic to aquatic life with long lasting effects

**Physical hazards**

Flammable liquids Category 4

- Combustible Liquid

**Precautionary Statements - EU (§28, 1272/2008)**

P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician

P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting

P260 - Do not breathe dust/fume/gas/mist/vapors/spray

P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection

P303 + P361 + P353 - IF ON SKIN (or hair): Remove/ 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

P310 - Immediately call a POISON CENTER or doctor/ physician

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

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking

P370 + P378 - In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction

P273 - Avoid release to the environment.

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Weight %	EC-No
Phenol	108-95-2	100	Present

### 4. FIRST AID MEASURES

**General advice**

Immediate medical attention is required.

**Main symptoms**

Burn. Central nervous system depression. Liver and kidney injuries may occur. Inhalation of vapors in high concentration may cause shortness of breath (lung edema).

<b>Eye contact</b>	Immediate medical attention is required. Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Do not rub affected area.
<b>Skin contact</b>	Immediate medical attention is required. Wash off immediately with soap and plenty of water removing all contaminated clothes and shoes. Apply PEG/EtOH solution liberally to affected area. Allow to remain 15 to 30 seconds, then wash with water. Continue cycle of water - PEG/EtOH solution for at least 15 minutes. (PEG/EtOH solution consists of 2 parts polyethylene glycol 400 to 1 part ethanol. For external use only). Finish decontamination with thorough washing using soap and water.
<b>Inhalation</b>	Move to fresh air. Call a physician or poison control center immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
<b>Ingestion</b>	Immediate medical attention is required. Do NOT induce vomiting. Rinse mouth. Ingest immediately about 350 ml (5 ml/kg body weight) of activated charcoal slurry. Note: To prepare activated charcoal slurry, mix thoroughly 50 g of activated charcoal in 400 ml (about 2 cups) water. Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately.
<b>Notes to physician</b>	Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Do not give chemical antidotes. Asphyxia from glottal edema may occur. Marked decrease in blood pressure may occur with moist rales, frothy sputum, and high pulse pressure. Treat symptomatically.
<b>Protection of first-aiders</b>	Use personal protective equipment. Avoid contact with skin, eyes and clothing.

## 5. FIRE-FIGHTING MEASURES

### Flammable properties

Combustible Liquid.

### Suitable Extinguishing Media

Dry chemical, Foam, Water spray, Carbon dioxide (CO<sub>2</sub>).

### Unsuitable Extinguishing Media

Do not use a solid water stream as it may scatter and spread fire.

### Specific hazards arising from the chemical

In the event of fire and/or explosion do not breathe fumes. The product causes burns of eyes, skin and mucous membranes. Thermal decomposition can lead to release of irritating gases and vapors.

### Protective equipment and precautions for firefighters

Wear self-contained breathing apparatus and protective suit.

## 6. ACCIDENTAL RELEASE MEASURES

### Personal precautions

Evacuate personnel to safe areas. Use personal protective equipment. Avoid contact with skin, eyes and clothing. Keep people away from and upwind of spill/leak.

### Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not allow material to contaminate ground water system. Should not be released into the environment. Prevent product from entering drains.

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<b>Methods for containment</b>	Prevent further leakage or spillage if safe to do so. Prevent spreading over a wide area (e.g. by containment or oil barriers).
<b>Methods for cleaning up</b>	Soak up with inert absorbent material. Take up mechanically and collect in suitable container for disposal. Clean contaminated surface thoroughly. Prevent product from entering drains.
<b>OTHER INFORMATION</b>	Refer to protective measures listed in sections 7 and 8.

## 7. HANDLING AND STORAGE

<b>Advice on safe handling</b>	Provide adequate information, instruction and training for operators. Wear personal protective equipment. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment.
<b>Technical measures/Storage conditions</b>	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers. Keep away from open flames, hot surfaces and sources of ignition.
<b>Incompatible products</b>	Incompatible with strong acids and bases. Incompatible with oxidizing agents, copper alloys, aluminum.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION****Exposure guidelines**

Chemical Name	ACGIH TLV	NIOSH REL	OSHA PEL	Ontario TWA	European Union
Phenol	TWA: 5 ppm S*	IDLH: 250 ppm Ceiling: 15.6 ppm 15 min Ceiling: 60 mg/m <sup>3</sup> 15 min TWA: 5 ppm TWA: 19 mg/m <sup>3</sup>	TWA: 5 ppm TWA: 19 mg/m <sup>3</sup> (vacated) TWA: 5 ppm (vacated) TWA: 19 mg/m <sup>3</sup> (vacated) S* S*	TWA: 5 ppm Skin	S* TWA 7.8 mg/m <sup>3</sup> TWA 2 ppm (3rd:) TWA 2 ppm (3rd:) TWA 8 mg/m <sup>3</sup> (3rd:) STEL 4 ppm (3rd:) STEL 16 mg/m <sup>3</sup> (3rd:) S*

Chemical Name	China	Japan	Korea	Australia	Taiwan
Phenol	TWA: 10 mg/m <sup>3</sup> STEL: 20 mg/m <sup>3</sup> Skin	TWA: 5 ppm TWA: 19 mg/m <sup>3</sup> Skin	Skin TWA: 5 ppm TWA: 19 mg/m <sup>3</sup>	1 ppm 4 mg/m <sup>3</sup> Skin	TWA: 5 ppm TWA: 19 mg/m <sup>3</sup>

Chemical Name	Mexico	Brazil	Argentina	Venezuela	India
Phenol	Mexico: TWA 5 ppm Mexico: TWA 19 mg/m <sup>3</sup> Mexico: STEL 10 ppm Mexico: STEL 38 mg/m <sup>3</sup>	TWA: 4 ppm TWA: 15 mg/m <sup>3</sup> Skin	TWA: 5 ppm Skin	Skin TWA: 5 ppm	TWA: 5 ppm TWA: 19 mg/m <sup>3</sup> Skin

**Other Exposure Guidelines** Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

**Engineering measures** Handle only in a place equipped with local exhaust (or other appropriate exhaust). Drain down and flush system prior to equipment break-in or maintenance. Carry out filling operations only at stations with exhaust ventilation facilities. Ensure that eyewash stations and safety showers are close to the workstation location.

**Personal protective equipment**

<b>Eye/face protection</b>	Tightly fitting safety goggles. Face-shield.
<b>Skin and body protection</b>	Wear as appropriate: Impervious clothing; Impervious gloves; Boots; Chemical resistant apron.
<b>Hand protection</b>	Fluorinated rubber, Chloroprene, Polyvinylchloride, Break through time, >60 min. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
<b>Respiratory Protection</b>	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators

**Hygiene measures**

Handle in accordance with good industrial hygiene and safety practice. When using, do not eat, drink or smoke. Wash hands and face before breaks and immediately after handling the product. Remove and wash contaminated clothing before re-use. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Keep away from food, drink and animal feeding stuffs.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

<b>Physical State @20°C</b>	Solid
<b>appearance</b>	white to Amber
<b>Odor</b>	Phenolic
<b>Odor Threshold</b>	No information available
<b>pH</b>	5.5
<b>Melting point/range</b>	40 °C
<b>Boiling point/boiling range</b>	182 °C
<b>Flash point</b>	79 °C
<b>Evaporation rate</b>	No information available
<b>Flammable properties</b>	Combustible Liquid
<b>Flammability Limits in Air</b>	
upper	8.6
lower	1.7
<b>Vapor pressure</b>	0.35 mmHg @ 25 °C
<b>Vapor density</b>	3.24
<b>Specific Gravity</b>	1.05
<b>Water solubility</b>	80 g/L @ 25 °C
<b>Partition coefficient:</b>	1.46
<b>Autoignition temperature</b>	715 °C
<b>Viscosity, dynamic</b>	3 cp @ 50 °C
<b>Molecular Weight</b>	94.11

**Dust explosion properties****10. STABILITY AND REACTIVITY**

<b>Stability</b>	Stable under normal conditions.
<b>Conditions to avoid</b>	Heat, flames and sparks.
<b>Incompatible products</b>	Incompatible with strong acids and bases, Incompatible with oxidizing agents, copper alloys, aluminum.
<b>Hazardous decomposition products</b>	Thermal decomposition can lead to release of irritating gases and vapors. Carbon monoxide. Carbon dioxide (CO <sub>2</sub> ).
<b>Hazardous reactions</b>	None under normal processing.

**11. TOXICOLOGICAL INFORMATION****Product Information**

<b>Acute toxicity</b>	0% of the mixture consists of ingredient(s) of unknown toxicity.
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Oral	100.10 mg/kg
Dermal	300.30 mg/kg
Inhalation	
gas	NA mg/l
Mist	0.50 mg/l
vapor	NA mg/l

**Component Information**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Phenol	= 317 mg/kg ( Rat )	= 630 mg/kg ( Rabbit )	= 316 mg/m <sup>3</sup> ( Rat ) 4 h

**Chronic toxicity**

**Carcinogenicity**                      There are no known carcinogenic chemicals in this product.

Chemical Name	IARC
Phenol	Group 3

**IARC: (International Agency for Research on Cancer)**

Group 3: Not classifiable as to its carcinogenicity to humans

Group 3 - Not Classifiable as to Carcinogenicity in Humans

**Irritation**                              Causes severe irritation and or burns.

**Mutagenic effects**                      Negative in the Ames test. Positive in the chromosomal aberration assay. Positive in a micronucleus assay. In vitro tests have shown mutagenic effects. Some in vivo tests have shown mutagenic effects.

**Reproductive toxicity**                      None known.

**Target Organ Effects**                      Pancreas, Respiratory system, Central nervous system (CNS), Central Vascular System (CVS), Eyes, Kidney, Liver, Skin, Eyes, Kidney, Liver, Respiratory system, Skin.

**12. ECOLOGICAL INFORMATION****Ecotoxicity**

0% of the mixture consists of components(s) of unknown hazards to the aquatic environment.

Toxic to aquatic life.

Chemical Name	Toxicity to algae	Toxicity to fish	Toxicity to microorganisms	Toxicity to daphnia and other aquatic invertebrates



Phenol	<p>EC50 96 h: = 46.42 mg/L (<i>Pseudokirchneriella subcapitata</i>) EC50 96 h: 0.0188 - 0.1044 mg/L static (<i>Pseudokirchneriella subcapitata</i>) EC50 72 h: 187 - 279 mg/L static (<i>Desmodesmus subspicatus</i>)</p>	<p>LC50 96 h: 11.9 - 50.5 mg/L flow-through (<i>Pimephales promelas</i>) LC50 96 h: 20.5 - 25.6 mg/L static (<i>Pimephales promelas</i>) LC50 96 h: = 32 mg/L (<i>Pimephales promelas</i>) LC50 96 h: 5.449 - 6.789 mg/L flow-through (<i>Oncorhynchus mykiss</i>) LC50 96 h: 7.5 - 14 mg/L static (<i>Oncorhynchus mykiss</i>) LC50 96 h: 4.23 - 7.49 mg/L semi-static (<i>Oncorhynchus mykiss</i>) LC50 96 h: 5.0 - 12.0 mg/L (<i>Oncorhynchus mykiss</i>) LC50 96 h: = 13.5 mg/L static (<i>Lepomis macrochirus</i>) LC50 96 h: 11.9 - 25.3 mg/L flow-through (<i>Lepomis macrochirus</i>) LC50 96 h: = 11.5 mg/L semi-static (<i>Lepomis macrochirus</i>) LC50 96 h: 34.09 - 47.64 mg/L static (<i>Poecilia reticulata</i>) LC50 96 h: = 31 mg/L semi-static (<i>Poecilia reticulata</i>) LC50 96 h: = 27.8 mg/L (<i>Brachydanio rerio</i>) LC50 96 h: 33.9 - 43.3 mg/L flow-through (<i>Oryzias latipes</i>) LC50 96 h: 23.4 - 36.6 mg/L static (<i>Oryzias latipes</i>)</p>	<p>EC50 21 - 36 mg/L 30 min EC50 = 23.28 mg/L 5 min EC50 = 25.61 mg/L 15 min EC50 = 28.8 mg/L 5 min EC50 = 31.6 mg/L 15 min</p>	<p>EC50 48 h: 4.24 - 10.7 mg/L Static (<i>Daphnia magna</i>) EC50 48 h: 10.2 - 15.5 mg/L (<i>Daphnia magna</i>)</p>
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**Persistence and degradability**

Readily biodegradable

The product can be degraded by abiotic (e.g. chemical or photolytic) processes

**Mobility**

Not expected to adsorb on soil. The product evaporates slowly.

Chemical Name	log Pow
Phenol	1.47

**13. DISPOSAL CONSIDERATIONS****Waste from residues / unused products**

Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities. The aqueous medium should be given appropriate treatment as waste water in line with local regulations.

**Contaminated packaging**

Do not re-use empty containers. Dispose of in accordance with local regulations. Empty containers should be taken to an approved waste handling site for recycling or disposal. Can be incinerated, when in compliance with local regulations. Where possible recycling is preferred to disposal or incineration.

**14. TRANSPORT INFORMATION****IMDG/IMO**

<b>Proper Shipping Name</b>	Phenol, solid, molten
<b>Hazard class</b>	6.1
<b>UN/ID No</b>	UN1671
<b>Packing group</b>	II
<b>EmS No.</b>	F-A, S-A
<b>Marine pollutant</b>	This product contains a chemical which is listed as a marine pollutant according to IMDG/IMO
<b>Description</b>	UN1671, Phenol, solid, molten, 6.1, II, Marine Pollutant

**ICAO/IATA**

<b>UN/ID No</b>	UN1671
<b>Proper Shipping Name</b>	Phenol, solid, molten
<b>Hazard class</b>	6.1
<b>Packing group</b>	II
<b>ERG Code</b>	6L
<b>Description</b>	UN1671, Phenol, solid, molten, 6.1, II

**DOT**

<b>Proper Shipping Name</b>	Phenol, solid, molten
<b>Hazard class</b>	6.1
<b>UN/ID No</b>	UN1671
<b>Packing group</b>	II
<b>Description</b>	UN1671, Phenol, solid, molten, 6.1, II

**ADR/RID**

<b>Proper Shipping Name</b>	Phenol, solid, molten
<b>Hazard class</b>	6.1
<b>UN/ID No</b>	UN1671
<b>Packing group</b>	II
<b>Classification Code</b>	T2
<b>Special Provisions</b>	279
<b>Description</b>	UN1671, Phenol, solid, molten, 6.1, II

## 15. REGULATORY INFORMATION

### International Inventories

All of the components in the product are on the following Inventory lists:

<b>TSCA</b>	Complies
<b>EINECS/ELINCS</b>	Complies
<b>DSL/NDSL</b>	Complies
<b>PICCS</b>	Complies
<b>ENCS</b>	Complies
<b>IECSC</b>	Complies
<b>AICS</b>	Complies
<b>KECL</b>	Complies

### Legend

**TSCA** (Toxic Substances Control Act)

**EINECS/ELINCS** - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

**DSL/NDSL** - Canadian Domestic Substances List/Non-Domestic Substances List

**PICCS** - Philippines Inventory of Chemicals and Chemical Substances

**ENCS** - Japan Existing and New Chemical Substances

**IECSC** - China Inventory of Existing Chemical Substances

**AICS** - Australian Inventory of Chemical Substances

**KECL** - Korean Existing and Evaluated Chemical Substances

**RESTRICTIONS - REACH TITLE VIII** No information available

### U.S. FEDERAL REGULATIONS

#### **SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372:

Chemical Name	CAS-No	Weight %	SARA 313 - Threshold Values %
Phenol	108-95-2	100	1.0

#### **SARA 311/312 Hazard Categories**

<b>Acute Health Hazard</b>	yes
<b>Chronic Health Hazard</b>	yes
<b>Fire Hazard</b>	yes
<b>Sudden Release of Pressure Hazard</b>	no
<b>Reactive Hazard</b>	no

#### **Clean Water Act**

This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Chemical Name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Phenol	1000 lb	X	X	X

#### **CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302):

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs	RQ
Phenol	1000 lb	1000 lb	RQ 1000 lb final RQ RQ 454 kg final RQ

**U.S. STATE REGULATIONS****U.S. State Right-to-Know Regulations**

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Phenol	X	X	X	X	X

Chemical Name	NPRI
Phenol	X

**Legend**

NPRI - National Pollutant Release Inventory

**16. OTHER INFORMATION**

Health Hazard	4
Fire Hazard	2
Reactivity	0

Issuing Date: 27-May-2012

Revision Date: 17-May-2014

**Disclaimer**

The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

## SAFETY DATA SHEET

Creation Date 09-May-2012

Revision Date 18-Jan-2018

Revision Number 4

### 1. Identification

**Product Name** Styrene, stabilized

**Cat No. :** AC132790000; AC132790010; AC132790025; AC132790050;  
AC132790100; AC132790250

**CAS-No** 100-42-5  
**Synonyms** Ethenylbenzene

**Recommended Use** Laboratory chemicals.  
**Uses advised against** Food, drug, pesticide or biocidal product use.  
**Details of the supplier of the safety data sheet**

**Company**

Fisher Scientific	Acros Organics
One Reagent Lane	One Reagent Lane
Fair Lawn, NJ 07410	Fair Lawn, NJ 07410
Tel: (201) 796-7100	

**Emergency Telephone Number**

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11  
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99  
**CHEMTREC** Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

### 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 2
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Ears, Central nervous system (CNS).	
Aspiration Toxicity	Category 1

**Label Elements**

**Signal Word**

Danger

**Hazard Statements**

Flammable liquid and vapor  
May be fatal if swallowed and enters airways  
Causes skin irritation  
Causes serious eye irritation  
Harmful if inhaled  
May cause respiratory irritation  
May cause drowsiness or dizziness  
Suspected of damaging the unborn child  
Causes damage to organs through prolonged or repeated exposure  
Suspected of causing cancer

**Precautionary Statements****Prevention**

Obtain special instructions before use  
Do not handle until all safety precautions have been read and understood  
Use personal protective equipment as required  
Use only outdoors or in a well-ventilated area  
Wash face, hands and any exposed skin thoroughly after handling  
Wear eye/face protection  
Do not breathe dust/fume/gas/mist/vapors/spray  
Do not eat, drink or smoke when using this product  
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  
Keep cool

**Response**

IF exposed or concerned: Get medical attention/advice

**Inhalation**

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

**Skin**

If skin irritation occurs: Get medical advice/attention

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

Wash contaminated clothing before reuse

**Eyes**

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

If eye irritation persists: Get medical advice/attention

**Ingestion**

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician

Do NOT induce vomiting

**Fire**

In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction

**Storage**

Store locked up

Store in a well-ventilated place. Keep container tightly closed

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

Harmful to aquatic life with long lasting effects

WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

### 3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Styrene	100-42-5	>95

### 4. First-aid measures

<b>General Advice</b>	If symptoms persist, call a physician.
<b>Eye Contact</b>	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
<b>Inhalation</b>	Remove to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs (by aspiration).
<b>Ingestion</b>	Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs naturally, have victim lean forward.
<b>Most important symptoms and effects</b>	Difficulty in breathing. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
<b>Notes to Physician</b>	Treat symptomatically

### 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	Water spray, carbon dioxide (CO <sub>2</sub> ), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	31 °C / 87.8 °F
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	490 °C / 914 °F
<b>Explosion Limits</b>	
<b>Upper</b>	7.0%
<b>Lower</b>	1.1%
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

**Specific Hazards Arising from the Chemical**

Flammable. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

**Hazardous Combustion Products**

Carbon monoxide (CO). Carbon dioxide (CO<sub>2</sub>).

**Protective Equipment and Precautions for Firefighters**

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

**Health**  
3

**Flammability**  
3

**Instability**  
2

**Physical hazards**  
N/A

## 6. Accidental release measures

**Personal Precautions**

Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

**Environmental Precautions**

Should not be released into the environment. See Section 12 for additional Ecological Information. Avoid release to the environment. Collect spillage. Do not flush into surface water or sanitary sewer system.

**Methods for Containment and Clean Up**

Keep in suitable, closed containers for disposal. Soak up with inert absorbent material. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

## 7. Handling and storage

**Handling**

Wear personal protective equipment/face protection. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.

**Storage**

Keep refrigerated. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat, sparks and flame.

## 8. Exposure controls / personal protection

**Exposure Guidelines**

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Styrene	TWA: 20 ppm STEL: 40 ppm	(Vacated) TWA: 50 ppm (Vacated) TWA: 215 mg/m <sup>3</sup> Ceiling: 200 ppm (Vacated) STEL: 100 ppm (Vacated) STEL: 425 mg/m <sup>3</sup> TWA: 100 ppm	IDLH: 700 ppm TWA: 50 ppm TWA: 215 mg/m <sup>3</sup> STEL: 100 ppm STEL: 425 mg/m <sup>3</sup>	TWA: 20 ppm STEL: 40 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

**Engineering Measures**

Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment.

**Personal Protective Equipment****Eye/face Protection**

Tight sealing safety goggles. Face protection shield.

**Skin and body protection**

Wear appropriate protective gloves and clothing to prevent skin exposure.

**Respiratory Protection**

No protective equipment is needed under normal use conditions.

**Hygiene Measures**

Handle in accordance with good industrial hygiene and safety practice.



## 9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	pungent
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-31 °C / -23.8 °F
Boiling Point/Range	145 - 146 °C / 293 - 294.8 °F @ 760 mmHg
Flash Point	31 °C / 87.8 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.0%
Lower	1.1%
Vapor Pressure	7 mbar @ 20 °C
Vapor Density	1.22
Specific Gravity	0.906
Solubility	Moderately soluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	490 °C / 914 °F
Decomposition Temperature	No information available
Viscosity	0.695 mPa.s at 25 °C
Molecular Formula	C8 H8
Molecular Weight	104.15

## 10. Stability and reactivity

Reactive Hazard	Yes
Stability	Stable under normal conditions.
Conditions to Avoid	Excess heat. Incompatible products. Keep away from open flames, hot surfaces and sources of ignition. Temperatures above 40°C.
Incompatible Materials	Acids, Halogenated compounds, Copper alloys, Strong oxidizing agents
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO <sub>2</sub> )
Hazardous Polymerization	Hazardous polymerization may occur. Hazardous polymerization may occur upon depletion of inhibitor.
Hazardous Reactions	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Styrene	-	LD50 > 2000 mg/kg ( Rat )	LC50 = 11.7 mg/L ( Rat ) 4 h

**Toxicologically Synergistic Products** No information available

### Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes, respiratory system and skin
Sensitization	No information available

**Carcinogenicity**

The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Styrene	100-42-5	Group 2A	Reasonably Anticipated	Not listed	X	Not listed

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

NTP: (National Toxicity Program)

**Mutagenic Effects**

No information available

**Reproductive Effects**

Experiments have shown reproductive toxicity effects on laboratory animals.

**Developmental Effects**

No information available.

**Teratogenicity**

No information available.

**STOT - single exposure**

Respiratory system

**STOT - repeated exposure**

Ears Central nervous system (CNS)

**Aspiration hazard**

Category 1

**Symptoms / effects, both acute and delayed** Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

**Endocrine Disruptor Information**

Component	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Styrene	Group I Chemical	High Exposure Concern	Not applicable

**Other Adverse Effects**

The toxicological properties have not been fully investigated.

## 12. Ecological information

**Ecotoxicity**

Do not empty into drains. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment. Contains a substance which is: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Styrene	EC50: 0.15 - 3.2 mg/L, 96h static (Pseudokirchneriella subcapitata) EC50: = 1.4 mg/L, 72h (Pseudokirchneriella subcapitata) EC50: = 0.72 mg/L, 96h (Pseudokirchneriella subcapitata) EC50: 0.46 - 4.3 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: 58.75 - 95.32 mg/L, 96h static (Poecilia reticulata) LC50: 19.03 - 33.53 mg/L, 96h static (Lepomis macrochirus) LC50: 6.75 - 14.5 mg/L, 96h static (Pimephales promelas) LC50: 3.24 - 4.99 mg/L, 96h flow-through (Pimephales promelas)	= 5.4 mg/L EC50 Photobacterium phosphoreum 5 min	EC50: 3.3 - 7.4 mg/L, 48h (Daphnia magna)

**Persistence and Degradability**

Insoluble in water Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation**

No information available.

**Mobility**

. Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

Component	log Pow
Styrene	2.95

### 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

### 14. Transport information

#### DOT

UN-No UN2055  
 Proper Shipping Name STYRENE MONOMER, STABILIZED  
 Hazard Class 3  
 Packing Group III

#### TDG

UN-No UN2055  
 Proper Shipping Name STYRENE MONOMER, STABILIZED  
 Hazard Class 3  
 Packing Group III

#### IATA

UN-No UN2055  
 Proper Shipping Name STYRENE MONOMER, STABILIZED  
 Hazard Class 3  
 Packing Group III

#### IMDG/IMO

UN-No UN2055  
 Proper Shipping Name STYRENE MONOMER, STABILIZED  
 Hazard Class 3  
 Packing Group III

### 15. Regulatory information

#### United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Styrene	100-42-5	X	ACTIVE	-

#### Legend:

**TSCA** - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

**TSCA 12(b)** - Notices of Export Not applicable

#### International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Styrene	100-42-5	X	-	202-851-5	X	X	X	X	KE-35342

#### U.S. Federal Regulations

##### SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Styrene	100-42-5	>95	0.1

**SARA 311/312 Hazard Categories** See section 2 for more information

**CWA (Clean Water Act)**

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Styrene	X	1000 lb	-	-

**Clean Air Act**

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Styrene	X		-

**OSHA** - Occupational Safety and Health Administration

Not applicable

**CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Styrene	1000 lb	-

**California Proposition 65**

This product contains the following Proposition 65 chemicals.

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Styrene	100-42-5	Carcinogen	27 µg/day	Carcinogen

**U.S. State Right-to-Know Regulations**

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Styrene	X	X	X	X	X

**U.S. Department of Transportation**

Reportable Quantity (RQ): N  
 DOT Marine Pollutant N  
 DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**

This product does not contain any DHS chemicals.

**Other International Regulations****Mexico - Grade**

Serious risk, Grade 3

## 16. Other information

**Prepared By**

Regulatory Affairs  
 Thermo Fisher Scientific  
 Email: EMSDS.RA@thermofisher.com

**Creation Date**

09-May-2012

**Revision Date**

18-Jan-2018

**Print Date**

18-Jan-2018

**Revision Summary**

This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other

materials or in any process, unless specified in the text

**End of SDS**

# SAFETY DATA SHEET

Toluene

**Airgas**  
an Air Liquide company

## Section 1. Identification

<b>GHS product identifier</b>	: Toluene
<b>Chemical name</b>	: toluene
<b>Other means of identification</b>	: Benzene, methyl-; Methylbenzene; Toluol; toluene, pure
<b>Product type</b>	: Liquid.
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: Benzene, methyl-; Methylbenzene; Toluol; toluene, pure
<b>SDS #</b>	: 001063
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>24-hour telephone</b>	: 1-866-734-3438

## Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: FLAMMABLE LIQUIDS - Category 2 SKIN IRRITATION - Category 2 TOXIC TO REPRODUCTION (Fertility) - Category 2 TOXIC TO REPRODUCTION (Unborn child) - Category 2 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2

### GHS label elements

**Hazard pictograms**



**Signal word** : Danger

**Hazard statements** : May form explosive mixtures with air.  
Highly flammable liquid and vapor.  
Causes skin irritation.  
Suspected of damaging fertility or the unborn child.  
May cause drowsiness or dizziness.  
May cause damage to organs through prolonged or repeated exposure.

### Precautionary statements

**General** : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

**Prevention** : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Do not breathe vapor. Wash hands thoroughly after handling.

## Section 2. Hazards identification

<b>Response</b>	: Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention.
<b>Storage</b>	: Store locked up. Store in a well-ventilated place. Keep cool.
<b>Disposal</b>	: Dispose of contents and container in accordance with all local, regional, national and international regulations.
<b>Hazards not otherwise classified</b>	: None known.

## Section 3. Composition/information on ingredients

<b>Substance/mixture</b>	: Substance
<b>Chemical name</b>	: toluene
<b>Other means of identification</b>	: Benzene, methyl-; Methylbenzene; Toluol; toluene, pure
<b>Product code</b>	: 001063

### CAS number/other identifiers

**CAS number** : 108-88-3

<b>Ingredient name</b>	<b>%</b>	<b>CAS number</b>
toluene	100	108-88-3

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

<b>Eye contact</b>	: 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.
<b>Inhalation</b>	: 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.
<b>Skin contact</b>	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
<b>Ingestion</b>	: Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. 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.

## Section 4. First aid measures

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

- Eye contact** : No known significant effects or critical hazards.
- Inhalation** : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness.
- Skin contact** : Causes skin irritation.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Ingestion** : Can cause central nervous system (CNS) depression.

#### Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:., pain or irritation, watering, redness
- Inhalation** : Adverse symptoms may include the following:., nausea or vomiting, headache, drowsiness/fatigue, dizziness/vertigo, unconsciousness, reduced fetal weight, increase in fetal deaths, skeletal malformations
- Skin contact** : Adverse symptoms may include the following:., irritation, redness, reduced fetal weight, increase in fetal deaths, skeletal malformations
- Ingestion** : Adverse symptoms may include the following:., reduced fetal weight, increase in fetal deaths, skeletal malformations

### 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.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

- Suitable extinguishing media** : Use dry chemical, CO<sub>2</sub>, water spray (fog) or foam.
- Unsuitable extinguishing media** : Do not use water jet.

- Specific hazards arising from the chemical** : Highly flammable liquid and vapor. Runoff to sewer may create fire or explosion hazard. 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. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. 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 touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. 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** : 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** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. 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). 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. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Do not ingest. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. 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 vapor or mist. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid exposure during pregnancy.
- 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 in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Store locked up. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. 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
toluene	<p><b>ACGIH TLV (United States, 3/2017).</b> TWA: 20 ppm 8 hours.</p> <p><b>NIOSH REL (United States, 10/2016).</b> STEL: 560 mg/m<sup>3</sup> 15 minutes. STEL: 150 ppm 15 minutes. TWA: 375 mg/m<sup>3</sup> 10 hours. TWA: 100 ppm 10 hours.</p> <p><b>OSHA PEL 1989 (United States, 3/1989).</b> STEL: 560 mg/m<sup>3</sup> 15 minutes. STEL: 150 ppm 15 minutes. TWA: 375 mg/m<sup>3</sup> 8 hours. TWA: 100 ppm 8 hours.</p> <p><b>OSHA PEL Z2 (United States, 2/2013).</b> AMP: 500 ppm 10 minutes. CEIL: 300 ppm TWA: 200 ppm 8 hours.</p>

#### Appropriate engineering controls

- : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

#### Environmental exposure controls

- : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

### Individual protection measures

#### Hygiene measures

- : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

#### Eye/face protection

- : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

#### 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. 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.

## Section 8. Exposure controls/personal protection

- 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.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Liquid. [Watery liquid.]
- Color** : Colorless.
- Odor** : Characteristic.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -95°C (-139°F)
- Boiling point** : 110.6°C (231.1°F)
- Critical temperature** : 318.65°C (605.6°F)
- Flash point** : Closed cup: 4.4°C (39.9°F)
- Evaporation rate** : 2 (butyl acetate = 1)
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Lower: 1.1%  
Upper: 7.1%
- Vapor pressure** : 3.1 kPa (23.17 mm Hg) [room temperature]
- Vapor density** : 3.1 (Air = 1)
- Specific Volume (ft<sup>3</sup>/lb)** : 1.1494
- Gas Density (lb/ft<sup>3</sup>)** : 0.87 (20°C / 68 to °F)
- Relative density** : 0.87
- Solubility** : Not available.
- Solubility in water** : 0.57 g/l
- Partition coefficient: n-octanol/water** : 2.73
- Auto-ignition temperature** : 480°C (896°F)
- Decomposition temperature** : Not available.
- Viscosity** : Dynamic (room temperature): 0.56 mPa·s (0.56 cP)
- Flow time (ISO 2431)** : Not available.
- Molecular weight** : 92.14 g/mole
- Aerosol product**
- Heat of combustion** : -40542180 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 vapor to accumulate in low or confined areas.
- Incompatible materials** : Reactive or incompatible with the following materials:  
oxidizing materials

## Section 10. Stability and reactivity

**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
toluene	LC50 Inhalation Vapor LC50 Inhalation Vapor	Rat Rat	28830 ppm 49 g/m <sup>3</sup>	1 hours 4 hours

#### Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
toluene	Eyes - Mild irritant	Rabbit	-	0.5 minutes	-
	Eyes - Mild irritant	Rabbit	-	100 milligrams	-
	Eyes - Severe irritant	Rabbit	-	870 Micrograms	-
	Skin - Mild irritant	Pig	-	24 hours 2 milligrams	-
	Skin - Mild irritant	Rabbit	-	24 hours 250 microliters	-
	Skin - Moderate irritant	Rabbit	-	435 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 20 milligrams	-
	Skin - Moderate irritant	Rabbit	-	500 milligrams	-

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

#### Classification

Product/ingredient name	OSHA	IARC	NTP
toluene	-	3	-

#### Reproductive toxicity

Not available.

#### Teratogenicity

Not available.

#### Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
toluene	Category 3	Not applicable.	Narcotic effects

#### Specific target organ toxicity (repeated exposure)

## Section 11. Toxicological information

Name	Category	Route of exposure	Target organs
toluene	Category 2	Not determined	Not determined

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

**Eye contact** : No known significant effects or critical hazards.

**Inhalation** : Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness.

**Skin contact** : Causes skin irritation.

**Ingestion** : Can cause central nervous system (CNS) depression.

### Symptoms related to the physical, chemical and toxicological characteristics

**Eye contact** : Adverse symptoms may include the following: pain or irritation, watering, redness

**Inhalation** : Adverse symptoms may include the following: nausea or vomiting, headache, drowsiness/fatigue, dizziness/vertigo, unconsciousness, reduced fetal weight, increase in fetal deaths, skeletal malformations

**Skin contact** : Adverse symptoms may include the following: irritation, redness, reduced fetal weight, increase in fetal deaths, skeletal malformations

**Ingestion** : Adverse symptoms may include the following: reduced fetal weight, increase in fetal deaths, skeletal malformations

### 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** : No known significant effects or critical hazards.

**Mutagenicity** : No known significant effects or critical hazards.

**Teratogenicity** : Suspected of damaging the unborn child.

**Developmental effects** : No known significant effects or critical hazards.

**Fertility effects** : Suspected of damaging fertility.

### Numerical measures of toxicity

#### Acute toxicity estimates

Not available.

## Section 12. Ecological information

### Toxicity

Product/ingredient name	Result	Species	Exposure
toluene	Acute EC50 12500 µg/l Fresh water	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 11600 µg/l Fresh water	Crustaceans - Gammarus pseudolimnaeus - Adult	48 hours
	Acute EC50 6000 µg/l Fresh water	Daphnia - Daphnia magna - Juvenile (Fledgling, Hatchling, Weanling)	48 hours
	Acute LC50 5500 µg/l Fresh water Chronic NOEC 1000 µg/l Fresh water	Fish - Oncorhynchus kisutch - Fry Daphnia - Daphnia magna	96 hours 21 days

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
toluene	2.73	90	low

### Mobility in soil

Soil/water partition coefficient (K<sub>oc</sub>) : 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. 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. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

### United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Toluene; Benzene, methyl-	108-88-3	Listed	U220

## Section 14. Transport information

## Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1294	UN1294	UN1294	UN1294	UN1294
UN proper shipping name	TOLUENE	TOLUENE	TOLUENE	TOLUENE	TOLUENE
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	II	II	II	II	II
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** 1000 lbs / 454 kg [137.86 gal / 521.84 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
- : **Limited quantity** Yes.
- : **Quantity limitation** Passenger aircraft/rail: 5 L. Cargo aircraft: 60 L.
- : **Special provisions** IB2, T4, TP1

#### TDG Classification

- : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.18-2.19 (Class 3).
- : **Explosive Limit and Limited Quantity Index** 1
- : **Passenger Carrying Road or Rail Index** 5

#### IATA

- : **Quantity limitation** Passenger and Cargo Aircraft: 5 L. Cargo Aircraft Only: 60 L. Limited Quantities - Passenger Aircraft: 1 L.

- Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

- Transport in bulk according to Annex II of MARPOL and the IBC Code** : Not available.

## Section 15. Regulatory information

- U.S. Federal regulations** : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined  
**Clean Water Act (CWA) 307:** toluene  
**Clean Water Act (CWA) 311:** toluene

- 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



## Section 15. Regulatory information

**DEA List II Chemicals (Essential Chemicals)** : 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	%
<b>Form R - Reporting requirements</b>	toluene	108-88-3	100
<b>Supplier notification</b>	toluene	108-88-3	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 Toluene, 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](http://www.P65Warnings.ca.gov).

Ingredient name	No significant risk level	Maximum acceptable dosage level
Toluene	-	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** : This material is listed or exempted.

**Canada** : This material is listed or exempted.

**China** : This material is listed or exempted.

**Europe** : This material is listed or exempted.

**Japan** : **Japan inventory (ENCS):** This material is listed or exempted.  
**Japan inventory (ISHL):** This material is listed or exempted.

**Malaysia** : This material is listed or exempted.



## Section 15. Regulatory information

<b>New Zealand</b>	: This material is listed or exempted.
<b>Philippines</b>	: This material is listed or exempted.
<b>Republic of Korea</b>	: This material is listed or exempted.
<b>Taiwan</b>	: This material is listed or exempted.
<b>Thailand</b>	: Not determined.
<b>Turkey</b>	: This material is listed or exempted.
<b>United States</b>	: This material is listed or exempted.
<b>Viet Nam</b>	: Not determined.

## Section 16. Other information

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

Health	/ 2
Flammability	3
Physical hazards	0

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
FLAMMABLE LIQUIDS - Category 2	Expert judgment
SKIN IRRITATION - Category 2	Expert judgment
TOXIC TO REPRODUCTION (Fertility) - Category 2	Expert judgment
TOXIC TO REPRODUCTION (Unborn child) - Category 2	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2	Expert judgment

### History

<b>Date of printing</b>	: 2/1/2018
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<b>Date of previous issue</b>	: No previous validation
<b>Version</b>	: 1

## Section 16. Other information

### 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.

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.

Living up to Life



## Safety Data Sheet

### Xylenes, Purified

#### SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND THE COMPANY

##### 1.1 Product Identifier

**Trade Name** Xylenes, Purified  
**Product #** 3803668 3803665  
**SDS #** 110  
**SDS Date** August 22, 2013

##### 1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

**Product Use:** Histology / Cytology procedures, clearing  
**Uses Advised Against:** All other uses.

##### 1.3 Details of the Supplier of the Substance or Mixture

**Manufacturer/Preparer:** Leica Biosystems Richmond, Inc. Leica Biosystems Canada, Inc.  
5205 Route 12 83 Terracon Place  
Richmond, IL 60071 Winnipeg, Manitoba R2J 4B3  
800-225-8867 800-665-7425

##### 1.4 Emergency Telephone Number

**Emergency Spill Information** 1-800- 424-9300 (CHEMTREC)  
+1-703-527-3887 International calls (call collect)  
**Other Product Information:** 1-800-225-8867

#### SECTION 2: HAZARDS IDENTIFICATION

##### 2.1 Classification of the Substance or Mixture

###### CLP/GHS Classification (1272/2008):

Physical:	Health:	Environmental
Flammable Liquid Category 3	Skin Irritant Category 2 Aspiration Hazard Category 1 Acute Inhalation Toxicity Category 4 Acute Dermal Toxicity Category 4 Carcinogen Category 2	Not Hazardous

**EU Classification (67/548/EEC):** Xn, Xi, R10, R20/21, R38

##### 2.2 Label Elements:

DANGER! Contains xylene, and ethylbenzene



#### Hazard Phrases

H226	Flammable liquid and vapor
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H315	Causes skin irritation
H332	Harmful if inhaled.
H351	Suspected of causing cancer

#### Precautionary Phrases

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/sparks/open flames/hot surfaces. – No smoking
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ventilating/lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measure against static discharge.
P261	Avoid breathing mist/vapours.
P271	Use only outdoors or in a well-ventilated area.
P264	Wash exposed skin thoroughly after handling.
P280	Wear protective gloves, protective clothing and eye protection.
P301+P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P331	Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water.
P362	Take off contaminated clothing and wash before reuse.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P304 + P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P312	Call a POISON CENTER or doctor/physician if you feel unwell.
P370 + P378	In case of fire: use dry chemical, foam or water spray for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of container/contents to approved disposal site in accordance with all local and national regulations.

#### 2.3 Other Hazards: None

### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1 Substances

Chemical Name	CAS Number / EINECS Number / REACH Reg. Number	% (w/w)	EU Classification (67/548/EEC)	CLP/GHS Classification (1272/2008)
Xylene	1330-20-7 215-535-7	< 90	Xn, Xi, R10, R20/21, R38	Flammable Liquid Category 3 (H226), Acute Dermal Toxicity Category 4 (H312), Acute Inhalation Toxicity Category 4 (H332), Skin Irritant Category 2 (H315)
Ethylbenzene	100-41-4 202-849-4	< 20	Xn, F, R11, R20	Flammable Liquid Category 2 (H225) Acute Inhalation Toxicity Category 4 (H332), Carcinogen Category 2 (H351), Aspiration Hazard Category 1 (H304)

See Section 16 for full text of GHS and EU Classifications.

## SECTION 4: FIRST AID MEASURES

### 4.1 Description of First Aid Measures

#### First Aid

**Eye contact:** Immediately flush eye with water for at least 15 minutes while lifting the upper and lower lids. Get medical attention if irritation persists.

**Skin contact:** Wash thoroughly with soap and water. Get medical attention if irritation develops. Remove contaminated clothing and laundry before reuse.

**Inhalation:** Remove to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if irritation persists, or the victim feels unwell.

**Ingestion:** If swallowed, rinse out mouth with water. Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head below hips to prevent aspiration into the lungs. Never give anything by mouth to a person who is unconscious or drowsy. Get immediate medical attention.

**See Section 11 for more detailed information on health effects.**

**4.2 Most Important symptoms and effects, both acute and delayed:** May cause eye, skin and respiratory irritation. Acute exposure to high concentrations can result in CNS effects and irritation. May be harmful by inhalation, or absorption through the skin. At high concentrations, vapor may cause severe breathing difficulties which may be delayed in onset. Acute poisoning and mortality in humans have occurred after very high exposure. Loss of consciousness occurs at approximately 10,000 ppm.

**4.3 Indication of any immediate medical attention and special treatment needed:** Aspiration hazard. Immediate medical attention is required for ingestion.

## SECTION 5: FIREFIGHTING MEASURES

### 5.1 Extinguishing Media:

Use dry chemical, alcohol-resistant foam, carbon dioxide (CO<sub>2</sub>), or water fog.

### 5.2 Special Hazards Arising from the Substance or Mixture

**Unusual Fire and Explosion Hazards:** Flammable liquid and vapor. Vapors are heavier than air and will travel along surfaces to remove ignition sources. Vapors will collect in low areas. Vapors may be ignited by static sparks.

**Combustion Products:** Oxides of carbon.

**5.3 Advice for Fire-Fighters:** Self-contained breathing apparatus and protective clothing should be worn in fighting large fires involving chemicals. Determine the need to evacuate or isolate the area according to your local emergency plan. Use water spray to keep fire exposed containers cool.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

### 6.1 Personal Precautions, Protective Equipment and Emergency Procedures:

Wear appropriate protective equipment. Eliminate all ignition sources and ventilate the area with explosion-proof equipment. Prevent entry into basements or confined areas.

### 6.2 Environmental Precautions:

Prevent entry in storm sewers and waterways. Report spill as required by local and federal regulations.

### 6.3 Methods and Material for Containment and Cleaning Up:

Stop spill at the source if it is safe to do so. Absorb with an inert material. Use non-sparking tools and equipment. Collect into a suitable container for disposal.

### 6.4 Reference to Other Sections:

Refer to Section 8 for personal protective equipment, and Section 13 for disposal information.

## SECTION 7: HANDLING and STORAGE

### 7.1 Precautions for Safe Handling:

Avoid eye and skin contact. Avoid breathing vapors. Use only with adequate ventilation. Wash thoroughly after handling. Remove contaminated clothing and launder before re-use. Keep product away from heat, sparks and all other sources of ignition. Electrically bond and ground transfer equipment. Use appropriately rated electrical equipment in areas where this material is handled and stored. Keep containers closed when not in use.

### 7.2 Conditions for Safe Storage, Including any Incompatibilities:

Keep product away from heat, sparks and all other sources of ignition. Electrically bond and ground transfer equipment. Use appropriately rated electrical equipment in areas where this material is handled and stored.

Protect containers from physical damage. Store in a cool area. Keep away from excessive heat and open flames. Keep containers closed when not in use. Store away from oxidizers, acids, and alkalis.

Empty containers retain product residues. Do not cut, weld, braze, etc. on or near empty containers. Follow all SDS precautions in handling empty containers

### 7.3 Specific end use(s):

**Industrial uses:** Histology / Cytology procedures, clearing.

**Professional uses:** Formalin neutralizing

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control Parameters:

Chemical Name	US OEL	EU IOEL	UK OEL	Germany OEL
Xylene	100 ppm TWA ACGIH TLV 150 ppm STEL ACGIH TLV 100 ppm TWA OSHA PEL	50 ppm TWA 100 ppm STEL	50 ppm TWA 100 ppm STEL	100 ppm TWA 200 ppm STEL
Ethylbenzene	20 ppm TWA ACGIH TLV 125 ppm STEL ACGIH TLV 100 ppm TWA OSHA PEL	100 ppm TWA 200 ppm STEL	100 ppm TWA 125 ppm STEL	20 ppm TWA 40 ppm STEL

Refer to local or national authority for exposure limits not listed above.

Chemical Name	Biological Limit Value
Xylene	Methylhippuric acids in urine 1.5 g/g creatinine, end of shift (ACGIH)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in urine 0.7 g/g creatinine, end of shift at end of workweek (ACGIH)

## 8.2 Exposure Controls:

**Recommended Monitoring Procedures:** Collection on charcoal tubes with analysis by gas chromatography.

**Appropriate Engineering Controls:** Use with adequate local exhaust ventilation to maintain exposure levels below the occupational exposure limits. Use explosion-proof equipment where required.

### Personal Protective Measures

**Eye/face Protection:** Wear safety glasses or chemical goggles as needed to avoid eye contact.

**Skin Protection:** Impervious clothing as needed to prevent skin contact.

**Hands:** Impervious gloves (butyl or nitrile rubber).

**Respiratory Protection:** None needed with adequate ventilation. If the occupational exposure limit is exceeded, use an approved organic vapor respirator. Selection of respiratory protection depends on the contaminant type, form and concentration. Select in accordance with OSHA 1910.134 or other applicable regulations and good Industrial Hygiene practice.

**Other protection:** Suitable washing facilities should be available.

## SECTION 9: PHYSICAL and CHEMICAL PROPERTIES

### 9.1 Information on basic Physical and Chemical Properties

**Appearance:** Clear liquid  
**Odor Threshold:** 20 ppm  
**Melting/Freezing Point:** -95°C (-139°F)  
**Flash Point:** : 26°C (78°F)  
**Lower Flammability Limit:** 1%  
**Upper Flammability Limit:** 7%  
**Vapor Density(Air=1):** 3.66  
**Solubility:** Insoluble in water  
**Autoignition Temperature:** 498°C (930°F)  
**Viscosity:** Not determined

**Oxidizing Properties:** None  
**Molecular Formula:** Mixture

**Odor:** Aromatic hydrocarbon  
**pH:** Neutral  
**Boiling Point:** 137.8°C (280°F)  
**Evaporation Rate:** Not applicable  
**Vapor Pressure:** 9 mmHg @ 25°C

**Relative Density:** 0.86  
**Octanol/Water Partition Coefficient:** Not available  
**Decomposition Temperature:** Not determined  
**Explosive Properties:** Vapors may be explosive in confined areas.  
**Specific Gravity (H<sub>2</sub>O= 1):** 0.86  
**Molecular Weight:** Mixture

**9.2 Other Information:** None available

## SECTION 10: STABILITY and REACTIVITY

**10.1 Reactivity:** This material is not reactive under normal conditions.

**10.2 Chemical Stability:** Normally stable.

**10.3 Possibility of Hazardous Reactions:** Reaction with strong oxidizers may generate heat and cause fire.

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**10.4 Conditions to Avoid:** Avoid heat, sparks, flames, and all other sources of ignition.

**10.5 Incompatible Materials:** Oxidizing agents, strong acids, and alkalis.

**10.6 Hazardous Decomposition Products:** Thermal breakdown of this product during fire or very high heat conditions may evolve the following decomposition products: Oxides of carbon.

## SECTION 11: TOXICOLOGICAL INFORMATION

### 11.1 Information on Toxicological Effects:

#### Potential Health Effects:

**Eye Contact:** May cause irritation with redness, tearing and swelling.

**Skin contact:** Causes irritation. Repeated exposure may cause dermatitis. May be harmful if absorbed through the skin with symptoms similar to inhalation.

**Inhalation:** May cause respiratory tract irritation and central nervous system effects such as dizziness, drowsiness, nausea, headache lightheadedness, stupor, and unconsciousness.

**Ingestion:** Swallowing may cause gastrointestinal effects, and central nervous system effects including nausea, vomiting, diarrhea, dizziness, drowsiness, and unconsciousness. Aspiration during swallowing or vomiting may cause chemical pneumonia or lung damage.

#### Acute toxicity:

Xylene: LD50 Oral Rat 3523 mg/kg  
LD50 Skin Rabbit 4400 mg/kg  
LC50 Inhalation Rat 27.6 -47.7 mg/L/4 hr  
Ethylbenzene: LD50 Oral Rat 3500 mg/kg  
LD50 Skin Rabbit 17.8 mL/kg  
LC50 Inhalation Rat 4000 ppm /4 hr

**Skin corrosion/irritation:** No data available for mixture. Components are skin irritants.

**Eye damage/ irritation:** No data available for mixture. Components may irritate eyes.

**Respiratory Irritation:** No data available for mixture. Vapors are irritating to the respiratory system.

**Respiratory Sensitization:** No data available for mixture. None of the components are respiratory sensitizers.

**Skin Sensitization:** No data available for mixture. None of the components are skin sensitizers.

**Germ Cell Mutagenicity:** No data available for mixture. None of the components are germ cell mutagens.

**Carcinogenicity:** No data available for mixture. Ethylbenzene is classified as Group 2B: Possible human carcinogen by IARC.

**Reproductive Toxicity:** No data available for mixture.

#### Specific Target Organ Toxicity:

Single Exposure: Aspiration during swallowing or vomiting may cause chemical pneumonia or lung damage.

Repeat Exposure: May cause damage to liver, kidneys, blood, and nervous system.



## SECTION 12: ECOLOGICAL INFORMATION

### 12.1 Toxicity:

Xylene: 96 hr LC50 rainbow trout 2.6-8.4 mg/L; LC50; Daphnia magna (Water flea) 150 mg/L/ 24 hr  
Ethylbenzene: LC50 Pimephales promelas (fathead minnow) 42.3 mg/L/ 96 hr

**12.2 Persistence and degradability:** Xylene: The biodegradation rate constant for xylenes in an activated sludge inoculum was calculated as 0.2 hours<sup>-1</sup>, with a half-life of 3.3 hours.

Ethylbenzene: Is biodegraded fairly rapidly by sewage or activated sludge inoculua. As a component of gas oil, it is completely degraded in groundwater in 8 days and seawater in 10 days.

**12.3 Bioaccumulative Potential:** Xylene: Experimental BCF values ranging from 6 to 23.4 have been measured for the different xylene isomers in eels, clams, and fish. This range of BCF values suggests that bioconcentration in aquatic organisms is low.

Ethylbenzene: BCF of 15 suggest the potential for bioconcentration in aquatic organisms is low.

**12.4 Mobility in Soil:** Xylene: Expected to have very high to moderate mobility in soil.

Ethylbenzene: Koc estimated to be 520. This estimated Koc value suggests that ethylbenzene is expected to have low mobility in soil.

**12.5 Results of PVT and vPvB assessment:** Not required.

**12.6 Other Adverse Effects:** No data available.

## SECTION 13: DISPOSAL CONSIDERATIONS

### 13.1 Waste Treatment Methods:

Dispose in accordance with local, state and national regulations.

## SECTION 14: TRANSPORTATION INFORMATION

	14.1 UN Number	14.2 UN Proper Shipping Name	14.3 Hazard Class(s)	14.4 Packing Group	14.5 Environmental Hazards
US DOT	UN1307	Xylenes	3	III	Packages containing 111lbs or greater are subject to RQ provisions.
Canadian TDG	UN1307	Xylenes	3	III	No
EU ADR/RID	UN1307	Xylenes	3	III	No
IMDG	UN1307	Xylenes	3	III	No
IATA/ICAO	UN1307	Xylenes	3	III	No

**14.6 Special Precautions for User:** None

**14.7 Transport in Bulk According to Annex III MARPOL 73/78 and the IBC Code:** Not determined.

## SECTION 15: REGULATORY INFORMATION

### 15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

#### INTERNATIONAL INVENTORIES

**EPA TSCA INVENTORY:** All of the components are listed on the TSCA inventory.

**CANADIAN ENVIRONMENTAL PROTECTION ACT:** All of the ingredients are listed on the Canadian Domestic Substances List.

**EUROPEAN UNION:** All of the components of this product are listed on the European Inventory of New and Existing Chemical Substances (EINECS) inventory.

**AUSTRALIA:** All of the ingredients of this product are listed on the Australian Inventory of Chemical Substances (AICS).

**CHINA:** All of the ingredients are listed on the Chinese chemical inventory.

**KOREA:** All of the components of this product are listed on the Korean Existing Chemical List (KECL).

**NEW ZEALAND:** All of the components of this product are listed on the New Zealand Inventory of Chemicals (NzIoC).

**PHILIPPINES:** All of the components of this product are listed on the Philippine Inventory of Chemicals and Chemical Substances (PICCS).

**JAPAN:** All of the components of this product are listed on the Japanese Existing and New Chemical Substances List (ENCS).

#### U.S. REGULATIONS

**OSHA HAZARD CLASSIFICATION:** Flammable, Irritant, Target Organ Effects, Carcinogen

**CERCLA Section 103:** Spills of this product over the RQ (reportable quantity) must be reported to the National Response Center. The RQ for the product, based on the RQ for Xylene (90% maximum) of 100 lbs, is 111 lbs. Many states have more stringent release reporting requirements. Report spills required under federal, state and local regulations.

**EPA SARA 302:** This product does not contain chemicals regulated under SARA Section 302.

**EPA SARA 311 HAZARD CLASSIFICATION:** Acute Health, Chronic Health, Fire Hazard

**EPA SARA 313:** This product contains the following chemicals that are regulated under SARA Title III, section 313:

Xylene	1130-20-7	< 90%
Ethylbenzene	100-41-4	< 20%

**CALIFORNIA PROPOSITION 65:** This product contains the following chemicals which are known to the State of California to cause cancer, reproductive toxicity or birth defects (developmental toxicity): Ethylbenzene (Cancer)

#### INTERNATIONAL REGULATIONS

**WHMIS CLASSIFICATION:** Class B-2, Class D-2-A

## SECTION 16: OTHER INFORMATION

**Revision History:** Updated Logo and website.

### EU Classes and Risk Phrases for Reference (See Sections 2 and 3)

F Highly Flammable

Xn Harmful

Xi Irritant

R10 Flammable

R11 Highly Flammable

R20 Harmful by inhalation

R20/21 Harmful by inhalation, and in contact with skin.

R38 Irritating to skin.

### CLP/GHS Classification and H Phrases for Reference (See Section 3)

H225	Highly flammable liquid and vapor
H226	Flammable liquid and vapor
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H315	Causes skin irritation
H332	Harmful if inhaled.
H351	Suspected of causing cancer

NFPA Rating:	Health: 2	Fire: 3	Instability: 0
HMIS Rating:	Health: 2*	Fire: 3	Physical Hazard: 0

This Safety Data Sheet has been prepared in accordance with the REACH regulation in the EU and the Globally Harmonized System for the Classification and Labeling of Chemicals (GHS). It complies with the requirements of the Canadian Controlled Products Regulations and US 29CFR 1910.1200. To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries makes any warranty of merchantability or any other warranty, expressed or implied, which respect to such information, and we assume no liability resulting from its use. In no event shall Leica Biosystems be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages resulting from use of or reliance upon this information.



# 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](http://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.

# Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

## 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

# Safety Data Sheet

Material Name: Gasoline All Grades

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110-54-3	Hexane	0.5-4
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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, CO<sub>2</sub>, 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

# Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

## 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.

# Safety Data Sheet

**Material Name: Gasoline All Grades**

**SDS No. 9950**

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/m<sup>3</sup> TWA  
150 ppm STEL; 560 mg/m<sup>3</sup> STEL  
NIOSH: 100 ppm TWA; 375 mg/m<sup>3</sup> TWA  
150 ppm STEL; 560 mg/m<sup>3</sup> STEL

#### Butane (106-97-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)  
OSHA: 800 ppm TWA; 1900 mg/m<sup>3</sup> TWA  
NIOSH: 800 ppm TWA; 1900 mg/m<sup>3</sup> TWA

#### Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: 100 ppm TWA  
150 ppm STEL  
OSHA: 100 ppm TWA; 435 mg/m<sup>3</sup> TWA  
150 ppm STEL; 655 mg/m<sup>3</sup> STEL

#### Benzene, 1,2,4-trimethyl- (95-63-6)

NIOSH: 25 ppm TWA; 125 mg/m<sup>3</sup> TWA

#### Ethyl alcohol (64-17-5)

ACGIH: 1000 ppm STEL  
OSHA: 1000 ppm TWA; 1900 mg/m<sup>3</sup> TWA  
NIOSH: 1000 ppm TWA; 1900 mg/m<sup>3</sup> TWA



# Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

## Ethylbenzene (100-41-4)

ACGIH: 20 ppm TWA  
OSHA: 100 ppm TWA; 435 mg/m<sup>3</sup> TWA  
125 ppm STEL; 545 mg/m<sup>3</sup> STEL  
NIOSH: 100 ppm TWA; 435 mg/m<sup>3</sup> TWA  
125 ppm STEL; 545 mg/m<sup>3</sup> 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/m<sup>3</sup> TWA  
NIOSH: 50 ppm TWA; 180 mg/m<sup>3</sup> 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.

# Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

## \*\*\* Section 9 - Physical & Chemical Properties \*\*\*

<b>Appearance:</b>	Translucent, straw-colored or light yellow	<b>Odor:</b>	Strong, characteristic aromatic hydrocarbon odor. Sweet-ether like
<b>Physical State:</b>	Liquid	<b>pH:</b>	ND
<b>Vapor Pressure:</b>	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)	<b>Vapor Density:</b>	AP 3-4
<b>Boiling Point:</b>	85-437 °F (39-200 °C)	<b>Melting Point:</b>	ND
<b>Solubility (H2O):</b>	Negligible to Slight	<b>Specific Gravity:</b>	0.70-0.78
<b>Evaporation Rate:</b>	10-11	<b>VOC:</b>	ND
<b>Percent Volatile:</b>	100%	<b>Octanol/H2O Coeff.:</b>	ND
<b>Flash Point:</b>	-45 °F (-43 °C)	<b>Flash Point Method:</b>	PMCC
<b>Upper Flammability Limit (UFL):</b>	7.6%	<b>Lower Flammability Limit (LFL):</b>	1.4%
<b>Burning Rate:</b>	ND	<b>Auto Ignition:</b>	>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

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**Material Name: Gasoline All Grades**

**SDS No. 9950**

**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/m<sup>3</sup> 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.

# Safety Data Sheet

**Material Name: Gasoline All Grades**

**SDS No. 9950**

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.

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Material Name: Gasoline All Grades

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## 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]
--------------------------------	--------------------------

# Safety Data Sheet

**Material Name: Gasoline All Grades**

**SDS No. 9950**

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]

# Safety Data Sheet

**Material Name: Gasoline All Grades**

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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.

# Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

## \*\*\* 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)



# Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

## 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

X

Chronic Health

X

Fire

X

Sudden Release of Pressure

--

Reactive

--

## 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.

# Safety Data Sheet

Material Name: Gasoline All Grades

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## 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

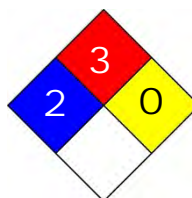
## Component Analysis - Inventory

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

# Safety Data Sheet

**Material Name: Gasoline All Grades**

**SDS No. 9950**

## Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

# MATERIAL SAFETY DATA SHEET

**ALCONOX®**

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations



## SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **ALCONOX®**  
CHEMICAL FAMILY NAME: Detergent.  
PRODUCT USE: Critical-cleaning detergent for laboratory, healthcare and industrial applications  
U.N. NUMBER: Not Applicable  
U.N. DANGEROUS GOODS CLASS: Non-Regulated Material  
SUPPLIER/MANUFACTURER'S NAME: Alconox, Inc.  
ADDRESS: 30 Glenn St., Suite 309, White Plains, NY 10603. USA  
EMERGENCY PHONE: **TOLL-FREE in USA/Canada** 800-255-3924  
**International calls** 813-248-0585  
BUSINESS PHONE: 914-948-4040  
DATE OF PREPARATION: May 2011  
DATE OF LAST REVISION: February 2008

## SECTION 2 - HAZARDS IDENTIFICATION

**EMERGENCY OVERVIEW:** This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS



EUROPEAN and (GHS) Hazard Symbols



Signal Word: **Warning!**

### EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1

EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC

EC# 207-638-8 Index# 011-005-00-2

EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

### GHS Hazard Classification(s):

Eye Irritant Category 2A

### Hazard Statement(s):

H319: Causes serious eye irritation

### Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray

P264: Wash hands thoroughly after handling

P271: Use only in well ventilated area.

P280: Wear protective gloves/protective clothing/eye protection/face protection/

### Hazard Symbol(s):

[Xi] Irritant

# MATERIAL SAFETY DATA SHEET

**ALCONOX®**

**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 difficulty 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.

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## 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.

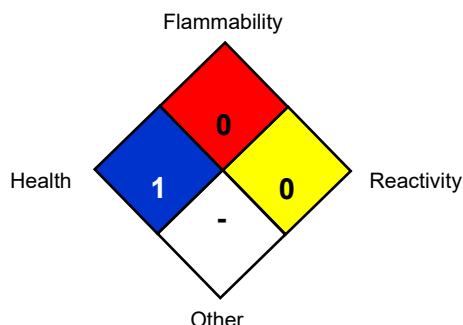
Explosion Sensitivity to Static Discharge:

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.

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## SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

### EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m <sup>3</sup> Total Dust	15 mg/m <sup>3</sup> Total Dust	10 mg/m <sup>3</sup> Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m <sup>3</sup> Total Dust	15 mg/m <sup>3</sup> Total Dust	10 mg/m <sup>3</sup> Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m <sup>3</sup> Total Dust	15 mg/m <sup>3</sup> Total Dust	10 mg/m <sup>3</sup> Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Sodium Carbonate	497-19-8	10 mg/m <sup>3</sup> Total Dust	15 mg/m <sup>3</sup> Total Dust	10 mg/m <sup>3</sup> Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m <sup>3</sup> Total Dust	15 mg/m <sup>3</sup> Total Dust	10 mg/m <sup>3</sup> 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

<b>PHYSICAL STATE:</b>	Solid
<b>APPEARANCE &amp; ODOR:</b>	White granular powder with little or no odor.
<b>ODOR THRESHOLD (PPM):</b>	Not Available
<b>VAPOR PRESSURE (mmHg):</b>	Not Applicable
<b>VAPOR DENSITY (AIR=1):</b>	Not Applicable.
<b>BY WEIGHT:</b>	Not Available
<b>EVAPORATION RATE (nBuAc = 1):</b>	Not Applicable.
<b>BOILING POINT (C°):</b>	Not Applicable.
<b>FREEZING POINT (C°):</b>	Not Applicable.
<b>pH:</b>	9.5 (1% aqueous solution)
<b>SPECIFIC GRAVITY 20°C: (WATER =1)</b>	0.85 – 1.1
<b>SOLUBILITY IN WATER (%)</b>	>10% w/w
<b>COEFFICIENT OF WATER/OIL DIST.:</b>	Not Available
<b>VOC:</b>	None
<b>CHEMICAL FAMILY:</b>	Detergent

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## 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/m <sup>3</sup> 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m <sup>3</sup> 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):**



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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/NDL 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 of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftlist 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

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**ALCONOX®**

**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.

**Section 1: IDENTIFICATION****Product Name:** Simple Green® All-Purpose Cleaner**Additional Names:****Manufacturer's Part Number:** *\*Please refer to Section 16***Recommended Use:** Cleaner & Degreaser for water tolerant surfaces.**Restrictions on Use:** Do not use on non-rinsable surfaces.**Company:** Sunshine Makers, Inc.  
15922 Pacific Coast Highway  
Huntington Beach, CA 92649 USA**Telephone:** 800-228-0709 • 562-795-6000 *Mon – Fri, 8am – 5pm PST***Fax:** 562-592-3830**Email:** [info@simplegreen.com](mailto:info@simplegreen.com)**Emergency Phone:** Chem-Tel 24-Hour Emergency Service: 800-255-3924**Section 2: HAZARDS IDENTIFICATION****This product is not classified as hazardous under 2012 OSHA Hazard Communication Standards (29 CFR 1910.1200).**OSHA HCS 2012Label Elements**Signal Word:** None**Hazard Symbol(s)/Pictogram(s):** None required**Hazard Statements:** None**Precautionary Statements:** None**Hazards Not Otherwise Classified (HNOC):** None**Other Information:** None Known**Section 3: COMPOSITION/INFORMATION ON INGREDIENTS**

<u>Ingredient</u>	<u>CAS Number</u>	<u>Percent Range</u>
Water	7732-18-5	> 84.8%*
Ethoxylated Alcohol	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Tetrasodium <i>N,N</i> -bis(carboxymethyl)-L-glutamate	51981-21-6	< 1%*
Sodium Carbonate	497-19-8	< 1%*
Citric Acid	77-92-9	< 1%*
Isothiazolinone mixture	55965-84-9	< 0.2%*
Fragrance	Proprietary Mixture	< 1%*
Colorant	Proprietary Mixture	< 1%*

*\*specific percentages of composition are being withheld as a trade secret***Section 4: FIRST-AID MEASURES****Inhalation:** Not expected to cause respiratory irritation. If adverse effect occurs, move to fresh air.**Skin Contact:** Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.**Eye Contact:** Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.**Ingestion:** May cause upset stomach. Drink plenty of water to dilute. See section 11.**Most Important Symptoms/Effects, Acute and Delayed:** None known.**Indication of Immediate Medical Attention and Special Treatment Needed, if necessary:** Treat symptomatically

**Section 5: FIRE-FIGHTING MEASURES**

**Suitable & Unsuitable Extinguishing Media:** Use Dry chemical, CO<sub>2</sub>, water spray or “alcohol” foam. Avoid high volume jet water.  
**Specific Hazards Arising from Chemical:** In event of fire, fire created carbon oxides may be formed.  
**Special Protective Actions for Fire-Fighters:** Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

*This product is non-flammable. See Section 9 for Physical Properties.*

**Section 6: ACCIDENTAL RELEASE MEASURES**

**Personal Precautions, Protective Equipment and Emergency Procedures:** *For non-emergency and emergency personnel:* See section 8 – personal protection. Avoid eye contact. Safety goggles suggested.

**Environmental Precautions:** Do not allow into open waterways and ground water systems.

**Methods and Materials for Containment and Clean Up:** Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

**Section 7: HANDLING AND STORAGE**

**Precautions for Safe Handling:** Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

**Conditions for Safe Storage including Incompatibilities:** Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

**Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION**

**Exposure Limit Values:** No components listed with TWA or STEL values under OSHA or ACGIH.

**Appropriate Engineering Controls:** Showers, eyewash stations, ventilation systems

**Individual Protection Measures / Personal Protective Equipment (PPE)**

**Eye Contact:** Use protective glasses or safety goggles if splashing or spray-back is likely.  
**Respiratory:** Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.  
**Skin Contact:** Use protective gloves (any material) when used for prolonged periods or dermally sensitive.  
**General Hygiene Considerations:** Wash thoroughly after handling and before eating or drinking.

**Section 9: PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance:</b>	Green Liquid	<b>Partition Coefficient: n-octanol/water:</b>	Not determined
<b>Odor:</b>	Added sassafras odor	<b>Autoignition Temperature:</b>	Non-flammable
<b>Odor Threshold:</b>	Not determined	<b>Decomposition Temperature:</b>	109°F
<b>pH ASTM D-1293:</b>	8.5 – 9.5	<b>Viscosity:</b>	Like water
<b>Freezing Point ASTM D-1177:</b>	0-3.33°C (32-38°F)	<b>Specific Gravity ASTM D-891:</b>	1.01 – 1.03
<b>Boiling Point &amp; Range ASTM D-1120:</b>	101°C (213.8°F)	<b>VOCs:</b>	<i>**Water &amp; fragrance exemption in calculation</i>
<b>Flash Point ASTM D-93:</b>	> 212°F	SCAQMD 304-91 / EPA 24:	0 g/L    0 lb/gal    0%
<b>Evaporation Rate ASTM D-1901:</b>	¼ Butyl Acetate @ 25°C	CARB Method 310**:	2.5 g/L    0.021 lb/gal    0.25%
<b>Flammability (solid, gas):</b>	Not applicable	SCAQMD Method 313:	Not tested
<b>Upper/Lower Flammability or Explosive Limits:</b>	Not applicable	<b>VOC Composite Partial Pressure:</b>	Not determined
<b>Vapor Pressure ASTM D-323:</b>	0.60 PSI @77°F, 2.05 PSI @100°F	<b>Relative Density ASTM D-4017:</b>	8.34 – 8.42 lb/gal
<b>Vapor Density:</b>	Not determined	<b>Solubility:</b>	100% in water

**Section 10: STABILITY AND REACTIVITY**

<b>Reactivity:</b>	Non-reactive.
<b>Chemical Stability:</b>	Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).
<b>Possibility of Hazardous Reactions:</b>	None known.
<b>Conditions to Avoid:</b>	Excessive heat or cold.
<b>Incompatible Materials:</b>	Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
<b>Hazardous Decomposition Products:</b>	Normal products of combustion - CO, CO <sub>2</sub> .

**Section 11: TOXICOLOGICAL INFORMATION**

<b>Likely Routes of Exposure:</b>	Inhalation -	Overexposure may cause headache.
	Skin Contact -	Not expected to cause irritation, repeated contact may cause dry skin.
	Eye Contact -	Not expected to cause irritation.
	Ingestion -	May cause upset stomach.

*Symptoms related to the physical, chemical and toxicological characteristics:* no symptoms expected under typical use conditions.

*Delayed and immediate effects and or chronic effects from short term exposure:* no symptoms expected under typical use conditions.

*Delayed and immediate effects and or chronic effects from long term exposure:* headache, dry skin, or skin irritation may occur.

*Interactive effects:* Not known.

Numerical Measures of Toxicity

<b>Acute Toxicity:</b>	Oral LD <sub>50</sub> (rat)	> 5 g/kg body weight
	Dermal LD <sub>50</sub> (rabbit)	> 5 g/kg body weight

*Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals*

<b>Skin Corrosion/Irritation:</b>	Non-irritant per Dermal Irritation® assay modeling. No animal testing performed.
<b>Eye Damage/Irritation:</b>	Minimal irritant per Ocular Irritation® assay modeling. No animal testing performed.
<b>Germ Cell Mutagenicity:</b>	Mixture does not classify under this category.
<b>Carcinogenicity:</b>	Mixture does not classify under this category.
<b>Reproductive Toxicity:</b>	Mixture does not classify under this category.
<b>STOT-Single Exposure:</b>	Mixture does not classify under this category.
<b>STOT-Repeated Exposure:</b>	Mixture does not classify under this category.
<b>Aspiration Hazard:</b>	Mixture does not classify under this category.

**Section 12: ECOLOGICAL INFORMATION**

<b>Ecotoxicity:</b>	Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
<b>Aquatic:</b>	Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC <sub>50</sub> & IC <sub>50</sub> ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
<b>Terrestrial:</b>	Not tested on finished formulation.
<b>Persistence and Degradability:</b>	Readily Biodegradable per OCED 301D, Closed Bottle Test
<b>Bioaccumulative Potential:</b>	No data available.
<b>Mobility in Soil:</b>	No data available.
<b>Other Adverse Effects:</b>	No data available.

**Section 13: DISPOSAL CONSIDERATIONS**

**Unused or Used Liquid:** May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

**Empty Containers:** May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

**Section 14: TRANSPORT INFORMATION**

**U.N. Number:** Not applicable  
**Transport Hazard Class(es):** Not applicable  
**Packing Group:** Not applicable  
**Environmental Hazards:** Marine Pollutant - NO  
**U.N. Proper Shipping Name:** Cleaning Compound, Liquid NOI  
**NMFC Number:** 48580-3  
**Class:** 55  
**Transport in Bulk (according to Annex II of MARPOL 73/78 and IBC Code):** Unknown.  
**Special precautions which user needs to be aware of/comply with, in connection with transport or conveyance either within or outside their premises:** None known.

**U.S. (DOT) / Canadian TDG:** Not Regulated for shipping.  
**IMO / IDMG:** Not classified as Hazardous  
**ICAO/ IATA:** Not classified as Hazardous  
**ADR/RID:** Not classified as Hazardous

**Section 15: REGULATORY INFORMATION**

**All components are listed on:** TSCA and DSL Inventory.

**SARA Title III:** Sections 311/312 Hazard Categories – Not applicable.  
 Sections 313 Superfunds Amendments and Reauthorizations Act of 1986 – Not applicable.  
 Sections 302 – Not applicable.

**Clean Air Act (CAA):** Not applicable

**Clean Water Act (CWA):** Not applicable

**State Right To Know Lists:** No ingredients listed

**California Proposition 65:** No ingredients listed

**Texas ESL:**

Ethoxylated Alcohol	68439-46-3	60 µg/m <sup>3</sup> long term	600 µg/m <sup>3</sup> short term
Sodium Citrate	68-04-2	5 µg/m <sup>3</sup> long term	50 µg/m <sup>3</sup> short term
Sodium Carbonate	497-19-8	5 µg/m <sup>3</sup> long term	50 µg/m <sup>3</sup> short term
Citric Acid	77-92-9	10 µg/m <sup>3</sup> long term	100 µg/m <sup>3</sup> short term

**Section 16: OTHER INFORMATION**

<u>Size</u>	<u>UPC</u>	<u>Size</u>	<u>UPC</u>
2 oz. Pump	043318130366	1 Gallon w/ Dilution Bottle	043318000669
2 oz. Pump	043318131035	1 Gallon	043318000799
4 oz. Pump	043318130014	1 Gallon w/ Dilution Bottle	043318001383
16 oz. Trigger	043318130021	1 Gallon w/ Dilution Bottle	043318002021
22 oz. Trigger	043318130229	1 Gallon	043318130052
24 oz. Trigger, 12 per case	043318000034	1 Gallon w/ Dilution Bottle, 112 per case	043318480140
24 oz. Trigger	043318000300	1 Gallon w/ Dilution Bottle, 4 per case	043318480416
24 oz. Trigger	043318130137	1 Gallon w/ Dilution Bottle, 24 per case	043318480492
32 oz. Trigger	043318000652	1 Gallon w/ laundry	043318002052
32 oz. Trigger	043318130335	1 Gallon w/ towel	043318001222
67.6 oz.	043318000393	140 oz.	043318001390
67.6 oz.	043318130144	140 oz., 168 per case	043318561405
1 Gallon w/ Dilution Bottle	043318000539	140 oz. w/ Dilution Bottle	043318001468
1 Gallon w/ Dilution Bottle	043318000645		

USA items listed only. Not all items listed. USA items may not be valid for international sale.

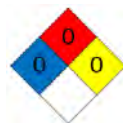
**Section 16: OTHER INFORMATION - continued****NFPA:**

Health – None

Flammability – Non-flammable

Stability – Stable

Special - None

**Acronyms**

NTP National Toxicology Program

OSHA Occupational Safety and Health Administration

TSCA Toxic Substances Control Act

IARC

CPSC

DSL

International Agency for Research on Cancer

Consumer Product Safety Commission

Domestic Substances List

**Prepared / Revised By:** Sunshine Makers, Inc., Regulatory Department.**This SDS has been revised in the following sections:** Revised SDS layout

**DISCLAIMER:** The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

# SAFETY DATA SHEET

## Hydrogen Chloride

### Section 1. Identification

<b>GHS product identifier</b>	: Hydrogen Chloride
<b>Chemical name</b>	: Hydrogen chloride
<b>Other means of identification</b>	:
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	:
<b>SDS #</b>	: 001028
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>24-hour telephone</b>	: 1-866-734-3438

### Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: 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

<b>Response</b>	: 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.
<b>Storage</b>	: Store locked up. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.
<b>Disposal</b>	: Dispose of contents and container in accordance with all local, regional, national and international regulations.
<b>Hazards not otherwise classified</b>	: 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

<b>Substance/mixture</b>	: Substance
<b>Chemical name</b>	: Hydrogen chloride
<b>Other means of identification</b>	:

### CAS number/other identifiers

<b>CAS number</b>	: 7647-01-0
<b>Product code</b>	: 001028

<b>Ingredient name</b>	<b>%</b>	<b>CAS number</b>
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

<b>Eye contact</b>	: 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.
<b>Inhalation</b>	: 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.
<b>Skin contact</b>	: 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.
<b>Ingestion</b>	: 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	<b>ACGIH TLV (United States, 3/2015).</b> C: 2 ppm <b>NIOSH REL (United States, 10/2013).</b> CEIL: 7 mg/m <sup>3</sup> CEIL: 5 ppm <b>OSHA PEL (United States, 2/2013).</b> CEIL: 7 mg/m <sup>3</sup> CEIL: 5 ppm <b>OSHA PEL 1989 (United States, 3/1989).</b> CEIL: 7 mg/m <sup>3</sup> 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

<b>Vapor pressure</b>	: 613 (psig)
<b>Vapor density</b>	: 1.3 (Air = 1)
<b>Specific Volume (ft<sup>3</sup>/lb)</b>	: 10.5263
<b>Gas Density (lb/ft<sup>3</sup>)</b>	: 0.095
<b>Relative density</b>	: Not applicable.
<b>Solubility</b>	: Soluble in the following materials: cold water.
<b>Solubility in water</b>	: Not available.
<b>Partition coefficient: n-octanol/water</b>	: 0.25
<b>Auto-ignition temperature</b>	: Not available.
<b>Decomposition temperature</b>	: Not available.
<b>SADT</b>	: Not available.
<b>Viscosity</b>	: Not applicable.

## Section 10. Stability and reactivity

<b>Reactivity</b>	: No specific test data related to reactivity available for this product or its ingredients.
<b>Chemical stability</b>	: The product is stable.
<b>Possibility of hazardous reactions</b>	: Under normal conditions of storage and use, hazardous reactions will not occur.
<b>Conditions to avoid</b>	: No specific data.
<b>Incompatible materials</b>	: No specific data.
<b>Hazardous decomposition products</b>	: 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.	Rat	3124 ppm	1 hours
	LC50 Inhalation Gas.	Rat	1562 ppm	4 hours

**IDLH** : 50 ppm

#### Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
hydrogen chloride	Eyes - Mild irritant	Rabbit	-	0.5 minutes 5 milligrams	-
	Skin - Mild irritant	Human	-	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

<b>Mutagenicity</b>	: No known significant effects or critical hazards.
<b>Teratogenicity</b>	: No known significant effects or critical hazards.
<b>Developmental effects</b>	: No known significant effects or critical hazards.
<b>Fertility effects</b>	: 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	Crustaceans - Carcinus maenas - Adult	48 hours
	Acute LC50 282 ppm Fresh water	Fish - Gambusia affinis - Adult	96 hours

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
hydrogen chloride	0.25	-	low

### Mobility in soil

**Soil/water partition coefficient (K<sub>oc</sub>)** : 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	<p>Inhalation hazard zone C</p> <p><b>Reportable quantity</b> 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.</p> <p><b>Limited quantity</b> Yes.</p> <p><b>Packaging instruction</b> <b>Passenger aircraft</b> Quantity limitation: Forbidden.</p> <p><b>Cargo aircraft</b> Quantity limitation: Forbidden.</p> <p><b>Special provisions</b> 3</p>	<p>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).</p> <p><b>Explosive Limit and Limited Quantity Index</b> 0</p> <p><b>ERAP Index</b> 25</p> <p><b>Passenger Carrying Ship Index</b> Forbidden</p> <p><b>Passenger Carrying Road or Rail Index</b> Forbidden</p> <p><b>Special provisions</b> 38</p>	-	-	<p><b>Passenger and Cargo Aircraft</b> Quantity limitation: 0 Forbidden</p> <p><b>Cargo Aircraft Only</b> Quantity limitation: 0 Forbidden</p>

“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	%
<b>Form R - Reporting requirements</b>	Hydrogen chloride	7647-01-0	100
<b>Supplier notification</b>	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.)

Health	3
Flammability	0
Physical hazards	3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### Procedure used to derive the classification

Classification	Justification
Press. Gas Comp. Gas, H280 Acute Tox. 3, H331 Skin Corr. 1, H314 Eye Dam. 1, H318 STOT SE 3, H335	According to package On basis of test data Expert judgment Expert judgment Expert judgment

### History

**Date of printing** : 6/24/2016  
**Date of issue/Date of revision** : 6/24/2016

## Section 16. Other information

**Date of previous issue** : No previous validation

**Version** : 0.01

**Key to abbreviations** : ATE = Acute Toxicity Estimate  
BCF = Bioconcentration Factor  
GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
IATA = International Air Transport Association  
IBC = Intermediate Bulk Container  
IMDG = International Maritime Dangerous Goods  
LogPow = logarithm of the octanol/water partition coefficient  
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)  
UN = United Nations

**References** : Not available.

Indicates information that has changed from previously issued version.

### Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

## SAFETY DATA SHEET

**SECTION 1:****PRODUCT AND COMPANY IDENTIFICATION**

### Hydrochloric Acid, 31 – 36%

**Product Name:** Hydrochloric Acid, 31 – 36.7%

**Identified Uses:** acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

**Company Information:**

ASHTA Chemicals Inc.

P.O. Box 858

Ashtabula Ohio 44005

**Phone:** (440) 997-5221

**Fax:** (440) 998-0286

**24-hour Emergency Phone:** CHEMTREC: (800) 424-9300

**SECTION 2:****HAZARDS IDENTIFICATION**

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

**GHS label elements, including precautionary statements:**

Signal Word: **Danger**

Pictogram(s):

**Hazard Statements**

H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

**Precautionary Statements**

P234	Keep only in original container.
P261	Avoid breathing dust/ fume/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.



P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container with a resistant inner liner.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

**Synonyms:**

CHEMICAL NAME:	Hydrochloric acid
TRADE NAME:	Hydrochloric acid, 31 – 36%
SYNONYMS:	Muriatic acid, Chlorohydric acid, Hydrogen Chloride

C.A.S:	7647-01-0
EC:	231-595-7
WHMIS:	D2A, E

CHEMICAL FORMULA:	HCl (in aqueous solution)
CHEMICAL FAMILY:	Inorganic Acid

### SECTION 4 FIRST AID MEASURES

**Description of first aid measures:**

Consult a physician. Show this safety data sheet to the doctor in attendance.

**If inhaled**

If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

**In case of skin contact**

Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

**If swallowed**

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.

**SECTION 5****FIRE FIGHTING MEASURES**

Flash Point (Method):	Non-combustible.
Extinguishing Media:	Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.
Auto Ignition Temp:	Non-combustible.
Special Fire Fighting Procedures:	Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials.
Unusual Fire/Explosion Hazards:	Releases flammable hydrogen gas when reacting with metals.

**SECTION 6****ACCIDENTAL RELEASE MEASURES****Environmental Precautions:**

Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

**Containment and Cleaning:**

Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill:	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.
Large Spill:	Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

**SECTION 7:****HANDLING AND STORAGE****Precautions to be taken for handling and storage:**

Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well ventilated area. Keep out of sun.

## SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

**Principal Component:** Hydrochloric Acid

**Occupational Exposure Limits:**

Regulatory Limits:

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrochloric Acid Mixture	---	---	5 ppm 7.59 mg/m <sup>3</sup>

ACGIH TLV = 5 ppm (7.59 mg/m<sup>3</sup>) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

**Exposure Controls:**

Eye Protection:

Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection:

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection:

Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended:

Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended:

Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

Appearance	Colorless to light yellow liquid
Odor	Pungent (irritating/strong)
Odor Threshold	0.3ppm (can cause olfactory fatigue)
pH	<1 (in aqueous solution)
Melting point/freezing point	-30°C (-22°F)
Initial boiling point	>100°C (>212°F)
Flash point	Not applicable
Auto-ignition Temp	Not applicable
Evaporation rate	No data available



Decomposition temperature	No data available
Flammability (solid, gas)	Not combustible
Upper/lower flammability or explosive limits	Not combustible
Water solubility	100%
Molecular Weight	36.46
Relative Density (Specific Gravity)	1.16 (32% HCl solution) 1.19 (36.5% HCl solution)
Bulk Density	8.75 lbs/gal (32% HCl solution) 9.83 lbs/gal (36.5% HCl solution)
Vapor Density (air = 1)	1.267 at 20 °C
Vapor Pressure	84 mm Hg @ 20°C
Partition Coefficient: n-octanol/water	No data available

<b>SECTION 10:</b>	<b>STABILITY AND REACTIVITY</b>
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Stability:	Hydrochloric acid is stable under normal conditions and pressures.
Conditions to avoid:	Incompatible materials, metals, excess heat, bases.
Incompatibility:	Bases, amines, metals, permanganates, (e.g. potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.
Hazardous decomposition products:	Hydrogen chloride, chlorine, hydrogen gas.
Polymerization:	Hazardous polymerization WILL NOT occur.

<b>SECTION 11:</b>	<b>TOXICOLOGICAL INFORMATION</b>
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**Information on likely routes of exposure:**

Inhalation:	Vapors and mist will irritate throat and respiratory system and cause coughing.
Skin contact:	Causes skin burns.
Eye contact:	Causes eye burns.
Ingestion:	Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

**Symptoms related to the physical, chemical and toxicological characteristics:**

Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

**Information on toxicological effects:**

Acute toxicity:	Harmful if swallowed.
Skin corrosion/irritation:	Causes severe skin burns and eye damage.
Serious eye damage/eye	
Irritation:	Causes serious eye damage.
Respiratory sensitization:	Not available.





Skin sensitization:	No data available.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure:	No data available.
Aspiration hazard:	Not available.
Chronic effects:	Prolonged inhalation may be harmful.

#### **Components Species Test Results:**

Hydrochloric acid (CAS# 7647-01-0)

Rat - Inhalation LC <sub>50</sub> :	3124 ppm, (1 hour)
Rabbit - Dermal LD <sub>50</sub> :	5010 mg/kg

### **SECTION 12: ECOLOGICAL INFORMATION**

Ecotoxicity:	Because of the low pH of this product, it would be expected produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity:	This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity:	Fish LC <sub>50</sub> Mosquito fish: 282 mg/l, 96 hours Fish LC <sub>50</sub> Bluegill: 3.6 mg/l, 48 hours
Persistence and degradability:	Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment..
Bioaccumulative Potential:	No data available.
Mobility in soil:	Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other adverse effects:	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation)

### **SECTION 13: DISPOSAL CONSIDERATIONS**

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material , if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.



<b>SECTION 14:</b>	<b>TRANSPORT INFORMATION</b>
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**Shipping:**

Usual Shipping Containers:	Tank cars, bulk tankers.
Usual Shelf Life:	Indefinite (life of containers).
Storage/Transport Temperatures:	Ambient.

**Suitable Storage:**

Materials/Coatings:	Teflon, Tygon, Rubber, PVC and polypropylene materials.
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**D.O.T. Information:**

Labeling:	Corrosive
D.O.T. Identification Number	UN 1789
D.O.T. Shipping Name:	Hydrochloric Acid
Hazard Class:	8
Packing Group:	II
Hazard Guide:	157
Placard:	UN 1789

<b>SECTION 15</b>	<b>REGULATORY INFORMATION</b>
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**SARA 302 Components**

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

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

Hydrochloric Acid	CAS#: 7647-01-0
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**SARA 311/312 Hazards**

Acute health hazard, reactive hazard.

**Massachusetts Right To Know Components**

Hydrochloric Acid	CAS#: 7647-01-0
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**Pennsylvania Right To Know Components**

Hydrochloric Acid	CAS#: 7647-01-0
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**New Jersey Right To Know Components**

Hydrochloric Acid	CAS#: 7647-01-0
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**California Prop. 65 Components**

This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

**OSHA PSM/RMP Threshold for Accidental Release:**

CAS# 7647-01-0 is regulated under OSHA PSM *only* if anhydrous HCl.

CAS# 7647-01-0 is regulated under EPA RMP *only* if  $\geq 37\%$  HCl.



**Toxic Substances Control Act (TSCA):**

Hydrochloric Acid

CAS#: 7647-01-0

**Comprehensive Environmental Response Compensation Liability Act: (CERCLA)**

Hydrochloric Acid

CAS#: 7647-01-0

**SECTION 16**

**OTHER INFORMATION**

**NFPA Rating:**

Health hazard: 3

Fire Hazard: 0

Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. Makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations, and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A regulations apply to the above.

Version 1.0	For the new GHS SDS Standard
Version 1.1	Graphics updated
Version 1.2	Title updated
Version 1.3	Section 9 changes
Version 1.4	Section 1, 15 changes

Revision Date: 12/31/2014
Revision Date: 3/9/2015
Revision Date: 6/2/2015
Revision Date: 7/30/2015
Revision Date: 4/15/2016



# Fisher Scientific

Part of Thermo Fisher Scientific

## SAFETY DATA SHEET

Creation Date 12-Mar-2009

Revision Date 28-Nov-2016

Revision Number 5

### 1. Identification

**Product Name** Nitric acid (65 - 70%)

**Cat No. :** A198C-212, A200-212, A200-212LC, A200-500, A200-500LC, A200-612GAL, A200C-212, A200S-212, A200S-212LC, A200S-500, A200SI-212, A467-1, A467-2, A467-250, A467-500, A483-212; S719721

**Synonyms** Azotic acid; Engraver's acid; Aqua fortis

**Recommended Use** Laboratory chemicals.

**Uses advised against** No Information available

**Details of the supplier of the safety data sheet**

**Company**

Fisher Scientific  
One Reagent Lane  
Fair Lawn, NJ 07410  
Tel: (201) 796-7100

**Emergency Telephone Number**

CHEMTREC®, Inside the USA: 800-424-9300  
CHEMTREC®, Outside the USA: 001-703-527-3887

### 2. Hazard(s) identification

**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Skin Corrosion/Irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

**Label Elements**

**Signal Word**

Danger

**Hazard Statements**

May intensify fire; oxidizer  
May be corrosive to metals  
Causes severe skin burns and eye damage  
May cause respiratory irritation

**Precautionary Statements****Prevention**

Do not breathe dust/fume/gas/mist/vapors/spray  
 Wash face, hands and any exposed skin thoroughly after handling  
 Wear protective gloves/protective clothing/eye protection/face protection  
 Use only outdoors or in a well-ventilated area  
 Keep away from heat/sparks/open flames/hot surfaces. - No smoking  
 Keep/Store away from clothing/ other combustible materials  
 Take any precaution to avoid mixing with combustibles  
 Keep only in original container

**Response**

Immediately call a POISON CENTER or doctor/physician

**Inhalation**

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

**Skin**

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower  
 Wash contaminated clothing before reuse

**Eyes**

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

**Ingestion**

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

**Fire**

In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction

**Spills**

Absorb spillage to prevent material damage

**Storage**

Store locked up  
 Store in a well-ventilated place. Keep container tightly closed  
 Store in corrosive resistant polypropylene container with a resistant inliner  
 Store in a dry place

**Disposal**

Dispose of contents/container to an approved waste disposal plant

**Hazards not otherwise classified (HNOC)**

None identified

### 3. Composition / information on ingredients

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

### 4. First-aid measures

**General Advice**

Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

**Eye Contact**

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

<b>Skin Contact</b>	Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.
<b>Inhalation</b>	If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Remove from exposure, lie down. Call a physician immediately.
<b>Ingestion</b>	Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.
<b>Most important symptoms/effects</b>	Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
<b>Notes to Physician</b>	Treat symptomatically

## 5. Fire-fighting measures

<b>Suitable Extinguishing Media</b>	CO <sub>2</sub> , dry chemical, dry sand, alcohol-resistant foam.
<b>Unsuitable Extinguishing Media</b>	No information available
<b>Flash Point</b>	Not applicable
<b>Method -</b>	No information available
<b>Autoignition Temperature</b>	No information available
<b>Explosion Limits</b>	
<b>Upper</b>	No data available
<b>Lower</b>	No data available
<b>Oxidizing Properties</b>	Oxidizer
<b>Sensitivity to Mechanical Impact</b>	No information available
<b>Sensitivity to Static Discharge</b>	No information available

### Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood, paper, oil, clothing, etc.).

### Hazardous Combustion Products

Nitrogen oxides (NO<sub>x</sub>) Thermal decomposition can lead to release of irritating gases and vapors

### Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

### NFPA

**Health**  
4

**Flammability**  
0

**Instability**  
0

**Physical hazards**  
OX

## 6. Accidental release measures

<b>Personal Precautions</b>	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.
<b>Environmental Precautions</b>	Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.
<b>Methods for Containment and Clean Up</b>	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.

## 7. Handling and storage

<b>Handling</b>	Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from clothing and other combustible materials.
<b>Storage</b>	Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

## 8. Exposure controls / personal protection

### Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m <sup>3</sup> (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m <sup>3</sup> TWA: 2 ppm TWA: 5 mg/m <sup>3</sup>	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m <sup>3</sup> STEL: 4 ppm STEL: 10 mg/m <sup>3</sup>
Component	Quebec	Mexico OEL (TWA)	Ontario TWA/EV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m <sup>3</sup> STEL: 4 ppm STEL: 10 mg/m <sup>3</sup>	TWA: 2 ppm TWA: 5 mg/m <sup>3</sup> STEL: 4 ppm STEL: 10 mg/m <sup>3</sup>	TWA: 2 ppm STEL: 4 ppm

### Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

<b>Engineering Measures</b>	Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.
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### Personal Protective Equipment

<b>Eye/face Protection</b>	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles. Face-shield.
<b>Skin and body protection</b>	Long sleeved clothing.
<b>Respiratory Protection</b>	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
<b>Hygiene Measures</b>	Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

## 9. Physical and chemical properties

<b>Physical State</b>	Liquid
<b>Appearance</b>	Clear Colorless, Light yellow
<b>Odor</b>	Strong Acid
<b>Odor Threshold</b>	No information available
<b>pH</b>	< 1.0 (0.1M)
<b>Melting Point/Range</b>	-41 °C / -41.8 °F
<b>Boiling Point/Range</b>	Not applicable
<b>Flash Point</b>	Not applicable

Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available
Specific Gravity	1.40
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	HNO <sub>3</sub>
Molecular Weight	63.02

## 10. Stability and reactivity

Reactive Hazard	Yes
Stability	Oxidizer: Contact with combustible/organic material may cause fire.
Conditions to Avoid	Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.
Incompatible Materials	Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents
Hazardous Decomposition Products	Nitrogen oxides (NO <sub>x</sub> ), Thermal decomposition can lead to release of irritating gases and vapors
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

## 11. Toxicological information

### Acute Toxicity

#### Product Information

Oral LD <sub>50</sub>	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD <sub>50</sub>	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC <sub>50</sub>	Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

#### Component Information

Component	LD <sub>50</sub> Oral	LD <sub>50</sub> Dermal	LC <sub>50</sub> Inhalation
Nitric acid	Not listed	Not listed	LC <sub>50</sub> = 2500 ppm. (Rat) 1h
Water	-	Not listed	Not listed

**Toxicologically Synergistic Products** No information available

### Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Causes severe burns by all exposure routes
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

**Mutagenic Effects** No information available



<b>Reproductive Effects</b>	No information available.
<b>Developmental Effects</b>	No information available.
<b>Teratogenicity</b>	No information available.
<b>STOT - single exposure</b>	Respiratory system
<b>STOT - repeated exposure</b>	None known
<b>Aspiration hazard</b>	No information available
<b>Symptoms / effects, both acute and delayed</b>	Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
<b>Endocrine Disruptor Information</b>	No information available
<b>Other Adverse Effects</b>	The toxicological properties have not been fully investigated.

## 12. Ecological information

### Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed

**Persistence and Degradability** Miscible with water Persistence is unlikely based on information available.  
**Bioaccumulation/ Accumulation** No information available.

**Mobility** Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Nitric acid	-2.3

## 13. Disposal considerations

**Waste Disposal Methods** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

## 14. Transport information

### DOT

UN-No UN2031  
 Proper Shipping Name NITRIC ACID  
 Hazard Class 8  
 Subsidiary Hazard Class 5.1  
 Packing Group II

### TDG

UN-No UN2031  
 Proper Shipping Name NITRIC ACID  
 Hazard Class 8  
 Subsidiary Hazard Class 5.1  
 Packing Group II

### IATA

UN-No UN2031  
 Proper Shipping Name NITRIC ACID  
 Hazard Class 8  
 Subsidiary Hazard Class 5.1  
 Packing Group II

**IMDG/IMO**

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

**15. Regulatory information**

All of the components in the product are on the following Inventory lists: X = listed

**International Inventories**

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

**Legend:**

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

**U.S. Federal Regulations**

TSCA 12(b) Not applicable

**SARA 313**

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	65 - 70	1.0

**SARA 311/312 Hazard Categories**

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

**CWA (Clean Water Act)**

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

**CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb

**California Proposition 65** This product does not contain any Proposition 65 chemicals**U.S. State Right-to-Know Regulations**

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitric acid	X	X	X	X	X
Water	-	-	X	-	-

**U.S. Department of Transportation**

Reportable Quantity (RQ): Y  
 DOT Marine Pollutant N  
 DOT Severe Marine Pollutant N

**U.S. Department of Homeland Security**

This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

**Other International Regulations****Mexico - Grade** No information available**Canada**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

**WHMIS Hazard Class**

C Oxidizing materials  
 E Corrosive material  
 D2B Toxic materials

**16. Other information**

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**Creation Date** 12-Mar-2009**Revision Date** 28-Nov-2016**Print Date** 28-Nov-2016

**Revision Summary** This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

**End of SDS**

# ATTACHMENT **G**

## **NYSDOH Generic Community Air Monitoring Plan**

## Appendix 1A

### New York State Department of Health Generic Community Air Monitoring Plan

#### Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

#### Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

**Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

**Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

### VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

### Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) 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  $150 \text{ mcg}/\text{m}^3$  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  $150 \text{ mcg}/\text{m}^3$  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  $150 \text{ mcg}/\text{m}^3$  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/m<sup>3</sup> (1 to 400,000 :ug/m<sup>3</sup>);
  - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m<sup>3</sup> for one second averaging; and +/- 1.5 g/m<sup>3</sup> 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/m<sup>3</sup>, 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° C (14 to 122° 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/m<sup>3</sup> (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/m<sup>3</sup>, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m<sup>3</sup> 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/m<sup>3</sup> 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 PM<sub>10</sub> 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/m<sup>3</sup> 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.