NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

SITE MANAGEMENT PLAN

WORK ASSIGNMENT D007622-52

26-28 WHITESBORO STREET SITE NO. B00063
UTICA/ONEIDA COUNTY, NY

Prepared for:
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway, 12th Floor
Albany, New York

Basil Seggos, Commissioner

DIVISION OF ENVIRONMENTAL REMEDIATION
Remedial Bureau E
Section A

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Buffalo, New York 14202

FINAL
January 2019

26-28 WHITESBORO STREET

ONEIDA COUNTY

UTICA, NEW YORK

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257 WEST GENESEE STREET, SUITE 400

BUFFALO, NEW YORK 14202

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

JANUARY 2019

CERTIFICATION STATEMENT

I, **Mark Lang, PE,** certify that I am currently a NYS registered professional engineer and that this Site Management 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).

P.E.

JAN 22. 2019 DATE

TABLE OF CONTENTS

26-28 WHITESBORO STREET

ONEIDA COUNTY

UTICA, NEW YORK

SITE MANAGEMENT PLAN

List of Tables

List of Figures

List of Appendices

List of Acronyms

BCA	Brownfield Cleanup Agreement
bgs	below ground surface
CAMP	Community Air Monitoring Plan
COC	contaminant of concern
EC	Engineering Control
EWP	Excavation Work Plan
HASP	Health and Safety Plan
IC	Institutional Control
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PES	Precision Environmental Services, Inc.
PFAS	per- and polyfluoroalkyl substances
PRR	Periodic Review Report
RAO	Remedial Action Objective
RAP	Remedial Action Plan
ROD	Record of Decision
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SVI	Soil Vapor Intrusion
SSDS	Sub-slab depressurization system
SVOCs	semi-volatile organic compounds
URS	URS Corporation
VOCs	volatile organic compounds

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring and reporting activities required by this Site Management Plan:

Site Identification: Site #B00063 26-28 Whitesboro Street

Institutional Controls:	The property may be used for commercial or industrial use;	
	• All ECs must be operated and maintained as specified in this SMP; • All ECs must be inspected at a frequency and in a manner defined in the SMP. • The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Oneida County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department. • An evaluation of the potential for vapor intrusion for any existing or new buildings must be performed upon redevelopment of the Site and the evaluation must include provisions for the monitoring or mitigation, if deemed necessary by the Department. • Groundwater and other environmental or public health monitoring must be performed as defined in this SMP; • Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP; • All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP; • Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP; • Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP; • Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.	
Engineering Controls:	1. Cover System	
Inspections:		Frequency
Monitoring well conditions		Annual
Cover Inspection		Annual
Monitoring:		
Groundwater Sampling		Annual

Site Identification: Site #B00063 26-28 Whitesboro Street

Maintenance:	
Landscaping/Cover	Quarterly
Reporting:	
Sampling and Analysis Reporting	Annually
Certification/PRR	Every three years

Further descriptions of the above requirements are provided in detail in the subsequent sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the 26-28 Whitesboro site located in Utica, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is in the New York State (NYS) Brownfield Cleanup Program, Site No. B00063, currently a Class "A" site (assigned to a non-registry site in any remedial program where work is underway and not yet complete) which is administered by New York State Department of Environmental Conservation (NYSDEC).

The City of Utica entered into a Brownfield Cleanup Agreement (BCA) in 1998 with the NYSDEC to remediate the Site. A figure showing the Site location and boundaries of this Site is provided in Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the recorded Environmental Easement provided in Appendix A.

After completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Oneida County Clerk in November 2018, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is violation of the

Environmental Easement, which is grounds for revocation of the Certificate of Completion;

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA (Site #B00063) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the Site is provided in Appendix B of this SMP.

This SMP was prepared by URS Corporation (URS), on behalf of NYSDEC and the City of Utica, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs that are required by the Environmental Easement for the Site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the Site conditions. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the BCA, 6NYCRR Part 375 and/or Environmental Conservation Law.

- 7-day advance notice of any field activity associated with the remedial program.

- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.

- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.

- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.

- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 on the following page includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1: Notifications*

Name	Contact Information
David Chiusano NYSDEC Project Manager	(518) 402-9813 david.chiusano@dec.ny.gov
Gary McCullough NYSDEC Regional Spills Engineer	(315) 785-2427 gary.mccullough@dec.ny.gov
Peter Taylor NYSDEC Regional HW Engineer	(315) 785-2511 peter.taylor@dec.ny.gov
Kelly Lewandowski NYSDEC Site Control Section	(518) 402-9553 kelly.lewandowski@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS REMEDIAL INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located in Utica, Oneida County, New York and is identified as Section 318.8 Block 1 and Lots 42, 43, 44, 45, 46, 47, and 48 on the Oneida Tax Map (see Figure 2). The Site is an approximately 1.532-acre area and is bounded by a railroad line to the north, Whitesboro Street to the south, Division Street to the southeast and east, and an industrial building to the west (see Figures 1 and 2). The boundaries of the Site are more fully described in Appendix A – Environmental Easement. The owner of the Site at the time of issuance of this SMP is:

City of Utica
1 Kennedy Plaza
Utica, New York 13502

2.2 Physical Setting

2.2.1 Land Use

The Site consists of a flat, grassy plot. The Site is zoned commercial and is currently vacant.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial and light industrial properties. The properties immediately south of the Site include commercial and industrial properties; the properties immediately north of the Site include industrial properties; the properties immediately east of the Site include commercial and industrial properties; and the properties to the west of the Site include industrial properties.

2.2.2 Geology

According to information obtained from the Surficial Geology of New York Map, the Site is underlain by kame deposits. The overburden kame deposits originate through deposition adjacent to ice, are laterally variable with respect to sorting and lithologic composition and may be firmly cemented. These deposits are generally composed of fine to coarse sand and gravel. Deposits vary from 30 to 100 feet in thickness. The Bedrock Geology Map of New York Map

indicates the Site is underlain by bedrock belonging to the Utica Shale Formation. This depositional unit belongs to the Lorraine, Trenton, and Black River Group and is of Upper Ordovician Age.

Historic urban fill consisting of concrete, brick, and other material was found at depths ranging from approximately 4 to 7 feet below ground surface (bgs) during the drilling work performed by Precision Environmental Services, Inc. (PES). Soils found beneath the fill were characterized as sandy, clayey silt. The boring logs indicate that bedrock was not encountered at the maximum depth drilled (16 feet bgs). Site-specific boring logs are provided in Appendix C.

2.2.3 Hydrogeology

The depth to groundwater in the overburden soil is approximately 10 feet bgs. Groundwater flow is generally north toward the Mohawk River. Groundwater is not used for potable supply or other uses, nor is it anticipated to be used in the foreseeable future. A groundwater contour map using data from July 5, 2006 is shown in Figure 3. Groundwater elevation data is provided in Table 2. Groundwater monitoring well construction logs are provided in Appendix C.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

The west side of the Site was historically used for the manufacturing of fishing rods and accessories, and the east side of the Site was occupied by various hotels from 1925 until 1973. In 1993, the City of Utica acquired the property in lieu of back taxes. All onsite structures were demolished after a fire in 1994, and the Site is currently vacant.

In 1997, Dames & Moore conducted two phases of remedial activities at the Site. As a result of elevated concentrations of volatile organic compounds (VOCs) found at the Site, the NYSDEC assigned Spill Number 97-09722 to the Site. Additional investigative work was completed at the Site by Hygia of New York in 1999, including the installation of shallow soil

borings and monitoring wells. VOCs and semi-volatile organic compounds (SVOCs) were found in both soil and groundwater.

Additional Site characterization work was performed by Dvirka & Bartilucci of New York in 2008, followed by the development of a Remedial Alternatives Analysis Report in 2009. These reports expanded the list of contaminants of concern (COCs) to also include metals, pesticides, and chlorinated VOCs. A Record of Decision (ROD) was developed in March 2011 to address the COCs at the Site. A Remedial Action Plan (RAP) was issued in 2015.

A limited subsurface investigation was conducted by Nature's Way of New York in January 2016. The results were summarized in a report issued in March 2016 and confirmed the soil impacts identified previously by both Dames & Moore and Dvirka & Bartilucci.

PES performed remedial work between April and August 2017. A supplemental subsurface investigation was performed on April 24, 2017 consisting of the installation of ten shallow soil borings to collect soil samples from four pre-designated target excavation Cells 1 through 4 (see Figure 4). Cells 1 through 4 were targeted for remediation based on results of the Remedial Investigation and Feasibility Study performed by others. Grab samples were collected from each soil boring and composited to represent soil quality within each respective Cell prior to excavation.

PES performed a remedial excavation at the Site between June 6 and 23, 2017. A total of 1,449 cubic yards (1,928 tons) of soil was excavated from the four cells. The excavated soil was characterized and transported off-site for disposal as non-hazardous waste at the Ava Landfill in Ava, New York as managed by the Oneida Herkimer Solid Waste Management Authority. The maximum depth of excavation in each cell was: 8 feet bgs in Cell 1; 7 feet bgs in Cell 2; 6 feet bgs in Cell 3, and 3 feet bgs in Cell 4. Prior to backfilling, a physical demarcation layer consisting of geotextile fabric was placed along each excavation cell bottom. Each excavation was backfilled with imported clean sand and gravel. The Site was graded between June 26 and 28, 2017. A cover consisting of 1 foot of NYSDEC-approved topsoil was placed in accordance with NYSDEC specifications. This topsoil was placed over the demarcation layer (felt fabric) on top of the completed excavation cells and the entirety of the unpaved areas. A hydro-seed

mixture was applied to the topsoil and to expedite vegetation cover growth. Remaining contaminants of concern in groundwater consist of VOCs.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the 26-28 Whitesboro Street Environmental Restoration Project Record of Decision dated March 2011 are as follows.

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

2.4.2 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 contamination.

2.4.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into new buildings constructed at the site as part of redevelopment.

2.5 Remaining Contamination

2.5.1 Soil

Tables 3 and 4 and Figures 4, 5, and 6 summarize the results of remaining surface and subsurface soil samples that exceed the Commercial Use and Protection of Groundwater Soil Cleanup Objectives (SCOs) at the Site after completion of remedial action. Most contaminated soil was removed during the remedial excavation performed by PES. As summarized on Tables 3 and 4, some soil exceedances of the Commercial Use SCOs for VOCs, SVOCs, and metals remain in soil located outside of the excavation cells. These exceedances are considered minor and do not warrant further remedial action.

2.5.2 Groundwater

Table 5 and Figure 7 summarize the results of groundwater samples collected in July 2006 (i.e., prior to remedial excavation by PES) and depict the compounds and analytes that exceeded the Standards, Criteria, and Guidance (SCGs). Several groundwater samples contained exceedances of VOCs, SVOCs, and metals, as shown on Table 5. VOCs are considered contaminants of concern in groundwater. Due to the removal of most of the contaminated soil during the remedial excavation, it is anticipated that the groundwater VOC concentrations will decrease over time. This will be confirmed during future groundwater sampling to be performed as part of this SMP.

In December 2018, PES collected groundwater samples from MW-1 and B-4 for analysis of emerging contaminants including per- and polyfluroalkyl substances (PFAS) and 1,4-dioxane and results are summarized on Table 5A. All results were below current SCGs.

As discussed with NYSDEC, future groundwater monitoring at the Site will be conducted annually as part of the SMP requirements. Samples will be analyzed for VOCs. In addition,

groundwater samples collected during the initial SMP monitoring event will be analyzed for emerging contaminants, including per- and polyfluroalkyl substances (PFAS) and 1,4-dioxane.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the Site, ICs and ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all ICs/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all ICs/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs/ECs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of ICs/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix D) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site; and
- Any other provisions necessary to identify or establish methods for implementing the ICs/ECs required by the Site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs are required by the ROD and Environmental Easement to: (1) implement, maintain, and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the Site to commercial or industrial uses only. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be

discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 2 and Appendix A. These ICs are:

- The property may be used for: commercial or industrial use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the Oneida County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- An evaluation of the potential for vapor intrusion for any new buildings must be performed upon redevelopment of the Site and the evaluation must include provisions for the monitoring or mitigation, if deemed necessary by the Department.
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;

- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.

3.3 Engineering Controls

3.3.1 Cover

Exposure to remaining contamination at the Site is prevented by a cover system comprised of a minimum of 1 foot of clean topsoil. Figure 2 and Appendix A present the location of the cover system and applicable demarcation layers. The EWP provided in Appendix D outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the Site and included as part of the HASP in Appendix E.

3.3.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.3 Cover System Integrity

The cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Quality Assurance Project Plan provided in Appendix F.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-wide Inspection

Site-wide inspections will be performed at a minimum of once per year. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix G – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that Site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If Site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Post-Remediation Media Monitoring and Sampling

Groundwater samples will be collected from the monitoring wells on a routine basis. Sampling locations, required analytical parameters, and schedule are provided in Table 6 – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 6 – Post Remediation Sampling Requirements and Schedule

Sampling Location	**Analytical Parameters**			**Schedule**
	VOCs (EPA Method 8260B)	PFAS* (EPA Method 537, Modified)	1,4-dioxane* (EPA Method 8270D SIM)	
**B-2	X	X	X	Annual
B-4	X	X	X	Annual
**B-5	X	X	X	Annual
MW-1	X	X	X	Annual

*initial sampling event only
**wells require rehabilitation/replacement before being sampled

Monitoring wells will be sampled annually for VOCs. During the initial sampling event, the wells will also be sampled for PFAS and 1,4-dioxane. If PFAS and 1,4-dioxane are found at the Site at elevated concentrations, these analytes will also be required to be sampled for annually.

Detailed sample collection and analytical procedures and protocols are provided in Appendix H – Field Sampling and Analysis Plan and Appendix F – Quality Assurance Project Plan.

4.3.1 Groundwater Sampling

Groundwater monitoring will be performed annually to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The network of monitoring wells has been installed to monitor on-site groundwater conditions. Table 7 summarizes the identification number, as well as the location, diameter, and screened intervals of the wells. As part of the groundwater monitoring, four wells are sampled to evaluate the effectiveness of the remedial system.

Table 7 – Monitoring Well Construction Details

Monitoring Well ID	Well Location	Coordinates (longitude/ latitude)	Well Diameter (inches)	Elevation*		
				Surface	Screen Top	Screen Bottom
**B-2	On-site	43.105276/ -75.226542	1	410.45	404.45	394.45
B-4	On-site	43.10528/ -75.226821	1	409.25	405.25	395.25
**B-5	On-site	43.105148/- 75.226652	1	411.70	407.70	397.70
MW-1	On-site	43.1051/ -75.226643	2	411.76	407.76	397.76

*Elevations in feet above mean sea level
** Wells require rehabilitation/replacement before being sampled

Monitoring well construction logs are included in Appendix C of this document.

If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

A site inspection performed on December 17, 2018 found that wells B-2 and B-5 had obstructions at depths of 3 feet and 4 feet, respectively. As part of the sampling effort, attempts were made to remove the obstructions but were not successful. As a result, these wells will be decommissioned in accordance with CP-43 and replaced in kind prior to the next annual inspection.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report (PRR). Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.3.2 Monitoring and Sampling Protocol

Sampling activities will be recorded in a field book and associated sampling log as provided in Appendix G - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional details regarding monitoring and sampling protocols are provided in the site-specific Field Sampling and Analysis Plan provided as Appendix H of this document.

4.4 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structures located on the Site by the Site owner, the Site owner will perform an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, the Site owner may install an SVI mitigation system as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive sub-slab depressurization system (SSD) that is capable of being converted to an active system.

If SVI work is to be conducted by the Site owner, then prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York". Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

For work conducted by the Site owner, preliminary (unvalidated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation. If any indoor air test results exceed NYSDOH guidelines, relevant NYSDOH fact sheets will be provided to all tenants and occupants of the Site within 15 days of receipt of validated data.

If this work is conducted by the NYSDEC, the SVI sampling results, evaluations, and follow-up actions will also be summarized in the next PRR.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

The Site remedy does not rely on any mechanical systems, such as groundwater treatment systems, sub-slab depressurization systems or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP. An Operation, Monitoring, and Maintenance (OM&M) Plan is included as Appendix J for groundwater sampling and landscaping.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the Site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the Site and/or engineering controls to severe storms/weather events and associated flooding.

The Site is within the 10-year Floodplain of the Mohawk River. Due to climate change, instances of flooding at the Site may increase in frequency and severity. The cover system at the Site will be monitored periodically and repaired as necessary if erosion should occur.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the PRR.

- Waste Generation – waste generated during any future remedial excavation work will be properly characterized and disposed of at the nearest disposable facility available to limit resulting vehicle emissions.

- Energy usage – there are no active remediation systems at the Site; therefore, no energy usage is required.

- Emissions – limited emissions will be generated via fuel usage for transportation to and from the Site for cover inspections. In the case of potential future remedial excavations, waste generated will be disposed of at the nearest disposable facility available to limit resulting vehicle emissions.

- Water usage – no water usage is necessary for the Site.

- Land and/or ecosystems – no disturbances of land and/or ecosystems will result from the implementation of the remedy.

6.2.1 Timing of Green Remediation Evaluations

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site in order to conduct system checks and or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

6.2.3 Metrics and Reporting

As discussed in Section 7.0 and as shown in Appendix G – Site Management Forms, information on energy usage, solid waste generation, transportation and shipping, water usage and land use, and ecosystems will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits.

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix G. These forms are subject to NYSDEC revision.

All applicable forms and records, including media sampling data generated for the Site during the reporting period, will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 8 and summarized in the Periodic Review Report.

Table 8: Schedule of Inspection Reports

Task/Report	Reporting Frequency*
Inspection Report	Annually
Periodic Review Report	Every 3 years, or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise modified by the NYSDEC.

All monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc.);

- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc. (attached to the checklist/form).

Non-routine event reporting forms will include, at a minimum:

- Date of event;

- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;

- Description of non-routine activities performed;

- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and

- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

7.2 Periodic Review Report

A PRR will be submitted to the Department by the City of Utica or subsequent property owner beginning 16 months after the Certificate of Completion is issued. After submittal of the initial PRR, the next PRR will be submitted every three years to the Department or at another frequency as may be required by the Department. In the event that the Site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the Site described in Appendix A -Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of the IC required by the remedy for the Site.

- Results of the required annual Site inspections and severe condition inspections, if applicable.

- All applicable site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.

- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.

- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:

  – The compliance of the remedy with the requirements of the site-specific ROD;

  – Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;

  – Recommendations regarding any necessary changes to the remedy and/or Operation, Monitoring, and Maintenance or Field Sampling and Analysis Plans; and

  – The overall performance and effectiveness of the remedy.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the Site, I certify that all of the following statements are true:*

- *The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*

- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*

- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*

- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*

- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*

- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;*

- *Use of the Site is compliant with the environmental easement;*

- *The engineering control systems are performing as designed and are effective;*

- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and*

- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as Owner's/Remedial Party's Designated Site Representative for the Site."

At the end of each certifying period, as determined by the NYSDEC, the following certification will be provided to the Department:

"For each institutional identified for the Site, I certify that all of the following statements are true:

- *The institutional control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the Site is compliant with the environmental easement.*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as Owner's Designated Site Representative for the Site."

- *No new information has come to my attention, including groundwater monitoring data from wells located at the Site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid; and*

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the PRR.

The PRR will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC. Upon completion of the Corrective Measure, a signed certification form must be submitted to the Department.

8.0 REFERENCES

6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation".

Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

City of Utica, 2018. Environmental Easement, Site No. B00063. November.

Dvirka and Bartilucci Consulting Engineers, 2008. *Site Investigation Report 26-28 Whitesboro Street Site*. December.

Dvirka and Bartilucci Consulting Engineers, 2009. *Remedial Alternatives Analysis Report 26-28 Whitesboro Street Site*. December.

New York State Department of Environmental Conservation, 2011. *Fact Sheet 26-28 Whitesboro Street Site*. February.

New York State Department of Environmental Conservation Division of Environmental Remediation, 2011. *Record of Decision 26-28 Whitesboro Street Environmental Restoration Project.* March.

Precision Environmental Services, Inc., 2018. *Record of Decision (ROD) Implementation Report of Findings.* July.

Table 2
Groundwater Elevations
26-28 Whitesboro Street Site
Utica, New York

WELL	REFERENCE ELEVATION (ft*)	TOP OF SCREEN (ft BG)	BOTTOM OF SCREEN (ft BG)	DATE							
				6/10/2003		9/11/2003		6/6/2005		7/5/2006	
				DTW	ELEV	DTW	ELEV	DTW	ELEV	DTW	ELEV
B-1	103.17	2.0	12.0	8.34	94.83	8.81	94.36	8.71	94.46	NM	NM
B-2	104.31	6.0	16.0	9.38	94.93	9.95	94.36	9.84	94.47	NM	NM
B-3	104.24	4.0	14.0	9.02	95.22	9.85	94.39	9.63	94.61	NM	NM
B-4	104.59	4.0	14.0	9.56	95.03	10.09	94.50	9.97	94.62	NM	NM
B-5	105.37	4.0	14.0	10.10	95.27	10.80	94.57	NM	NM	NM	NM
B-6	106.03	4.0	14.0	10.62	95.41	11.39	94.64	11.21	94.82	NM	NM
B-7	105.60	4.0	14.0	10.07	95.53	10.81	94.79	10.65	94.95	NM	NM
B-8	105.61	4.0	14.0	9.80	95.81	10.59	95.02	NM	NM	NM	NM
B-9	105.93	4.0	14.0	10.12	95.81	10.88	95.05	10.60	95.33	NM	NM
B-10	106.15	4.0	14.0	10.37	95.78	11.17	94.98	11.01	95.14	NM	NM
B-11	103.59	4.0	14.0	9.28	94.31	9.81	93.78	9.74	93.85	NM	NM
B-12	104.19	4.0	14.0	8.55	95.64	9.44	94.75	9.15	95.04	NM	NM
MW-1	105.24	4.0	14.0	NI	NI	NI	NI	10.41	94.83	8.57	96.67
MW-2	104.00	4.0	14.0	NI	NI	NI	NI	9.30	94.70	7.87	96.13
MW-3	103.15	4.0	14.0	NI	NI	NI	NI	8.57	94.58	7.11	96.04
MW-4	104.13	4.0	14.0	NI	NI	NI	NI	9.76	94.37	8.29	95.84
MW-5	100.48	4.0	14.0	NI	NI	NI	NI	6.46	94.02	6.92	93.56
MW-6	100.84	4.0	14.0	NI	NI	NI	NI	6.63	94.21	4.85	95.99
MW-7	102.29	4.0	14.0	NI	NI	NI	NI	7.70	94.59	6.05	96.24
MW-8	102.50	4.0	14.0	NI	NI	NI	NI	8.58	93.92	6.63	95.87

NOTES: ft* = elevations in feet relative to elevation of 105.96 feet at manhole MH-2 ft
BG = feet below grade
DTW = depth to water in feet below measuring point on top of well casing
ELEV = groundwater elevation in feet
NI = well not installed
NM = not measured, well damaged or not located

Table 3
Remaining Surface Soil Contamination
26-28 Whitesboro Street Site
Utica, New York

Sample Identification	SS-1	SS-2	SS-3	SS-4	SS-5	SS-7	SS-9	SS-10	SS-11	SS-14	SS-15	NYSDEC Part 375 & CP-51 Commercial	NYSDEC Part 375 & CP-51 Protection of Groundwater
Sample Depth (feet)	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2		
Date of Collection	6/6/2003	6/6/2003	6/6/2003	6/6/2003	6/6/2003	6/6/2003	6/1/2005	6/1/2005	6/1/2005	6/1/2005	6/1/2005		
SVOCs (µg/kg)													
Phenol								120 J	360 J			500000	330
Naphthalene	70 J		1300				160 J	130 J	820	81 J	99 J	500000	12000
Acenaphthylene	79 J		1500	60 J	99 J	99 J	130 J	270 J	920	69 J	98 J	500000	98000
Acenaphthene	75 J		3100	52 J	66 J		320 J	340 J	1900	100 J	130 J	500000	107000
Dibenzofuran	70 J		2500	43 J			240 J	220 J	1200	120 J	140 J	350000	210000
Fluorene	85 J		3700	55 J	74 J	45 J	290 J	400	2300	140 J	190 J	500000	386000
Phenanthrene	1500	82 J	100000 D	830	1100	610	4100	6500 D	25000 D	1500	1800	500000	1000000
Anthracene	150 J		23000 DJ	180 J	250 J	150 J	830	1800	5900	410	460	500000	1000000
Di-n-butylphthalate								40 J	80 J	57 J	52 J		8100
Fluoranthene	2800	270 J	200000 D	1500	2600	2000	5100	16000 D	36000 D	2900	2800	500000	1000000
Pyrene	1800	240 J	170000 D	1300	2200	1600	4300	14000 D	35000 D	2200	2400	500000	1000000
Benzo (a) anthracene	800	160 J	**79000 D**	700	1200	850	2500	**7200 D**	**16000 D**	1300	1600	5600	1000
Chrysene	980	160 J	**75000 D**	760	1200	900	2200	5600D	13000 D	1300	1300	56000	1000
bis(2-Ethylhexyl)phthalate	130 J	110 J	320 J	200 J	1900	200 J	45 J	270 J	3300	62 J	100 J		435000
Benzo(b)fluoranthene	2100	260 J	**110000 D**	1200	2000	1600	2800	**7700 D**	**20000 D**	1600	2200	5600	1700
Benzo(k)fluoranthene	670	81 J	33000 DJ	420	640	510	1400	4700	7300 D	950	780	56000	1700
Benzo(a)pyrene	950	150 J	**76000 D**	810	**1300**	**1100**	**2000**	**5100 D**	**13000 D**	**1100**	**1300**	1000	22000
Indeno(1,2,3-cd)pyrene	670	92 J	**38000 DJ**	490	710	600	550	1500	4400	320 J	440	5600	8200
Dibenzo(a,h) anthracene	190 J		**1400**	150 J	220 J	180 J	180 J	500	**1300**	100 J	140 J	560	1000000
Benzo(g,h,i)perylene	750	100 J	43000 D	590	780	640	470	1400	4200	320 J	420	500000	1000000
Pesticides/ PCBs (µg/kg)													
Heptachlor			2 P				NA	NA	NA	NA	NA	15000	380
4,4'-DDD			7.8 P				NA	NA	NA	NA	NA	92000	14000
Endosulfan Sulfate			8.2 P				NA	NA	NA	NA	NA	200000	1000000
4,4'-DDT			15 P	9.1 P	8.8 P	6.8	NA	NA	NA	NA	NA	47000	136000
alpha-Chlordane							NA	NA	NA	NA	NA	24000	2900
gamma-Chlordane							NA	NA	NA	NA	NA		14000
Aroclor-1260			350 P	100 P	87 P		NA	NA	NA	NA	NA	1000	3200
Metals (mg/kg)													
Arsenic	5.1	7.7	4.5	5.2	4.2	3.6	9.3	4.6	3.4	7.1	6.2	16	16
Barium	69.5	39.6 B	235	78.8	84.7	108	186	90.9	121	75.5	147	400	820
Beryllium	0.38 B	0.35 B	0.17 B	0.38 B	0.42 B	0.28 B	0.31	0.2 B	0.15 B	0.22 B	0.25 B	590	47
Cadmium			1.4				0.91	0.72	0.76	0.96	0.77	9.3	7.5
Chromium	14.3	11	13.9	11.3	12.4	9.3	8.4	7.8	8	6.7	14	1500	
Copper	31.8	23.9	198	26.7	26	17.8	397	61	44.9	39.5	39.7	270	1720
Lead	34.1	11.2 B	501	144	151	150	674	176	84.2	161	413	1000	450
Manganese	531	655	230	485	501	442	538	308	233	172	305	10000	2000
Mercury			0.19	0.085 B	0.14	0.063 B	1.1	0.38	0.11	0.21	0.35	2.8	0.73
Nickel	18.6	16.1	39.9	15.9	17.7	12.6	22.9	23.8	19.4	9.9	20	310	130
Selenium			0.88 B	0.93 B					0.24 B	0.56 B	0.41 B	1500	4
Zinc	63.4	42.7	315	74.8	77.7	93.9	280	121	184	112	177	10000	2480
Cyanide			0.39 B				NA	NA	NA	NA	NA	27	40

Bold = Exceeding Commercial Criteria

= Exceeding Protection of Groundwater

B = Compound concentration is less than the CRDL, but greater than the IDL.

J = Estimated Concentration

P = Greater than 25% difference for detected concentrations between the two GC columns, lower value reported

D = Result is taken from reanalysis at a secondary dilution

NA = Not Analyzed

Blank Cell = Non Detect

Table 4
Remaining Subsurface Soil Contamination
26-28 Whitesboro Street Site
Utica, New York

Sample Identification	B-1	B-2	B-4	B-6	B-7	B-8	B-9	B-10	B-12	B14	B14	B15	B15	MW-3	MW-4	MW-4	MW-6	NYSDEC Part 375 & CP-51 Commercial	NYSDEC Part 375 & CP 51 Protection of Groundwater
Sample Depth (feet)	6-8	6-8	8-10	8-10	6-8	2-4	6-8	6-8	8-10	6-8	8-10	2-4	6-8	6-8	4-6	6-8	6-8		
Date of Collection	6/5/2003	6/5/2003	6/5/2003	6/6/2003	6/5/2003	6/5/2003	6/6/2003	6/6/2003	6/6/2003	6/1/2005	6/1/2005	6/1/2005	6/1/2005	6/2/2005	6/2/2005	6/2/2005	6/2/2005		
VOCs (µg/kg)																			
Vinyl Chloride												12						13000	20
Acetone	16	40	13		12	11	10 J	11 J		4 J							45	500000	50
Methylene Chloride														2 J	3 J	3 J	3 J	500000	50
trans-1,2-Dichloroethene												30	2 J					500000	190
cis-1,2-Dichloroethene												160 D	39					500000	250
Benzene																	2 J	44000	60
Trichloroethene	9 J	2 J			2 J					56	6 J	180 D	40	3 J	26	18		200000	470
Toluene				19					13									500000	700
Ethylbenzene																	140	390000	1000
m,p-Xylenes	NA	NA	NA	NA	NA	NA	NA	NA	NA								56	500000	1600
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA								220 E	500000	1600
Total Xylenes																	270	500000	1600
1,2-Dichlorobenzene															2 J	2 J		500000	1100
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA								220 E	500000	3900
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA								1,000 DJ	190000	8400
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA								3,900 D	190000	3600
sec-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA								64	500000	11000
SVOCs (µg/kg)																			
Phenol																	1,800 J	500000	330
Naphthalene			72 J							500	1,800				170 J		61,000 D	500000	12000
Acenaphthylene		120 J	57 J	55 J					94 J	140 J	120 J						14,000	500000	107000
Acenaphthene		110 J	99 J	57 J						350 J	1,600	81 J			74 J		36,000 DJ	500000	107000
Fluorene		150 J	160 J	160 J						460	530	100 J			89 J		50,000 D	500000	386000
Phenanthrene	69 J	1500	1700	1000	59 J	63 J				4,200	2,500	1,100	190 J	130 J	1,100		410,000 D	500000	1000000
Anthracene		370 J	360	190 J						930	670	290 J	53 J		230 J		120,000 D	500000	1000000
Di-n-butylphthalate		47 J								45 J		48 J			48 J				8100
Fluoranthene	120 J	5800 D	2700 D	1400	130 J	150 J			230 J	5,400	590	2,100	270 J	210 J	1,500		470,000 D	500000	1000000
Pyrene	110 J	3400	2300	1100	110 J	190 J			350 J	5,000	1,000	1,400	250 J	170 J	1,200		430,000 D	500000	1000000
Benzo (a) anthracene	61 J	2500	1100	630	64 J	100 J			240 J	2,300	450	1,000 J	160 J	110 J	810		**200,000 D**	5600	1000
Chrysene	59 J	2400	1100	560	66 J	120 J			230 J	2,300	460	1,100	140 J	80 J	680		**210,000 D**	56000	1000
bis(2-Ethylhexyl)phthalate	180 J	320 J	1600	330 J	560	790	84 J	75 J	200 J	860	56 J	160 J	290 J	110 J	150 J	110 J	8,700		435000
Benzo(b)fluoranthene	82 J	3300	1700	640	90 J	200 J			380	2,700	180 J	1,200	160 J	88 J	800		**150,000 D**	5600	1700
Benzo(k)fluoranthene	40 J	1300	600	230 J	41 J	66 J			140 J	1,400	120 J	650 J	56 J	45 J	330 J		**91,000 D**	56000	1700
Benzo(a)pyrene	45 J	**2000**	**1200**	420 J	57 J	120 J			150 J	**1,800**	250 J	880 J	110 J	71 J	550		**130,000 D**	1000	22000
Indeno(1,2,3-cd)pyrene		800	620	200 J		75 J			190 J	410	78 J	350 J	60 J	41 J	320 J		**59,000 D**	5600	8200
Dibenzo(a,h)anthracene		270 J	180 J	74 J					57 J	130 J		110 J			89 J		**15,000**	560	1000000
Benzo(g,h,i)perylene		770	660	240 J		100 J			230 J	390	95 J	340 J	66 J	46 J	320 J		69,000 D	500000	1000000
Pesticides/ PCBs (µg/kg)																			
Endrin		11							9.9	NA	NA	NA	NA	NA	NA	NA	NA	89000	60
Endosulfan Sulfate									3.8	NA	NA	NA	NA	NA	NA	NA	NA	200000	1000000
4,4'-DDE			3.4 P	9.6	5.1 P					NA	NA	NA	NA	NA	NA	NA	NA	62000	17000
Endosulfan II										NA	NA	NA	NA	NA	NA	NA	NA	200000	102000
4,4'-DDD		5.3 P	2.6 JP						4 P	NA	NA	NA	NA	NA	NA	NA	NA	92000	14000
4,4'-DDT		44	11 P	16 P	23					NA	NA	NA	NA	NA	NA	NA	NA	47000	136000
gamma-Chlordane									4 P	NA	NA	NA	NA	NA	NA	NA	NA		14000
Metals (mg/kg)																			
Arsenic	3	4.7	4.9	4.8	5.6	9.4	9	4.1	8.3	NA	NA	NA	NA	NA	NA	NA	NA	16	16
Barium	**884**	96.2	35.5 B	45.1	38.2 B	63.6	25.9 B	15.3 B	49.7	NA	NA	NA	NA	NA	NA	NA	NA	400	820
Beryllium	0.16 B	0.43 B	0.22 B	0.30 B	0.29 B	0.44 B	0.45 B	0.27 B	0.25 B	NA	NA	NA	NA	NA	NA	NA	NA	590	47
Cadmium	1.4									NA	NA	NA	NA	NA	NA	NA	NA	9.3	7.5
Chromium	55.4	13.3	27.8	9.2	10.5	13.2	14	8.9	14.7	NA	NA	NA	NA	NA	NA	NA	NA	1500	
Copper	180	33	37.8	25	31.5	29.8	45.2	20.7	31.8	NA	NA	NA	NA	NA	NA	NA	NA	270	1720
Lead	314	41.4	22.9	51.8	50.6	23.7	11.1 B	7.1 B	11.5 B	NA	NA	NA	NA	NA	NA	NA	NA	1000	450
Manganese	251	1170	332	442	622	1290	698	401	94	NA	NA	NA	NA	NA	NA	NA	NA	10000	2000
Mercury	0.16	0.36	**12.4**	0.33	0.18	0.22				NA	NA	NA	NA	NA	NA	NA	NA	2.8	0.73
Nickel	73.5	18.1	**551**	12	15.3	20.1	17.9	10.8	15.4	NA	NA	NA	NA	NA	NA	NA	NA	310	130
Selenium	2.1	0.88 B	0.80 B			0.66 B	0.85 B			NA	NA	NA	NA	NA	NA	NA	NA	1500	4
Zinc	639	79.2	122	76.5	55.4	84.2	69.1	48.3	54.5	NA	NA	NA	NA	NA	NA	NA	NA	10000	2450
Cyanide			1.3		0.82	0.51 B				NA	NA	NA	NA	NA	NA	NA	NA	27	40

Bold = Exceeding Commercial Criteria
= Exceeding Protection of Groundwater
B = Compound concentration is less than the CRDL, but greater than the IDL.
J = Estimated Concentration
P = Greater than 25% difference for detected concentrations between the two GC columns, lower value reported
D = Result is taken from reanalysis at a secondary dilution
NA = Not Analyzed
Blank Cell = Non Detect
E = Compound concentration exceeds calibration range, value estimated

Table 5
Remaining Groundwater Exceedances
26-28 Whitesboro Street Site
Utica, New York

Detected Concentrations	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)	Frequency Exceeding SCG
VOCs			
Vinyl Chloride	1 – 5	2	1 of 20
cis-1,2-Dichloroethene	2 – 200	5	3 of 20
Trichloroethene	4 – 120	5	5 of 20
Benzene	11 – 43	1	3 of 20
Toluene	3 – 23	5	3 of 20
Ethylbenzene	3 – 73	5	1 of 20
Xylenes (total)	2 – 66	5	1 of 20
Isopropylbenzene	1 – 21	5	1 of 20
n-Propylbenzene	7	5	1 of 20
1,3,5-Trimethylbenzene	29	5	1 of 20
1,2,4-Trimethylbenzene	3 – 120	5	1 of 20
Naphthalene	5 – 1,100	10	1 of 20
SVOCs			
Benzo(a)anthracene	ND – 6 J	0.002	1 of 12
Chrysene	ND – 6 J	0.002	2 of 12
Benzo(b)fluoranthene	ND – 6 J	0.002	1 of 12
Benzo(k)fluoranthene	ND – 3 J	0.002	1 of 12
Benzo(a)pyrene	ND – 4 J	ND	1 of 12
Indeno(1,2,3-cd)pyrene	ND – 3 J	0.002	1 of 12
METALS			
Arsenic	1.7 – 618	25	6 of 37
Barium	30.7 – 6430	1000	4 of 37
Beryllium	0.15 – 27.7	3	5 of 37
Cadmium	0.13 – 47.8	5	5 of 37
Chromium	0.49 – 2600	50	5 of 37
Copper	6.4 – 4190	200	5 of 37
Lead	0.62 – 2250	25	8 of 37
Manganese	3.1 – 95900	300	26 of 37
Total Mercury	0.068 – 8.6	0.7	5 of 37
Nickel	1.4 – 3810	100	7 of 37
Selenium	1.5 – 72.7	10	2 of 37
Zinc	4.8 – 7680	2000	3 of 37

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).

J- Estimated values

TABLE 5A
DECEMBER 2018 GROUNDWATER ANALYTICAL RESULTS FOR EMERGING CONTAMINANTS
26-28 WHITESBORO STREET

Location ID			B- 4	FIELDQC	MW- 1
Sample ID			B-4	Field Blank	MW-1
Matrix			Groundwater	Water Quality	Groundwater
Depth Interval (ft)			-	-	-
Date Sampled			12/17/18	12/17/18	12/17/18
Parameter	**Units**	**Criteria***		Field Blank (1-1)	
Semivolatile Organic Compounds					
1,4-Dioxane	UG/L	-	0.20 U	NA	0.34
Per- and Polyfluoroalkyl Substances					
Perfluorobutanoic acid (PFBA)	NG/L	-	3.3	2.1 U	1.6 J
Perfluoropentanoic acid (PFPeA)	NG/L	-	1.1 J	2.1 U	1.7
Perfluorohexanoic acid (PFHxA)	NG/L	-	0.78 J	2.1 U	0.88 J
Perfluoroheptanoic acid (PFHpA)	NG/L	-	0.84 J	2.1 U	0.53 J
Perfluorooctanoic acid (PFOA)	NG/L	70	2.1	0.34 J	3.1
Perfluorononanoic acid (PFNA)	NG/L	-	1.6 U	2.1 U	0.58 J
Perfluorodecanoic acid (PFDA)	NG/L	-	1.6 U	2.1 U	1.7 U
Perfluoroundecanoic acid (PFUnA)	NG/L	-	0.37 JB	0.32 JB	1.4 JB
Perfluorododecanoic acid (PFDoA)	NG/L	-	1.6 U	2.1 U	1.7 U
Perfluorotridecanoic acid (PFTriA)	NG/L	-	1.6 U	2.1 U	1.7 U
Perfluorotetradecanoic acid (PFTeA)	NG/L	-	1.6 U	2.1 U	1.7 U
Perfluorobutanesulfonic acid (PFBS)	NG/L	-	1.7	2.1 U	0.70 J
Perfluorohexanesulfonic acid (PFHxS)	NG/L	-	0.26 J	2.1 U	1.7 U
Perfluoroheptanesulfonic acid (PFHpS)	NG/L	-	1.6 U	2.1 U	1.7 U
Perfluorooctanesulfonic acid (PFOS)	NG/L	70	5.3	2.1 U	7.0
Perfluorodecane sulfonate (PFDS)	NG/L	-	1.6 U	2.1 U	1.7 U
Perfluorooctane sulfonamide (PFOSA)	NG/L	-	1.6 U	2.1 U	1.7 U
N-Methyl perfluorooctanesulfonamidoacetic acid	NG/L	-	16 U	21 U	17 U
N-Ethyl perfluorooctanesulfonamidoacetic acid	NG/L	-	16 U	21 U	17 U
1H,1H,2H,2H-Perfluorooctanesulfonic acid (6:2)	NG/L	-	16 U	21 U	17 U

*Criteria- USEPA Drinking Water Health Advisory (USEPA, May 2016)

Flags assigned during chemistry validation are shown.

Concentration Exceeds Criteria

- - No criteria.

J - The reported concentration is an estimated value. U - Not detected above the reported quantitation limit.

JB - The reported concentration is an estimated value and has been detected in an associated method blank.

Detection Limits shown are PQL

TABLE 5A
DECEMBER 2018 GROUNDWATER ANALYTICAL RESULTS FOR EMERGING CONTAMINANTS
26-28 WHITESBORO STREET

Location ID			B- 4	FIELDQC	MW- 1
Sample ID			B-4	Field Blank	MW-1
Matrix			Groundwater	Water Quality	Groundwater
Depth Interval (ft)			-	-	-
Date Sampled			12/17/18	12/17/18	12/17/18
Parameter	**Units**	**Criteria***		Field Blank (1-1)	
Per- and Polyfluoroalkyl Substances					
1H,1H,2H,2H-Perfluorodecanesulfonic acid (8:2)	NG/L	-	16 U	21 U	17 U

*Criteria- USEPA Drinking Water Health Advisory (USEPA, May 2016)

Flags assigned during chemistry validation are shown.

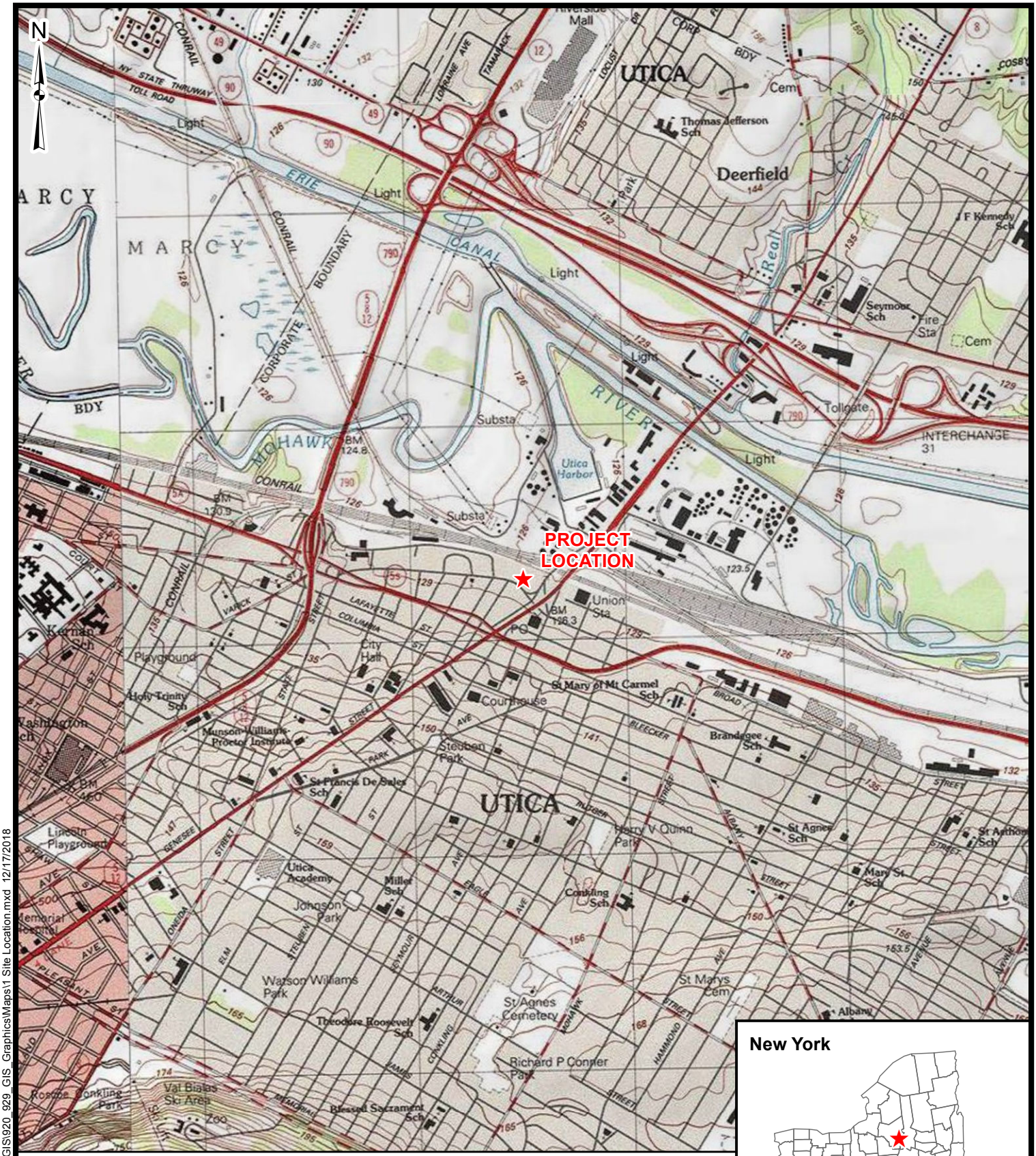
Concentration Exceeds Criteria

- - No criteria.

J - The reported concentration is an estimated value. U - Not detected above the reported quantitation limit.

JB - The reported concentration is an estimated value and has been detected in an associated method blank.

Detection Limits shown are PQL



Source: USA Topo Maps, ESRI Map Service

2,000 0 2,000 Feet

URS

26-28 WHITESBORO STREET SITE
UTICA, NEW YORK
SITE LOCATION MAP

FIGURE 1

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N

Institutional Control Limits and Cover

B-4

B-2

B-5

MW-1

CELL I

CELL II

CELL III

CELL IV

POST EXCAVATION GRADING LIMITS
AREA=±69,520 SqFt.

LANDS NOW OR FORMERLY
NATIONAL BUILDING RESTORATION CORP.
LIBER 2593 PAGE 85
TAX MAP PARCEL 318.8-1-49
VACANT COMMERCIAL

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2812 PAGE 593
TAX MAP PARCEL 318.8-1-47
VACANT COMMERCIAL

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2650 PAGE 253
TAX MAP PARCEL 318.8-1-48
VACANT COMMERCIAL

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2650 PAGE 252
TAX MAP PARCEL 318.8-1-46
VACANT COMMERCIAL

LANDS NOW OR FORMERLY
CITY OF UTICA
INSTRUMENT # 2017-001646
TAX MAP PARCEL 318.8-1-45
VACANT COMMERCIAL

LANDS NOW OR FORMERLY
CITY OF UTICA
IRPS 2751 PAGE 140
TAX MAP PARCEL 318.8-1-43
VACANT COMMERCIAL

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2650 PAGE 561
TAX MAP PARCEL 318.8-1-42
VACANT COMMERCIAL

LANDS NOW OR FORMERLY
THE BOILERMAKER ROAD RACE, INC.
BOOK 2842 PAGE 642
TAX MAP PARCEL 318.8-1-41
VACANT COMMERCIAL

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2639 PAGE 541
TAX MAP PARCEL 318.8-1-44
VACANT COMMERCIAL

BENCHMARK: "x" CUT
SOUTH EAST LP BOLT
ELEVATION=411.91'

GRAVEL ROAD

BRICK BUILDING

BRICK ROAD

WHITESBORO STREET

DIVISION STREET

PAVEMENT

GRASS

CONC. SIDEWALK

GRAN. CURB

CONC. CURB

FOUND REBARS

40 0 40 Feet

Legend

Remedial Excavation Cell

Sources:
1. Post Cap Survey Drawing, Record of Decision Implementation Report of Findings, Precision Environmental Services Inc., July 2018
2. Excavation Cell/Soil Boring Location/ID Map, Record of Decision Implementation Report of Findings, Precision Environmental Services Inc., July 2018

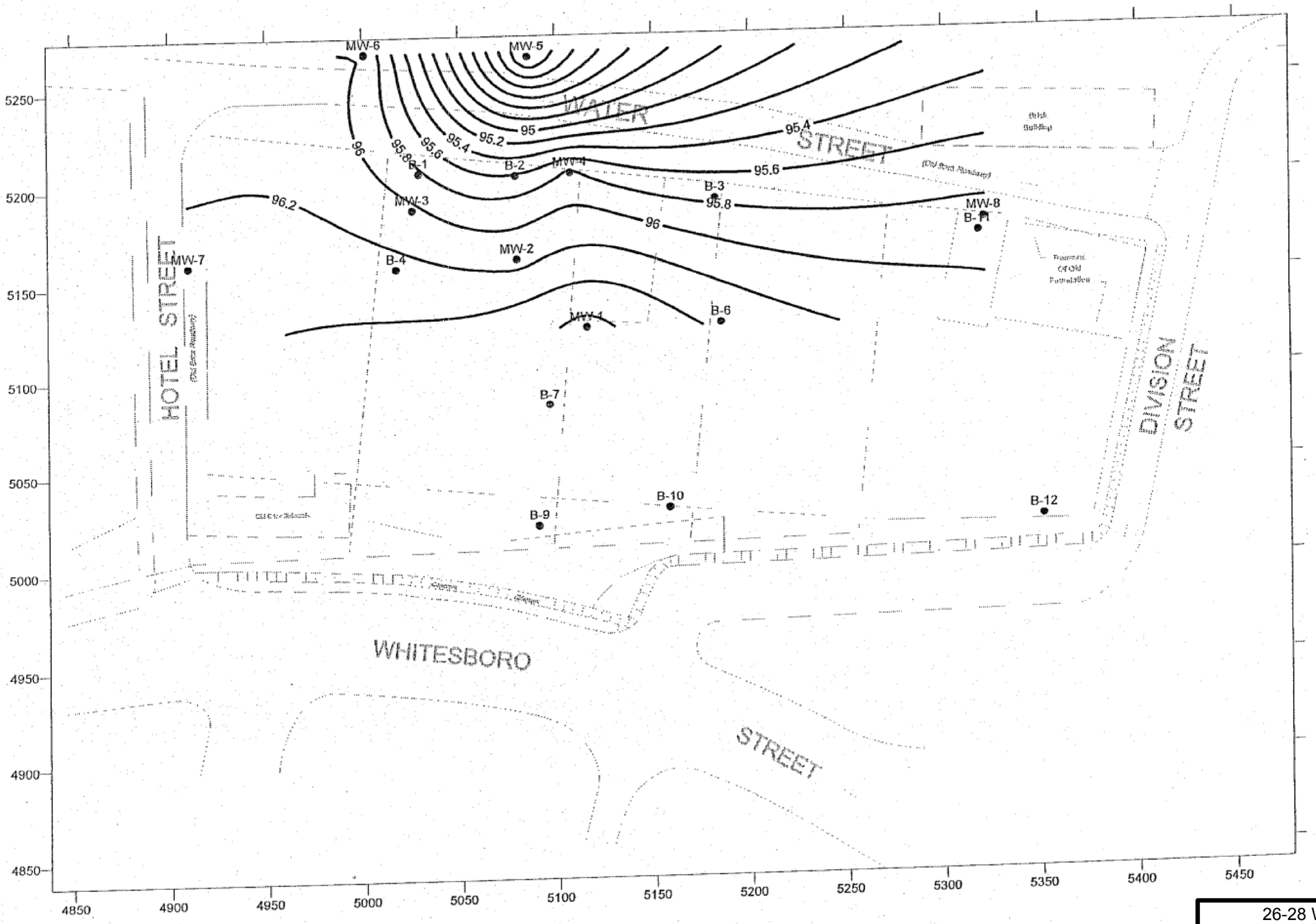
26-28 WHITESBORO STREET SITE
SITE PLAN

URS

FIGURE 2

J:\Projects\60592094_2628_White\900_CAD_GIS\920_929_GIS_Graphics\Maps\2 Site Plan.mxd 12/20/2018

N



NOTES

- contour interval = 0.2 feet
- elevations are relative to elevation of 105.96 feet at manhole MH-2 located at the south side of the site

Source: Groundwater Contour Map - July 5, 2006, Site Investigation Report, Dvirka and Bartilucci Consulting Engineers, December 2008

26-28 WHITESBORO STREET SITE
GROUNDWATER CONTOUR MAP
JULY 5, 2006

URS

FIGURE 3

J:\Projects\60592094_2628_White\900_CAD_GIS\920_929_GIS_Graphics\Maps\3 GW Contours.mxd 12/17/2018

N

SS-1	6/6/03
bnz(b)fluor	2100

SS-2	6/6/03
SVOCs	NE
aluminum	7,910
magnesium	10,700
potassium	1,500
sodium	147

SS-5	6/6/03
bnz(a)anth	1,200
chrysene	1,200
bnz(b)fluor	2,000
bnz(a)pyr	1,300

SS-14	6/1/05
bnz(a)anth	1,300
chrysene	1,300
bnz(a)pyr	1,100

SS-6	6/6/03
SVOCs	NE
chromium	18.0
copper	137
iron	25,600
lead	254
magnesium	4,770
mercury	0.63
nickel	24.4
potassium	1,080
sodium	227
zinc	243

SS-15	6/6/03
bnz(a)anth	1,600
chrysene	1,300
bnz(b)fluor	2,200
bnz(a)pyr	1,300

SS-11	6/1/05
bnz(a)anth	16,000 D
chrysene	13,000 D
bnz(b)fluor	20,000 D
bnz(k)fluor	7,300 D
bnz(a)pyr	13,000 D
dbnzo(a,h)	1,300

SS-3	6/6/03
phenanthrene	100,000 D
bnz(a)anth	79,000 D
chrysene	75,000 D
bnz(b)fluor	110,000 D
bnz(k)fluor	33,000 DJ
bnz(a)pyr	76,000 D
indeno	38,000 DJ
dbnzo(a,h)	1,400

SS-12	6/1/05
SVOCs	NE
lead	980
mercury	8.9
zinc	162

SS-8	6/6/03
bnz(a)anth	5,200
chrysene	5,600
bnz(b)fluor	9,700
bnz(k)fluor	3,200
bnz(a)pyr	6,700
chromium	12.7
lead	857
magnesium	4,710
manganese	757
mercury	0.59
nickel	18.0
potassium	1,220
sodium	187
zinc	212

SS-9	6/1/05
bnz(a)anth	2,500
chrysene	2,200
bnz(b)fluor	2,800
bnz(a)pyr	2,000

SS-10	6/1/05
bnz(a)anth	7,200 D
chrysene	5,600 D
bnz(b)fluor	7,700 D
bnz(k)fluor	4,700
bnz(a)pyr	5,100 D

SS-4	6/6/03
SVOCs	NE
aluminum	7,840
beryllium	0.38
magnesium	7,700
potassium	1,640
sodium	159

SS-7	6/6/03
bnz(a)pyr	1,100

SS-13	6/1/05
dbnzo(a,h)	330 J
lead	1,290
mercury	0.48
sodium	105
thallium	1.3
zinc	177

WATER STREET (Old Brick Roadway)

HOTEL STREET (Old Brick Roadway)

WHITESBORO STREET

DIVISION STREET

Edge Of Curb

Cell I

Cell II

Cell III

Cell IV

AREA 1

AREA 2

SS-1 SS-2 SS-3 SS-4 SS-5 SS-6 SS-7 SS-8 SS-9 SS-10 SS-11 SS-12 SS-13 SS-14 SS-15

BSS-1 BSS-2 BSS-3 BSS-4 BSS-5

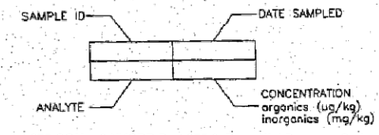
LEGEND

SURFACE SOIL SAMPLE LOCATION
SS-5 (BSS = BACKGROUND SURFACE SOIL LOCATION)
SITE BOUNDARY

ABBREV.	ANALYTE	UNITS	SCG	375-COM	375-PG
phenol	phenol	ug/kg	30	500,000	330
phenanthrene	phenanthrene	ug/kg	50,000	500,000	1,000,000
fluoranthene	fluoranthene	ug/kg	50,000	500,000	1,000,000
pyrene	pyrene	ug/kg	50,000	500,000	1,000,000
bnz(a)anth	benzo(a)anthracene	ug/kg	224	5,600	1,000
chrysene	chrysene	ug/kg	400	56,000	1,000
bnz(b)fluor	benzo(b)fluoranthene	ug/kg	1100	5,600	1,700
bnz(k)fluor	benzo(k)fluoranthene	ug/kg	1100	56,000	1,700
bnz(a)pyr	benzo(a)pyrene	ug/kg	61	1,000	22,000
indeno	indeno(1,2,3-c,d)pyrene	ug/kg	3,200	5,600	8,200
dbnzo(a,h)	dibenzo(a,h)anthracene	ug/kg	14	560	1,000,000
aluminum	aluminum	mg/kg	SB (6,620)	-	-
beryllium	beryllium	mg/kg	0.16/SB (0.36)	590	47
cadmium	cadmium	mg/kg	1/SB (13)	9.3	7.5
calcium	calcium	mg/kg	SB (73,100)	-	-
chromium	chromium	mg/kg	10/SB (13)	1,500	-
copper	copper	mg/kg	25/SB (129)	270	1720
iron	iron	mg/kg	2,000/SB (22,200)	-	-
lead	lead	mg/kg	SB (173)	1,000	450
magnesium	magnesium	mg/kg	SB (4,460)	-	-
manganese	manganese	mg/kg	SB (712)	10,000	2,000
mercury	mercury	mg/kg	0.1	2.8	0.73
nickel	nickel	mg/kg	13/SB (17.8)	310	130
potassium	potassium	mg/kg	SB (788)	-	-
sodium	sodium	mg/kg	SB (78.4)	-	-
thallium	thallium	mg/kg	SB (0.69)	-	-
zinc	zinc	mg/kg	20/SB (145)	10,000	2,480

SVOC exceedances based on exceedance of TAGM 4046 and background sample data

J = estimated concentration



375-COM = 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives. Protection of Public Health, Commercial.
375-PG = 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives. Restricted Use. Protection of Groundwater.

Legend

- Results Prior to Remedial Excavations
- No Exceedances w/ Current Criteria
- Remedial Excavation Cell

Sources:
1. Exceedances in Surface Soil, Site Investigation Report, Dvirka and Bartilucci Consulting Engineers, December 2008
2. Excavation Cell/Soil Boring Location/ID Map, Record of Decision Implementation Report of Findings, Precision Environmental Services Inc., July 2018

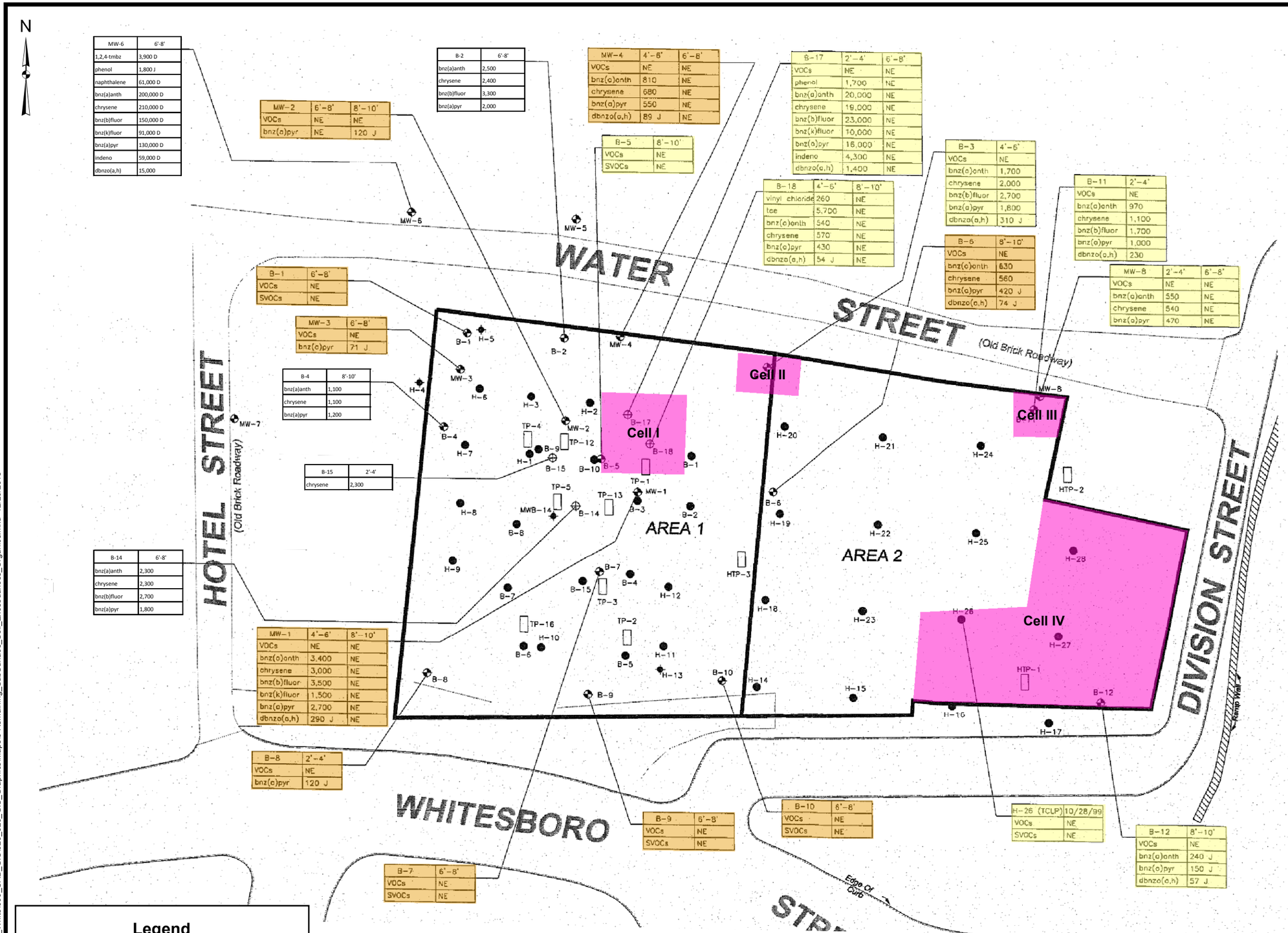
50 0 50 Feet

26-28 WHITESBORO STREET SITE REMAINING SURFACE SOIL EXCEEDANCES

URS

FIGURE 4

J:\Projects\60592094_2628_White\900_CAD_GIS\920_929_GIS_Graphics\Maps\4 Remaining_Surface_Soil_Exceedances.mxd 12/20/2018



MW-6	6'-8'
1,2,4-tmbz	3,900 D
phenol	1,800 J
naphthalene	61,000 D
bnz(a)anth	200,000 D
chrysene	210,000 D
bnz(b)fluor	150,000 D
bnz(k)fluor	91,000 D
bnz(a)pyr	130,000 D
indeno	59,000 D
dbnzo(a,h)	15,000

MW-2	6'-8'	8'-10'
VOCs	NE	NE
bnz(a)pyr	NE	120 J

B-2	6'-8'
bnz(a)anth	2,500
chrysene	2,400
bnz(b)fluor	3,300
bnz(a)pyr	2,000

MW-4	4'-6'	6'-8'
VOCs	NE	NE
bnz(a)anth	810	NE
chrysene	680	NE
bnz(a)pyr	550	NE
dbnzo(a,h)	89 J	NE

B-5	8'-10'
VOCs	NE
SVOCs	NE

B-17	2'-4'	6'-8'
VOCs	NE	NE
phenol	1,700	NE
bnz(a)anth	20,000	NE
chrysene	19,000	NE
bnz(b)fluor	23,000	NE
bnz(k)fluor	10,000	NE
bnz(a)pyr	18,000	NE
indeno	4,300	NE
dbnzo(a,h)	1,400	NE

B-18	4'-6'	8'-10'
vinyl chloride	260	NE
tce	5,700	NE
bnz(a)anth	540	NE
chrysene	570	NE
bnz(a)pyr	430	NE
dbnzo(a,h)	54 J	NE

B-3	4'-6'
VOCs	NE
bnz(a)anth	1,700
chrysene	2,000
bnz(b)fluor	2,700
bnz(a)pyr	1,800
dbnzo(a,h)	310 J

B-6	8'-10'
VOCs	NE
bnz(a)anth	630
chrysene	560
bnz(a)pyr	420 J
dbnzo(a,h)	74 J

B-11	2'-4'
VOCs	NE
bnz(a)anth	970
chrysene	1,100
bnz(b)fluor	1,700
bnz(a)pyr	1,000
dbnzo(a,h)	230

MW-8	2'-4'	6'-8'
VOCs	NE	NE
bnz(a)anth	550	NE
chrysene	540	NE
bnz(a)pyr	470	NE

B-1	6'-8'
VOCs	NE
SVOCs	NE

MW-3	6'-8'
VOCs	NE
bnz(a)pyr	71 J

B-4	8'-10'
bnz(a)anth	1,100
chrysene	1,100
bnz(a)pyr	1,200

B-15	2'-4'
chrysene	2,300

B-14	6'-8'
bnz(a)anth	2,300
chrysene	2,300
bnz(b)fluor	2,700
bnz(a)pyr	1,800

MW-1	4'-6'	8'-10'
VOCs	NE	NE
bnz(a)anth	3,400	NE
chrysene	3,000	NE
bnz(b)fluor	3,500	NE
bnz(k)fluor	1,500	NE
bnz(a)pyr	2,700	NE
dbnzo(a,h)	290 J	NE

B-8	2'-4'
VOCs	NE
bnz(a)pyr	120 J

B-9	6'-8'
VOCs	NE
SVOCs	NE

B-10	6'-8'
VOCs	NE
SVOCs	NE

B-7	6'-8'
VOCs	NE
SVOCs	NE

H-26 (TCLP)	10/28/99
VOCs	NE
SVOCs	NE

B-12	8'-10'
VOCs	NE
bnz(a)anth	240 J
bnz(a)pyr	150 J
dbnzo(a,h)	57 J

LEGEND

SITE BOUNDARY

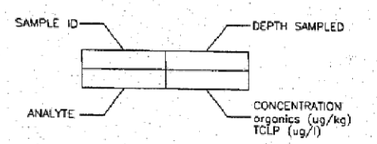
B-5 BORING LOCATION- D&B 2003

H-4 (H = HYGEIA 1999, MWB = DAMES & MOORE 1997) WELL LOCATION- PREVIOUS

H-6 (H = HYGEIA 1999, B = DAMES & MOORE 1997) BORING LOCATION- PREVIOUS

ABBREV.	ANALYTE	UNITS	SCG	375-COM	375-PG
acetone	acetone	ug/kg	200	500,000	50
t-1,2-dce	trans-1,2,dichlorethene	ug/kg	300	500,000	190
vinyl chloride	vinyl chloride	ug/kg	200	13,000	20
tce	trichloroethene	ug/kg	700	200,000	470
phenol	phenol	ug/kg	30	500,000	330
2-mthylphen	2-methylphenol	ug/kg	100	500,000	330
4-mthylphen	4-methylphenol	ug/kg	900	500,000	330
naphthalene	naphthalene	ug/kg	13,000	500,000	1,200
bnz(a)anth	benzo(a)anthracene	ug/kg	224	5,600	1,000
chrysene	chrysene	ug/kg	400	56,000	1,000
bnz(b)fluor	benzo(b)fluoranthene	ug/kg	1100	5,600	1,700
bnz(k)fluor	benzo(k)fluoranthene	ug/kg	1100	56,000	1,700
bnz(a)pyr	benzo(a)pyrene	ug/kg	61	1,000	22,000
dbnzo(a,h)	dibenzo(a,h)anthracene	ug/kg	14	560	1,000,000
dibenzofuran	dibenzofuran	ug/kg	6,200	350,000	210,000
phenanthrene	phenanthrene	ug/kg	50,000	500,000	1,000,000
anthracene	anthracene	ug/kg	50,000	500,000	1,000,000
fluoranthene	fluoranthene	ug/kg	50,000	500,000	1,000,000
pyrene	pyrene	ug/kg	50,000	500,000	1,000,000
indeno	indeno(1,2,3-c,d)pyrene	ug/kg	3,200	5,600	8,200
bnz(g,h,i)per	benzo(g,h,i)perylene	ug/kg	50,000	500,000	1,000,000
1,2,4-tmbz	1,2,4-Trimethylbenzene	ug/kg	---	190,000	3,600

J = estimated concentration
VOCs = volatile orgainc compounds
SVOCs = semivolatile organic compounds
NE = no exceedances
TCLP = toxicity characteristic leaching procedure



375-COM = 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives. Protection of Public Health, Commercial.
375-PG = 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives. Restricted Use. Protection of Groundwater.

Legend

- Results Prior to Remedial Excavations
- No Exceedances w/ Current Criteria
- Remedial Excavation Cell

Sources:
1. Exceedances in Subsurface Soil - Organics, Site Investigation Report, Dvirka and Bartilucci Consulting Engineers, December 2008
2. Excavation Cell/Soil Boring Location/ID Map, Record of Decision Implementation Report of Findings, Precision Environmental Services Inc., July 2018

Note:
Only Data collected after 2000 is shown

50 0 50 Feet

26-28 WHITESBORO STREET SITE REMAINING SUBSURFACE ORGANIC EXCEEDANCES

URS

FIGURE 5

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N

B-2	6'-8'
aluminum	9,700
beryllium	0.43
chromium	13.3
iron	22,400
magnesium	6,070
manganese	1,170
mercury	0.36
nickel	18.1
potassium	1,890
sodium	138

B-5	8'-10'
aluminum	7,090
potassium	1,290
sodium	114

B-3	4'-6'
aluminum	6,670
magnesium	6,060
manganese	725
mercury	0.42
potassium	1,180
sodium	124

B-6	8'-10'
aluminum	6,990
antimony	1.8
mercury	0.33
potassium	1,380
sodium	91.2

B-11	2'-4'
beryllium	0.40
mercury	0.30
potassium	928
sodium	199

B-1	6'-8'
antimony	3.1
barium	884
cadmium	1.4
chromium	55.4
copper	180
lead	314
mercury	0.16
nickel	73.5
potassium	820
selenium	2.1
sodium	255
zinc	639

B-4	8'-10'
mercury	12.4
nickel	551

B-8	2'-4'
aluminum	10,000
beryllium	0.44
chromium	13.2
iron	25,700
manganese	1,280
mercury	0.22
nickel	20.1
potassium	1,170
sodium	79.8

B-7	6'-8'
aluminum	6,680
magnesium	9,680
mercury	0.18
potassium	1,390
sodium	155

B-9	6'-8'
aluminum	9,930
beryllium	0.45
chromium	14.0
iron	27,000
nickel	17.9
potassium	1,070
sodium	81.0

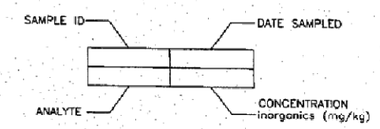
B-10	6'-8'
potassium	960

B-12	8'-10'
aluminum	8,820
chromium	14.7
iron	26,900
potassium	1,420
sodium	370

LEGEND

- SITE BOUNDARY
- BORING LOCATION- D&B 2003 B-5
- WELL LOCATION- PREVIOUS H-4 (H = HYGEIA 1999, MWB = DAMES & MOORE 1997)
- BORING LOCATION- PREVIOUS H-6 (H = HYGEIA 1999, B = DAMES & MOORE 1997)

ABBREV.	ANALYTE	UNITS	SCG	375-COM	375-PG
aluminum	aluminum	mg/kg	SB (6,620)	-	-
antimony	antimony	mg/kg	SB (1.5)	-	-
barium	barium	mg/kg	300/SB (82.8)	400	820
beryllium	beryllium	mg/kg	0.16/SB (0.36)	590	47
cadmium	cadmium	mg/kg	1/SB (13)	9	8
chromium	chromium	mg/kg	10/SB (13)	1,500	-
copper	copper	mg/kg	25/SB (129)	270	1720
iron	iron	mg/kg	2,000/SB (22,200	-	-
lead	lead	mg/kg	SB (173)	1,000	450
magnesium	magnesium	mg/kg	SB (4,460)	-	-
manganese	manganese	mg/kg	SB (712)	10,000	2,000
mercury	mercury	mg/kg	0.1	2.8	0.73
nickel	nickel	mg/kg	13/SB (17.8)	310	130
potassium	potassium	mg/kg	SB (788)	-	-
selenium	selenium	mg/kg	2/SB (0.32)	1500	4
sodium	sodium	mg/kg	SB (78.4)	-	-
zinc	zinc	mg/kg	20/SB (145)	10,000	2,480



375-COM = 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives. Protection of Public Health, Commercial.
375-PG = 6 NYCRR Part 375.6, Remedial Program Soil Cleanup Objectives. Restricted Use. Protection of Groundwater.

Legend

- Results Prior to Remedial Excavations
- No Exceedances w/ Current Criteria
- Remedial Excavation Cell

Sources:
1. Exceedances in Subsurface Soil - Metals, Site Investigation Report, Dvirka and Bartilucci Consulting Engineers, December 2008
2. Excavation Cell/Soil Boring Location/ID Map, Record of Decision Implementation Report of Findings, Precision Environmental Services Inc., July 2018

50 0 50 Feet

26-28 WHITESBORO STREET SITE REMAINING SUBSURFACE METAL EXCEEDANCES

URS

FIGURE 6

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N

MW-6	6/6/05	7/5/06
benzene	43	NS
toluene	23	NS
ethylbenzene	73	NS
m,p-xylenes	14	NS
o-xylene	53	NS
isopropylbenz	21	NS
n-propylbenz	7	NS
1,3,5-trimet	29	NS
1,2,4-trimet	120	NS
naphthalene	1,100	NS
antimony	2.5	3.5
iron	391	469
manganese	2,660	1,290
sodium	36,300	18,900
thallium	7.1	5.5

B-2	6/10/03
tce	12
SVOCs	NE
METALS	NS

MW-5	6/6/05	7/5/06
benzene	18	NS
toluene	8	NS
iron	898	7,380
manganese	913	1,180
sodium	24,700	35,400
thallium	3.5	5.2

MW-2	6/6/05	7/5/06
vinyl chloride	5	NS
cis-1,2-dce	200	NS
tce	120	NS
toluene	10	NS
magnesium	36,000	38,800
sodium	99,700	55,600
thallium	8.5	ND

MW-4	6/6/05	7/5/06
VOCs	NE	NS
magnesium	60,500	100,000
manganese	2,090	37.9
sodium	65,500	52,100
thallium	5.3	ND

B-3	6/10/03
cis-1,2-dce	9 J
SVOCs	NE
arsenic	62.0
chromium	50.2
iron	608,000
lead	88.3
manganese	3,230
sodium	34,000

B-5	6/10/03
tce	26
SVOCs	NE
METALS	NS

MW-8	6/6/05	7/5/06
VOCs	NE	NS
manganese	747	229
selenium	11.3	3.9
sodium	48,000	34,900
thallium	7.8	2.3

H-5	10/28/99
n-butylbenz	230
naphthalene	1,700
SVOCs	NE

B-1	6/10/03
cis-1,2-dce	7 J
tce	25
bnz(a)anth	6 J
chrysene	6 J
bnz(b)fluor	6 J
bnz(k)fluor	3 J
bnz(a)pyr	4 J
indeno	3 J
antimony	65.1
arsenic	425
barium	6,430
beryllium	20.9
cadmium	33.0
chromium	2,600
copper	3,570
iron	1,020,000
lead	2,250
magnesium	169,00
manganese	93,000
mercury	1.8
nickel	3,810
sodium	323,000
zinc	7,680

H-4	10/28/99
VOCs	NE
SVOCs	NE

MW-3	6/6/05
VOCs	NE
chromium	171
iron	31,300
lead	27.5
magnesium	37,500
manganese	1,760
nickel	285
sodium	287,000
thallium	8.3

MW-1	6/6/05	7/5/06
VOCs	NE	NS
antimony	ND	9.5
magnesium	44,500	74,000
sodium	174,000	90,000
thallium	8.3	ND

B-4	6/10/03
VOCs	NE
SVOCs	NE
METALS	NS

MW-7	6/6/05	7/5/06
benzene	11	NS
manganese	1,360	27.6
sodium	108,000	17,400
thallium	8.4	1.7

B-8	6/10/03
VOCs	NE
SVOCs	NE
METALS	NS

MWB-14	6/30/97
VOCs	NE
SVOCs	NE
METALS	NE

B-9	6/10/03
VOCs	NE
SVOCs	NE
METALS	NS

B-7	6/10/03
tce	7 J
chrysene	1 J
METALS	NS

B-6	6/10/03
VOCs	NE
SVOCs	NE
METALS	NS

H-13	10/28/99
VOCs	NE
SVOCs	NE

B-10	6/10/03
VOCs	NE
SVOCs	NE
arsenic	417
barium	3,100
beryllium	17.7
cadmium	19.9
chromium	288
copper	1,950
iron	1,020,000
lead	644
magnesium	113,000
manganese	95,900
mercury	1.2
nickel	569
sodium	394,000
zinc	2,640

B-12	6/10/03
VOCs	NE
SVOCs	NE
antimony	6.9
arsenic	618
barium	3,600
beryllium	27.7
cadmium	47.8
chromium	822
copper	4,190
iron	2,170,000
lead	1,730
magnesium	273,000
manganese	24,100
mercury	3.9
nickel	1,150
sodium	541,000
zinc	5,330

B-11	6/10/03
VOCs	NE
SVOCs	NE
antimony	3.1
arsenic	351
barium	2,330
beryllium	15.9
cadmium	28.1
chromium	169
copper	1,750
iron	345,000
lead	1,380
magnesium	72,000
manganese	29,800
mercury	8.6
nickel	444
selenium	72.7
sodium	97,000

WATER STREET (Old Brick Roadway)

HOTEL STREET (Old Brick Roadway)

DIVISION STREET

WHITESBORO STREET

Edge Of Curb

AREA 1

AREA 2

MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-7 MW-8

MWB-14

B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8 B-9 B-10 B-11 B-12

H-4 H-5 H-13

LEGEND

SITE BOUNDARY

MONITORING WELL LOCATION - D&B 2003 & 2005

B-5 WELL LOCATION- PREVIOUS

H-4 (H = HYGEIA 1999, MWB = DAMES & MOORE 1997)

ABBREV.	ANALYTE	SCG	UNITS
n-butylbenz	n-butylbenzene	5	ug/l
naphthalene	naphthalene	10	ug/l
cis-1,2-dce	cis-1,2-dichloroethene	5	ug/l
tce	trichloroethene	5	ug/l
vinyl chloride	vinyl chloride	2	ug/l
benzene	benzene	1	ug/l
toluene	toluene	5	ug/l
ethylbenzene	ethylbenzene	5	ug/l
m,p-xylenes	m,p-xylenes	5	ug/l
o-xylene	o-xylene	5	ug/l
isopropylbenz	isopropylbenzene	5	ug/l
n-propylbenz	n-propylbenzene	5	ug/l
1,3,5-trimeth	1,3,5-trimethylbenzene	5	ug/l
1,2,4-trimeth	1,2,4-trimethylbenzene	5	ug/l
bnz(a)anth	benzo(a)anthracene	0.002	ug/l
chrysene	chrysene	0.002	ug/l
bnz(b)fluor	benzo(b)fluoranthene	0.002	ug/l
bnz(k)fluor	benzo(k)fluoranthene	0.002	ug/l
bnz(a)pyr	benzo(a)pyrene	ND	ug/l
indeno	indeno(1,2,3-c,d)pyrene	0.002	ug/l
antimony	antimony	3	ug/l
arsenic	arsenic	25	ug/l
barium	barium	1,000	ug/l
beryllium	beryllium	3	ug/l
cadmium	cadmium	5	ug/l
chromium	chromium	50	ug/l
copper	copper	200	ug/l
iron	iron	300*	ug/l
lead	lead	25	ug/l
magnesium	magnesium	35,000	ug/l
manganese	manganese	300*	ug/l
mercury	mercury	0.7	ug/l
nickel	nickel	100	ug/l
selenium	selenium	10	ug/l
sodium	sodium	20,000	ug/l
thallium	thallium	0.5	ug/l
zinc	zinc	2,000	ug/l

ND = non-detectable
* = combined standard for iron and manganese is 500 ug/l
J = estimated concentration
VOCs = volatile organic compounds
SVOCs = semivolatile organic compounds
NE = no exceedances
NS = not sampled

SAMPLE ID — DATE SAMPLED
ANALYTE — CONCENTRATION (ug/l)

Source:
Exceedances in Groundwater, Site Investigation Report, Dvirka and Bartilucci Consulting Engineers, December 2008

50 0 50 Feet

26-28 WHITESBORO STREET SITE REMAINING GROUNDWATER EXCEEDANCES

URS

FIGURE 7

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APPENDIX A – RECORDED ENVIRONMENTAL EASEMENT

COPY OF FILING

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this 20th day of November, 2018 between Owner(s) City of Utica, having an office at 1 Kennedy Plaza, Utica, New York 13502, County of Oneida, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property having an address of Water Street in the City of Utica, County of Oneida and State of New York, known and designated on the tax map of the County Clerk of Oneida as tax map parcel number: Section 318.8 Block 1 Lot 42, being the same as that property conveyed to Grantor by deed dated October 9, 1992 and recorded in the Oneida County Clerk's Office in Liber and Page 2639/541.

WHEREAS, Grantor, is the owner of real property having an address of Water Street in the City of Utica, County of Oneida and State of New York, known and designated on the tax map of the County Clerk of Oneida as tax map parcel number: Section 318.8 Block 1 Lot 43, being a portion of the property conveyed to Grantor by deed dated January 27, 1998 and recorded in the Oneida County Clerk's Office in Liber and Page 2812/540.

WHEREAS, Grantor, is the owner of real property having an address of 14-18 Whitesboro Street in the City of Utica, County of Oneida and State of New York, known and designated on

the tax map of the County Clerk of Oneida as tax map parcel number: Section 318.8 Block 1 Lot 44, being a portion of the property conveyed to Grantor by deed dated October 9, 1992 and recorded in the Oneida County Clerk's Office in Liber and Page 2639/541.

WHEREAS, Grantor, is the owner of real property having an address of Whitesboro Street in the City of Utica, County of Oneida and State of New York, known and designated on the tax map of the County Clerk of Oneida as tax map parcel number: Section 318.8 Block 1 Lot 45, being the same as that property conveyed to Grantor by deed dated December 19, 2006 and recorded in the Oneida County Clerk's Office in Instrument No. 2007-001046.

WHEREAS, Grantor, is the owner of real property having an address of 26-28 Whitesboro Street in the City of Utica, County of Oneida and State of New York, known and designated on the tax map of the County Clerk of Oneida as tax map parcel number: Section 318.8 Block 1 Lot 46, being the same as that property conveyed to Grantor by deed dated February 17, 1993 and recorded in the Oneida County Clerk's Office in Liber and Page 2650/252.

WHEREAS, Grantor, is the owner of real property having an address of Water Street in the City of Utica, County of Oneida and State of New York, known and designated on the tax map of the County Clerk of Oneida as tax map parcel number: Section 318.8 Block 1 Lot 47, being the same as that property conveyed to Grantor by deed dated January 27, 1998 and recorded in the Oneida County Clerk's Office in Liber and Page 2812/593.

WHEREAS, Grantor, is the owner of real property having an address of 30-34 Whitesboro Street in the City of Utica, County of Oneida and State of New York, known and designated on the tax map of the County Clerk of Oneida as tax map parcel number: Section 318.8 Block 1 Lot 48, being the same as that property conveyed to Grantor by deed dated February 17, 1993 and recorded in the Oneida County Clerk's Office in Liber and Page 2650/253.

WHEREAS, the property subject to this Environmental Easement (the "Controlled Property") comprises approximately 1.532 +/- acres, and is hereinafter more fully described in the Land Title Survey dated November 13, 2017 prepared by Bruce W. Snyder, L.L.S., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of State Assistance Contract Number: NYWII-B0063-12-14, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and

redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Oneida County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential or Restricted Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i) and (ii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: B00063
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

City of Utica:

By: Robert Palmieri

Print Name: Robert M Palmieri

Title: Mayor Date: 9/25/18

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF Oneida)

On the 25th day of Sept., in the year 2018, before me, the undersigned, personally appeared Robert Palmieri, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Ashley B Bizzari
Notary Public - State of New York

ASHLEY B. BIZZARI
Notary Public, State of New York
Registration No. 01BI6236877
Qualified in Oneida County
My Comm. Expires August 27, 2019

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Michael J. Ryan, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 20th day of November, in the year 2018, before me, the undersigned, personally appeared Michael J. Ryan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2022

SCHEDULE "A" PROPERTY DESCRIPTION

SURVEYOR'S DESCRIPTION:

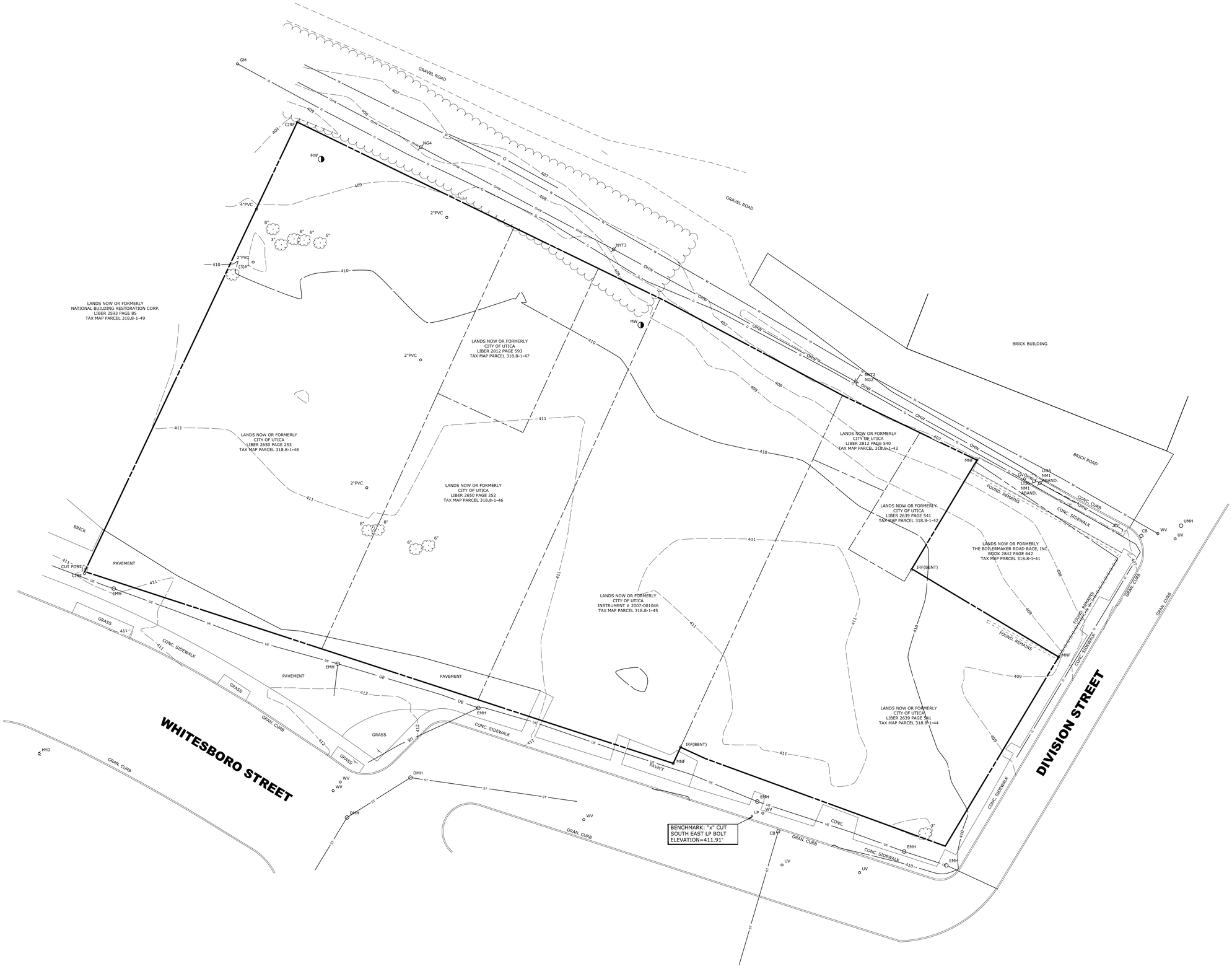
ALL THAT TRACT OR PARCEL OF LAND SITUATE IN THE CITY OF UTICA, COUNTY OF ONEIDA AND STATE OF NEW YORK, BOUNDED AND DESCRIBED AS FOLLOWS:

Beginning at an iron rod on the northerly highway boundary of Whitesboro Street, said iron rod standing at the intersection of the northerly highway boundary of Whitesboro Street with the easterly boundary of National Building Restoration Corp. (Now or Formerly), as described in a Warranty Deed dated July 1, 1991 and filed in the Oneida County Clerks Office in Liber 2593 of Deeds at Page 85; said point of beginning being further described as standing therein distant **S69°26'00"E 72.57 feet** as measured along the northerly highway boundary of Whitesboro Street from the intersection of the northerly highway boundary of Whitesboro Street with the easterly highway boundary of Hotel Street; thence **N27°50'30"E 211.84 feet** along the easterly boundary of National Building Restoration Corp. to an iron rod standing on the nominal southerly highway boundary of Water Street; thence **S61°34'03"E 173.97 feet** along the nominal southerly highway boundary of Water Street to a point; thence **S59°27'32"E 86.55 feet** continuing along the nominal southerly highway boundary of Water Street to a point; thence **S61°47'28"E 63.00 feet** still along the nominal southerly highway boundary of Water Street to an iron rod standing on the westerly boundary of The Boilermaker Road Race, Inc. (Now or Formerly); thence **S33°28'00"W 54.00 feet** along the westerly boundary of The Boilermaker Road Race, Inc. to an iron rod standing on the southerly boundary of The Boilermaker Road Race, Inc.; thence **S56°32'00"E 73.00 feet** along the southerly boundary of The Boilermaker Road Race, Inc. to an iron rod standing on the westerly highway boundary of Division Street; thence **S33°28'00"W 94.00 feet** along the westerly highway boundary of Division Street to an iron rod standing on the northerly highway boundary of Whitesboro Street; thence **N67°26'00"W 108.88 feet** along the northerly highway boundary of Whitesboro Street to an iron rod; thence **N62°51'00"W 11.55 feet** continuing along the northerly highway boundary of Whitesboro Street to an iron rod standing on the westerly highway boundary of Whitesboro Street; thence **S27°08'30"W 7.57 feet** along the westerly highway boundary of Whitesboro Street to an iron rod standing on the northerly highway boundary of Whitesboro Street; thence **N69°26'00"W 263.80 feet** along the northerly highway boundary of Whitesboro Street to the **point and place of beginning.**

The above described parcel containing **1.532 acres** (66,722.7 Sq. Ft.) of land, more or less.

Subject to any easements, covenants or restrictions of record.

The property is subject to an environmental easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the New York Environmental Conservation Law. The engineering and institutional controls for this Easement are set forth in more detail in the Site Management Plan (SMP). A copy of the SMP must be obtained by any party with an interest in the property. The SMP can be obtained from NYS Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at derweb@dec.ny.gov.



MAP NOTES:

1.) NORTH ORIENTATION IS BASED ON MAP REFERENCE NO. 1.

2.) VERTICAL DATUM BASED NAVD 1988.

3.) THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN UP TO DATE ABSTRACT OF TITLE OR TITLE REPORT AND IS THEREFORE SUBJECT TO ANY EASEMENTS, COVENANTS, RESTRICTIONS OR ANY STATEMENT OF FACT THAT SUCH DOCUMENTS MAY DISCLOSE.

4.) UNDERGROUND FACILITIES, STRUCTURES AND UTILITIES HAVE BEEN PLOTTED FROM DATA OBTAINED BY FIELD SURVEY, PREVIOUS MAPS AND RECORDS, (AND PAROL TESTIMONY). THEREFORE THEIR LOCATIONS MUST BE CONSIDERED APPROXIMATE ONLY. THERE MAY BE OTHER UNDERGROUND UTILITIES, THE EXISTENCE OF WHICH ARE NOT KNOWN TO THE UNDERSIGNED. SIZE AND LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES MUST BE VERIFIED BY THE APPROPRIATE AUTHORITIES PRIOR TO ANY CONSTRUCTION.

5.) FIELD WORK PERFORMED APRIL 21, 2017.

MAP REFERENCES:

1. MAP ENTITLED: "MAP OF PROPERTY OF CITY OF UTICA T.M. #318.08-1-42 THRU 48" PREPARED BY SUSAN M. ANACKER, L.S. DATED 12/29/2015.

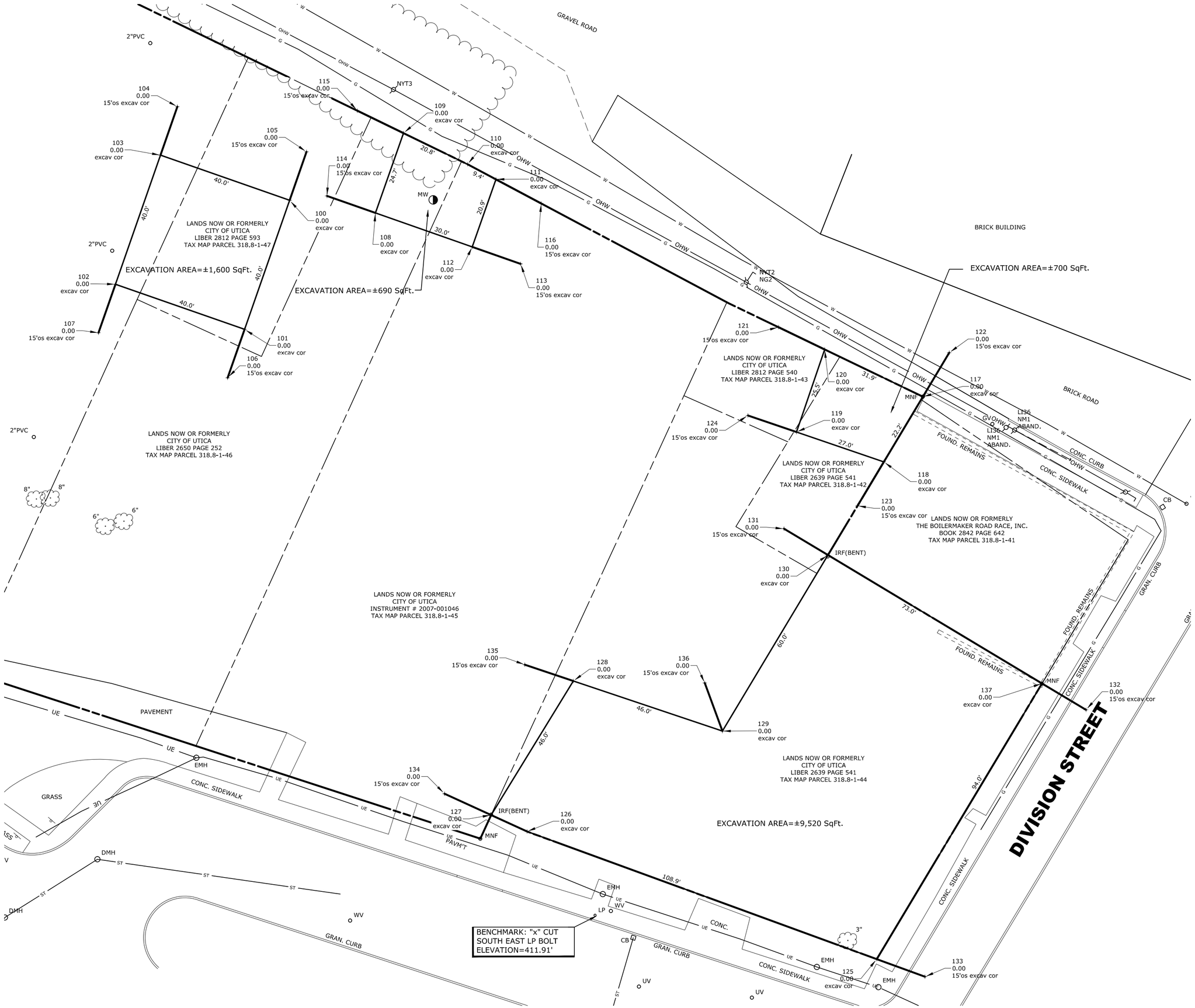
BAR SCALE

20 0 10 20 40

1 inch = 20 ft.

LEGEND

IRON ROD FOUND	IRF
CAPPED IRON ROD FOUND	CIRF
MAGNETIC NAIL FOUND	MNF
LIGHT POLE	LP
UTILITY POLE	
UTILITY POLE W/ LIGHT	
ELECTRIC MANHOLE	EMH
MONITOR WELL	MW
UNKNOWN MANHOLE	UMH
UNKNOWN VALVE	UV
FIRE HYDRANT	HYD
WATER VALVE	WV
SIGN	
CATCH BASIN	CB
DRAINAGE MANHOLE	DMH
GAS LINE MARKER	GM
GAS VALVE	GV
OVERHEAD WIRES	OHW
UNDERGROUND GAS LINE	G
WATER LINE	W
UNDERGROUND ELEC. LINE	UE
STORM LINE	ST
DECIDUOUS TREE	3"


GRAVEL ROAD
BRICK BUILDING
BRICK ROAD
2"PVC
2"PVC
2"PVC
NYT3
NYT2
NG2
MW
MNF
IRF(BENT)
IRF(BENT)
MNF
MNF
EMH
EMH
EMH
EMH
DMH
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WV
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LP
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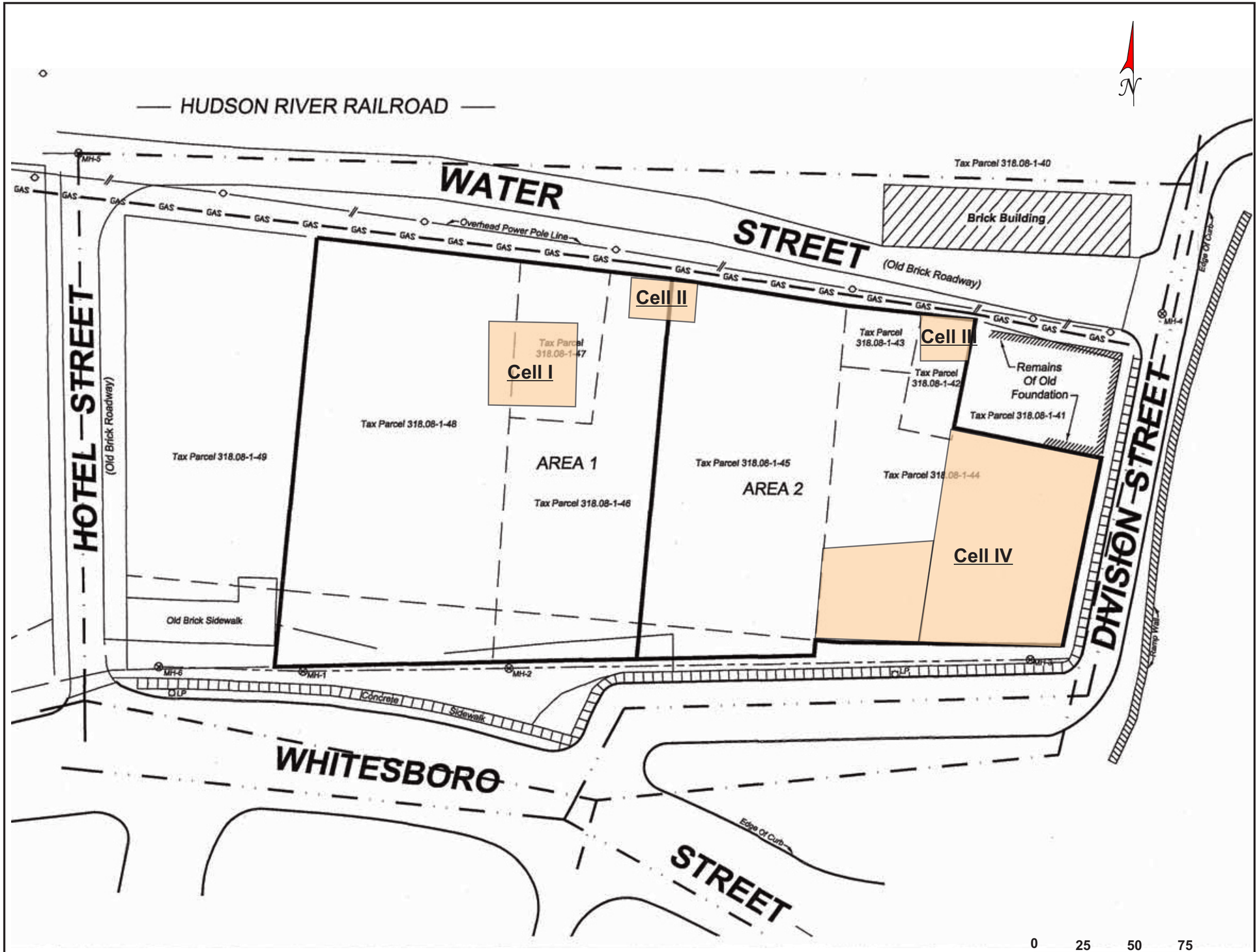
24.7'
20.8'
9.4'
20.9'
30.0'
31.9'
25.5'
22.2'
27.0'
73.0'
60.0'
46.0'
46.0'
108.9'
94.0'
EXCAVATION AREA=±1,600 SqFt.
EXCAVATION AREA=±690 SqFt.
EXCAVATION AREA=±700 SqFt.
EXCAVATION AREA=±9,520 SqFt.
LANDS NOW OR FORMERLY CITY OF UTICA LIBER 2812 PAGE 593 TAX MAP PARCEL 318.8-1-47
LANDS NOW OR FORMERLY CITY OF UTICA LIBER 2812 PAGE 540 TAX MAP PARCEL 318.8-1-43
LANDS NOW OR FORMERLY CITY OF UTICA LIBER 2650 PAGE 252 TAX MAP PARCEL 318.8-1-46
LANDS NOW OR FORMERLY CITY OF UTICA LIBER 2639 PAGE 541 TAX MAP PARCEL 318.8-1-42
LANDS NOW OR FORMERLY THE BOILERMAKER ROAD RACE, INC. BOOK 2842 PAGE 642 TAX MAP PARCEL 318.8-1-41
LANDS NOW OR FORMERLY CITY OF UTICA INSTRUMENT # 2007-001046 TAX MAP PARCEL 318.8-1-45
LANDS NOW OR FORMERLY CITY OF UTICA LIBER 2639 PAGE 541 TAX MAP PARCEL 318.8-1-44
BENCHMARK: "x" CUT SOUTH EAST LP BOLT ELEVATION=411.91'
DIVISION STREET
PAVEMENT
GRASS
CONC. SIDEWALK
CONC. CURB
CONC. SIDEWALK
GRAN. CURB
GRAN. CURB
CONC.
CONC. SIDEWALK
CONC. SIDEWALK
PAVM'T.
FOUND. REMAINS
FOUND. REMAINS
FOUND. REMAINS
LI36 NM1 ABAND.
LI36 NM1 ABAND.
OHW
W
G
UE
ST
GV
8"
8"
6"
6"
3"



PRECISION ENVIRONMENTAL SERVICES, INC.
831 RT. 67,LOT 38A
BALLSTON SPA, NY 12020
TEL: 518-885-4399
FAX: 518-885-4416
CERTIFIED WOMEN-OWNED BUSINESS ENTERPRISE

EXCAVATION CELL/SOIL BORING LOCATION/ID MAP

26-28 Whitesboro Street

PROJECT #: B-00063	
LOCATION: 26-28 Whitesboro Street, Utica, NY	
DATE: 6/18	**REVISED BY:** JJJ
FIGURE: 3	**SCALE:** see below

LEGEND

- SB-1 — SOIL BORING
- EXCAVATION CELL

LEGEND

- SITE BOUNDARY
- UTILITY – WATER UNDERGROUND
- UTILITY – ELECTRIC UNDERGROUND
- UTILITY – SEWER
- GAS — UTILITY – GAS UNDERGROUND

- *Utility Water Underground*
- *Utility Electric Underground*
- *Utility Sewer Underground*
- Gas — *Utility Gas Underground*

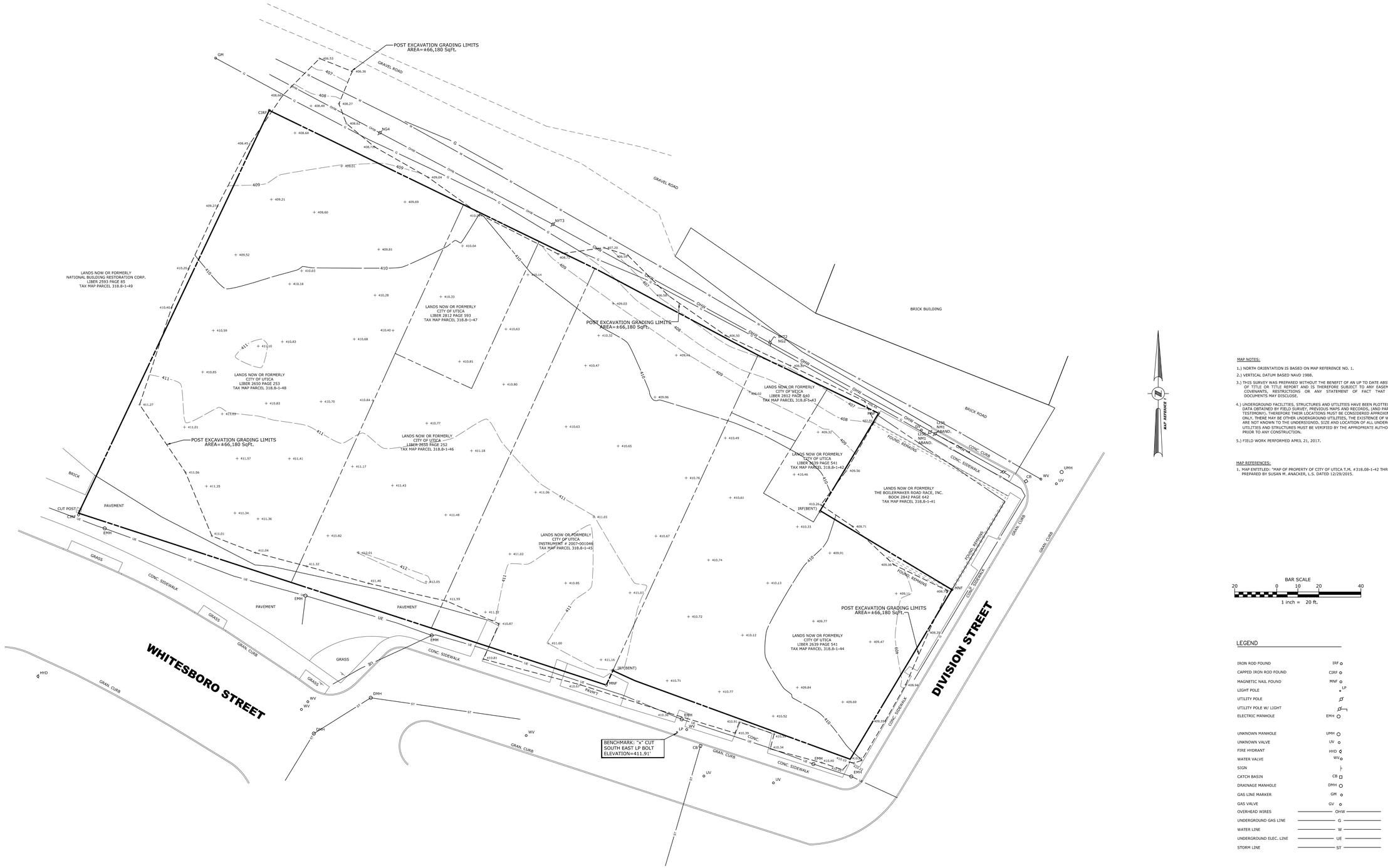
NOTES:

- BASE MAP SOURCE: Duirka & Bartillucci (2009)
- ALL LOCATIONS ARE APPROXIMATE

XREFS: NONE

PROJECT NUMBER: 17.7234

CAD DWG. FILE NAME: CTM NYSDEC SITE #B00063 Post Excav.dwg



MAP NOTES:

1.) NORTH ORIENTATION IS BASED ON MAP REFERENCE NO. 1.

2.) VERTICAL DATUM BASED NAVD 1988.

3.) THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN UP TO DATE ABSTRACT OF TITLE OR TITLE REPORT AND IS THEREFORE SUBJECT TO ANY EASEMENTS, COVENANTS, RESTRICTIONS OR ANY STATEMENT OF FACT THAT SUCH DOCUMENTS MAY DISCLOSE.

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5.) FIELD WORK PERFORMED APRIL 21, 2017.

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BAR SCALE

20 0 10 20 40

1 inch = 20 ft.

LEGEND

IRON ROD FOUND	IRF
CAPPED IRON ROD FOUND	CIRF
MAGNETIC NAIL FOUND	MNF
LIGHT POLE	LP
UTILITY POLE	
UTILITY POLE W/ LIGHT	
ELECTRIC MANHOLE	EMH
UNKNOWN MANHOLE	UMH
UNKNOWN VALVE	UV
FIRE HYDRANT	HYD
WATER VALVE	WV
SIGN	
CATCH BASIN	CB
DRAINAGE MANHOLE	DMH
GAS LINE MARKER	GM
GAS VALVE	GV
OVERHEAD WIRES	OHW
UNDERGROUND GAS LINE	G
WATER LINE	W
UNDERGROUND ELEC. LINE	UE
STORM LINE	ST

"ONLY COPIES OF THIS MAP SIGNED IN RED INK AND EMBOSSED WITH THE SEAL OF AN OFFICER OF C.T. MALE ASSOCIATES OR A DESIGNATED REPRESENTATIVE SHALL BE CONSIDERED TO BE A VALID TRUE COPY".

DAVID J. UHRINEC, PLS
P.L.S. NO. 050052

STATE OF NEW YORK
DAVID JOSEPH UHRINEC
050052
LICENSED LAND SURVEYOR

DATE		REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW.

© 2017
C.T. MALE ASSOCIATES

APPROVED: dju
DRAFTED : dju
CHECKED : dju
PROJ. NO : 17.7234
SCALE : 1"=20'
DATE : 06/29/17

POST EXCAVATION SURVEY
NYSDEC SITE #B00063

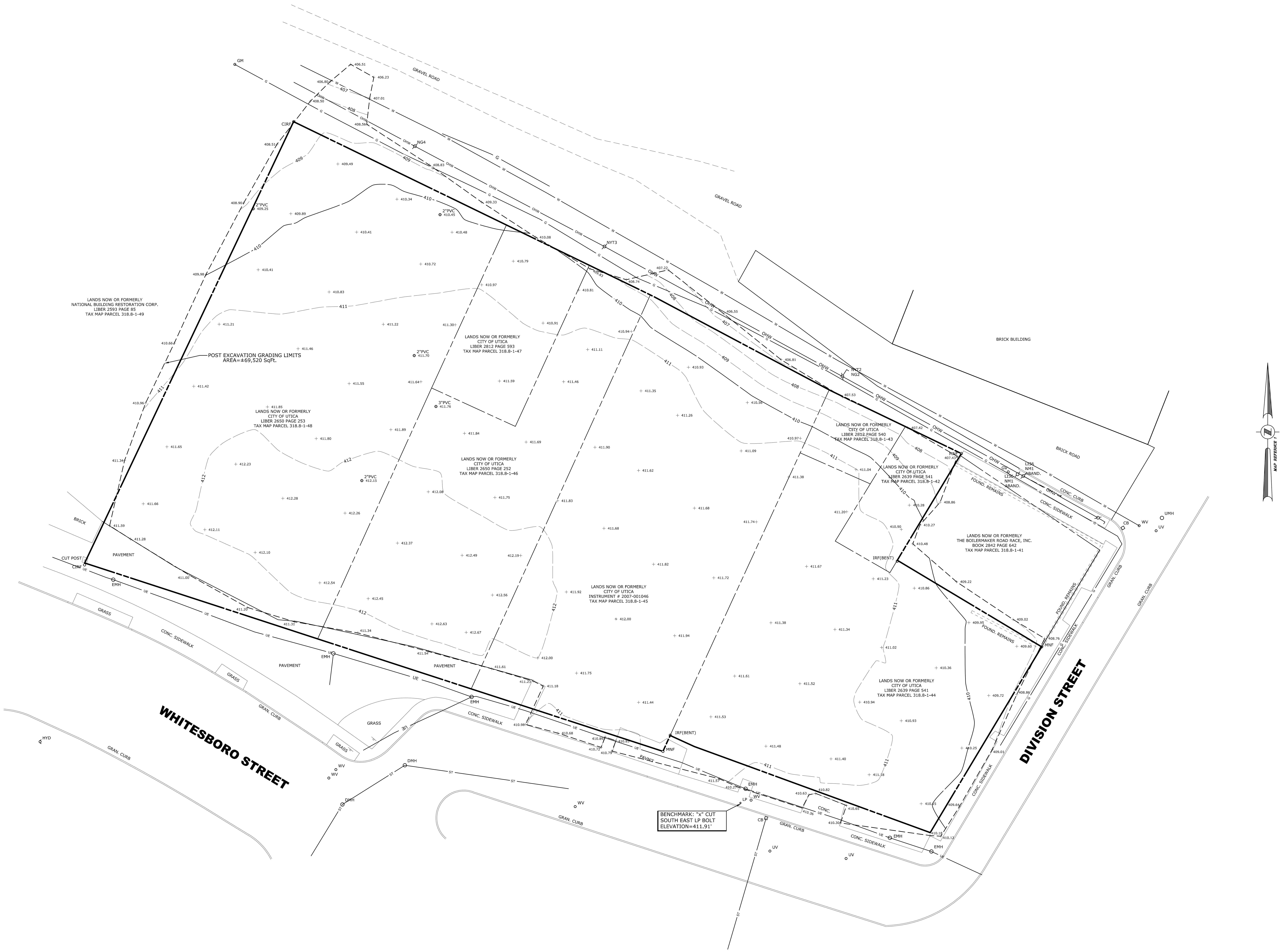
WHITESBORO AND DIVISION STREETS, UTICA NEW YORK

CITY OF UTICA — ONEIDA COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture & Landscape Architecture, D.P.C.
200 GATEWAY PARK DRIVE, BLDG. C, P.O. BOX 3246
SYRACUSE, NY 13220-3246
315.458.6498 * FAX 315.458.4427

SHEET 1 OF 1

DWG. NO: 17-0393



MAP NOTES:

1.) NORTH ORIENTATION IS BASED ON MAP REFERENCE NO. 1.

2.) VERTICAL DATUM BASED NAVD 1988.

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5.) FIELD WORK PERFORMED JULY 12, 2017.

MAP REFERENCES:

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BAR SCALE

20 0 10 20 40

1 inch = 20 ft.

LEGEND

IRON ROD FOUND	IRF
CAPPED IRON ROD FOUND	CIRF
MAGNETIC NAIL FOUND	MNF
LIGHT POLE	LP
UTILITY POLE	
UTILITY POLE W/ LIGHT	
ELECTRIC MANHOLE	EMH
UNKNOWN MANHOLE	UMH
UNKNOWN VALVE	UV
FIRE HYDRANT	HYD
WATER VALVE	WV
SIGN	
CATCH BASIN	CB
DRAINAGE MANHOLE	DMH
GAS LINE MARKER	GM
GAS VALVE	GV
OVERHEAD WIRES	OHW
UNDERGROUND GAS LINE	G
WATER LINE	W
UNDERGROUND ELEC. LINE	UE
STORM LINE	ST

"ONLY COPIES OF THIS MAP SIGNED IN RED INK AND EMBOSSED WITH THE SEAL OF AN OFFICER OF C.T. MALE ASSOCIATES OR A DESIGNATED REPRESENTATIVE SHALL BE CONSIDERED TO BE A VALID TRUE COPY".

DAVID J. UHRINEC, PLS
P.L.S. NO. 050052

STATE OF NEW YORK — DAVID JOSEPH UHRINEC — 050052 — LICENSED LAND SURVEYOR

DATE		REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.
	1				
	2				
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	9				

APPROVED: dju
DRAFTED : dju
CHECKED : dju
PROJ. NO : 17.7234
SCALE : 1"=20'
DATE : 07/12/17

POST CAP SURVEY
NYSDEC SITE #B00063

WHITESBORO AND DIVISION STREETS, UTICA NEW YORK

CITY OF UTICA — ONEIDA COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture & Landscape Architecture, D.P.C.
200 GATEWAY PARK DRIVE, BLDG. C, P.O. BOX 3246
SYRACUSE, NY 13220-3246
315.458.6498 * FAX 315.458.4427

SHEET 1 OF 1
DWG. NO: 17-0416

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
City of Utica	(315) 792-0100 mayor@cityofutica.com
Mike Gutmann	(716) 923-1120 mike.gutmann@aecom.com
David Chiusano	(518) 402-9813 david.chiusano@dec.ny.gov
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APPENDIX C
BORING LOGS AND MONITORING WELL LOGS

Driller: Prospect Well Co
Inspector: S. Popting
Rig Type: IR A300
Drilling Method: Direct Push

Dvirka and Bartilucci Boring Log

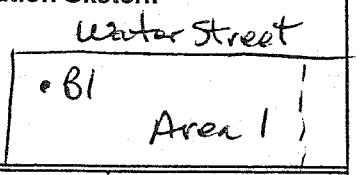
Project Name: Utica - Whitesboro
Project #: ~~1110~~ F109
Boring Depth: 12'

Boring ID: B1
Sheet 1 of 1
Location: NW corner site

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03 - 0925
Finish (Date & Time): 6/5/03 - 1020
Weather: Overcast, upper 60's F, rain
Elevation of Ground Surface:

Location Sketch:



Sample Interval	Sample No.	~~REC~~ Blows	PID (ppm)	Field Description	Well Schematic	Comments
0-2	0928	1.2	0	~~Fill~~ Dark Yellowish brown (10YR 4/2) SILT, some f-c sand, little clay, trace m-c gravel (subrounded) (moist) red brick at 1.9'		1" ø PVC riser
2-4	0942	0.2	0	brick and mortar, wood, glass and SILT	-2'	refusal at 2.1 ft, offset 2'SE
4-6	1007	0.1	0	Dusky yellowish brown (10YR 2/2) f-c SAND, some silt - brick (moist)		refusal at 4 ft, offset 2'SE
6-8	1010	1.0	0	same		collected sample WB-B1(6-8) VOCs, SVOCs, Pest, PCB, TAL, CN water at 8' bg
8-10	1015	1.2	0	Moderate brown (5YR 3/4) f-SAND, little silt, trace f-gravel (moist)		
				Moderate brown (5YR 3/4) f-c SAND little silt, trace f-gravel (wet)		1" ø PVC 10 slot screen
10-12	1018	0.6	0	same		NO sand or seal
				EOB at 12 ft bg, install flushmount	12'	

Soil Stratigraphy Summary

Driller: Parratt-Wolff
Inspector: S. Peplin
Rig Type: DR A300
Drilling Method: Direct push/3¼" HSA

Dvirka and Bartilucci Boring Log

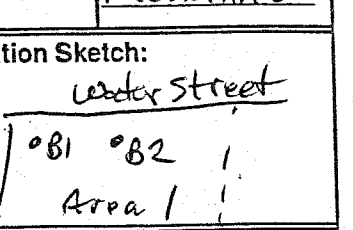
Project Name: White-Whiteshore
Project #: 1909
Boring Depth: 16

Boring ID: B2
Sheet 1 of 1
Location: N center Area 1

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03 - 1028
Finish (Date & Time): 6/5/03 - 1259
Weather: Overcast, mid 60°s F
rain
Elevation of Ground Surface: ____

Location Sketch:



Sample Interval	Sample No.	Rec Blows (ft)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1029	0.7	0	Grayish brown (5YR3/2) SILT, some f. sand, little clay, trace m. gravel (moist)		1" ø PVC riser
2-4	1032	0.9	0	redbrick at 1.9' redbrick (0.3' thick) wood (0.3' thick) Grayish brown (5YR3/2) SILT and f.c SAND (moist)		refusal @ 4.2' concrete offset 2', refusal @ 4.7' concrete offset, east
4-6	1111	0.4	0	brick-red concrete		
6-8	1113	0.9	0	redbrick Grayish brown (5YR3/2) SILT, some f. sand), little clay (moist)	6'	- slight petroleum like odor Sample WB-B2(6-8) collected for VOC, SVOC, Pest/PCB, TAL, CN
8-10	1117	0.3	0	Same		refusal at 9.6' offset to N, refusal at 3 ft on 3 attempts used 5' solid stem to 5', switched to HSA and augered to 8 ft through concrete
10-12	1242	1.6	0	Dusky brown (5YR2/2) SILT, some f.c Sand), little clay (moist)		
				- wet at 11.5'		
12-14	1245	1.5	0	Moderate brown (5YR4/4) f.c SAND, little SILT (wet)		1" ø PVC 10 slot screen
14-16	1250	1.1	0	Same		No sand or seal
					16'	
				EOB at 16 ft bg, Install 1-inch PVC well, 10 ft 10-slot		

Soil Stratigraphy Summary ____

d&b boring log GG version.xls

Driller: Parratt-Wolff
Inspector: S. Perling
Rig Type: IR A300
Drilling Method: 2" direct push

Dvirka and Bartilucci Boring Log

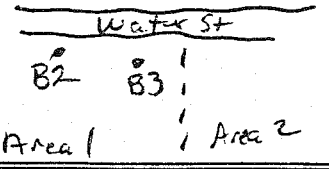
Project Name: Utica-Whitesboro St.
Project #: 1904
Boring Depth: 14'

Boring ID: B3
Sheet 1 of 1
Location: NE corner Area 1

	Groundwater Observations		
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/6/03 - 1126
Finish (Date & Time): 6/6/03 - 1150
Weather: Overcast, low 60°s F
Elevation of Ground Surface: _____

Location Sketch:



Sample Interval	Sample No.	Rec (ft) Blows (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0				grass		
0-2	1129	1.0	0	Moderate brown (5YR 3/4) SILT, some f-m sand (moist)		
1						
2				red brick		
2-4	1132	NR	NM	No recovery		1" ø PVC Riser No sand or seal
3						
4					4'	
4-6	1135	1.2	0	Dusky yellowish brown (10YR 2/2) SILT, some f-c Sand, little f-c gravel, trace coal (moist)		collected sample WB-B3(4-6) for VOCs, SVOCs, Pest, PCB, TAL, CN
5						
6						
6-8	1142	0.3	0	Dusky yellowish brown (10YR 2/2) SILT, little f-c sand (moist)		re-sand at 6', HS 4 to 6.5'
7						
8						
8-10	1144	1.2	0	Same Blackish red (5R 2/2) Peat Olive gray (5Y 4/1) SILT and CLAY (moist)		1-in ø PVC 10 slot screen
9						
10						
10-12	1146	1.5	0	Olive Black (5Y 2/1) SILT, some clay, trace f-m sand (wet)		water at 10' bg
11						
12						
12-14	1148	1.8	0	same		
13						
14						14'
				EOB at 14 ft bg, install 1-in ø PVC well		
15						

Soil Stratigraphy Summary _____

Driller: Parratt-Wolff
Inspector: S. Pepling
Rig Type: IRA300
Drilling Method: direct push

Dvirka and Bartilucci Boring Log

Project Name: Utica Whitesboro Street
Project #: 1909
Boring Depth: 14'

Boring ID: B4
Sheet 1 of 1
Location: center Southwest side Area

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03-1542
Finish (Date & Time): 6/5/03-1614
Weather: Overcast, drizzle 60's F, rain
Elevation of Ground Surface: _____

Location Sketch: Water Street
N
B1 B2 B4 B5 B7 Road

Sample Interval	Sample No.	Rec Blows (Feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1543	0.3	0	grass Grayish brown (5YR 5/2) SILT, some f. sand (moist), gravel fragment in nose		1" ø PVC riser no sand or seal
2-4	1548	0.9	0	Same red brick		refusal at 3 ft, offset refusal at 3 ft, HSA to 8 ft bgs very tough
8-10	1606	0.4	0	Dark yellowish brown (10YR 4/2) f. m SAND, some Silt, trace f. gravel (moist)	4'	collected sample WB-B4 (8-10) Semivols, SVOCs, Pest, PCB, TAL, CN - 14 oz Jar
10-12	1608	0.2	0	Same (wet)		1" ø PVC 10 slot screen - water at 10' bgs
12-14	1610	1.8	0	Same		
				EOB at 14 ft bgs, install 1-in ø PVC well ~~tie~~ 10 ft screen, 10 slot	14'	

Soil Stratigraphy Summary _____

Driller: Parratt-Wolff
Inspector: S. Peplis
Rig Type: IR A300
Drilling Method: direct push/3¼ in HSA

Dvirka and Bartilucci Boring Log

Project Name: Whitesboro
Project #: 1909
Boring Depth: 14

Boring ID: B-5
Sheet 1 of 1
Location: center Area 1

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03 · 1416
Finish (Date & Time): 6/5/03 - 1505
Weather: Overcast, upper 60's F, rain
Elevation of Ground Surface: ____

Location Sketch: Water Street
B1 B2 B3 Area 1

	Sample Interval	Sample No.	REC (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0	0-2	1418	1.1	0	Grayish brown (5YR3/2) SILT and f. SAND (moist) cinders, red brick (1-2')		
1							
2	2-4	1421	0.2	0	Red brick and gravel Congmerate,	1" ϕ PVC riser	no sand or seal
3							
4	4-6	1426	0.4	0	Red bricks, cinders, and gravel	4'	refusal @ 4' used HSA to auger to 6', seems clean
5							
6	6-8	1438	0.2	0	Grayish brown (5YR3/2) SILT, some f. Sand, trace f. gravel (moist)	1" ϕ PVC 10 slot screen	
7							
8	8-10	1445	0.9	0	Moderate brown (5YR 4/4) f. SAND, little fine gravel, little silt (moist)		collected sample WB-B5 (8-10) for VOCs, SVOCs, Pest/PCB, TAL-CU
9							
10	10-12	1448	1.4	0	same (wet)		
11							no sand or seal
12	12-14	1450	1.0	0	same		
13							
14					EOB at 14 ft bg. Install 1-in ϕ PVC well, 10 ft. 10 slot		14'
15							

Soil Stratigraphy Summary ____

Driller: Pacratt. Wolfe
Inspector: S. Pepling
Rig Type: IR A300
Drilling Method: direct push

Dvirka and Bartilucci Boring Log

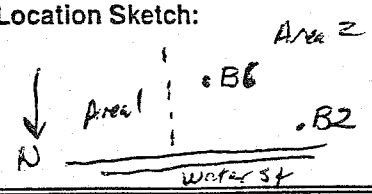
Project Name: Utica-Whitesboro Street
Project #: 1909
Boring Depth: 14'

Boring ID: B6
Sheet 1 of 1
Location: E center side Area 1

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/6/03 - 0832
Finish (Date & Time): 6/6/03 - 1100
Weather: Overcast, upper 50's F
Elevation of Ground Surface: _____

Location Sketch:



Sample Interval	Sample No.	Rec Blows (feet)	PID (ppm)	Field Description	Well Schematic	Comments
				grass		
0-2	1034	0.6	0	Grayish brown (5YR 3/2) SILT, some f-c Sand, trace f. mg gravel (moist)		
				red brick		1" Ø PVC Riser
2-4	1037	0.7	0	red brick		#30 sand or Seal
4-6	1040	0.6	0	red brick and mortar	4'	
				wood		
6-8	1044	0.1	0	Concrete (0.2' thick) concrete (0.1' thick)		
8-10	1047	0.2	0	Moderate brown (5YR 3/4) SILT, some f-m Sand, trace f. c gravel, trace brick (moist)		collected sample WB-B6 (8-10) for VOCs, SVOCs, Pest, PCB, TAL, CN 8 oz jar
10-12	1050	0.3	0	Sand (wet)		water at 10' bg
12-14	1055	0.9	0	Moderate brown (5YR 3/4) f. c SAND some silt, trace f. m gravel (wet)		1" Ø PVC 10 slot screen
				EOB at 14 ft bg, install 1-in Ø PVC well	14'	

Soil Stratigraphy Summary _____

Driller: Parratt-Wolff
Inspector: S. Popling
Rig Type: IR A300
Drilling Method: direct push

Dvirka and Bartilucci Boring Log

Project Name: Utica-Whitesboro Street
Project #: 1909
Boring Depth: 14

Boring ID: B7
Sheet 1 of 1
Location: Mid-South Center Area

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03 - 1510
Finish (Date & Time): 6/5/03 - 1535
Weather: Overcast, upper 60°F, rain
Elevation of Ground Surface: ____

Location Sketch: Center St
B1 B2
B5
B7

Sample Interval	Sample No.	Blows		Field Description	Well Schematic	Comments
0-2	1512	0.4	0	Dark yellowish brown (10YR 4/2) SILT and f. sand (moist)		
2-4	1513	1.1	0	Brick (red)	1-in Ø PVC riser	
4-6	1515	0.1	0	brick	4'	Novasand or seal
6-8	1520	0.9	0	brick Moderate brown (5YR 3/4) f. SAND, some silt, little f. m. gravel (moist)		Collect sample B7 (6-8) for VOC, SVOC, Pest, PCB, TAL, CN
8-10	1524	0.8	0	Dark yellowish brown (10YR 4/2) f.-m. SAND, little silt, little f.-m. gravel (wet)		water @ 8.5'
10-12	1526	0.4	0	Same		
12-14	1530	0.7		Same	1' Ø PVC 10 slot screen	
				grayish red (10R 4/2) SILT and CLAY, trace f. gravel (moist)		
				EOB at 14 ft bg, install 1-in Ø PVC well 10 ft screen, 10 slot.	14'	

Soil Stratigraphy Summary ____

Driller: Parratt-Wolff
Inspector: S. Pooling
Rig Type: IR-A300
Drilling Method: Direct Push

Dvirka and Bartilucci Boring Log

Project Name: Utica-Whitesboro St.
Project #: 1909
Boring Depth: 14'

Boring ID: B8
Sheet 1 of 1
Location: SW corner Area 1

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03-1627
Finish (Date & Time): 6/5/03-1648
Weather: Overcast, upper 60°F, rain
Elevation of Ground Surface: ____

Location Sketch: Water St
N
B-8
Whitesboro

Sample Interval	Sample No.	Rec Blows (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-1	1629	0.7	0	grass Grayish brown (5YR 3/2) SILT, some clay, little f.c sand (moist)		
2-4	1632	1.0	0	same		1" Ø PVC riser no sand or seal
4-6	1635	0.4	0	Moderate brown (5YR 3/4) f. SAND, some silt, trace fine gravel (moist)	4'	collected soil sample WB-B8(2-4) for VOCs, SVOCs, pest, PCB, TAL, CN
6-8	1637	0.4	0	same		1" Ø PVC 10 slot screen
8-10	1639	0.4	0	same (wet)		water at 8.5 ft bg
10-12	1641	0.7	0	same		
12-14	1644	1.1	0	same		
				Greyish Red (10R 4/2) SILT and CLAY, trace c sand (very compact) (moist)		14'
				EOB at 14 ft bg, install 1-in Ø PVC well, 10ft 10slot screen		

Soil Stratigraphy Summary

Driller: Parratt-Wolff
Inspector: S. Pepling
Rig Type: IR A300
Drilling Method: direct push

Dvirka and Bartilucci Boring Log

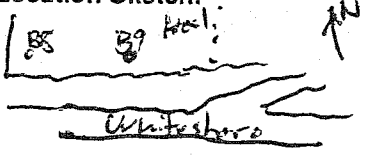
Project Name: Utica Whitesboro St.
Project #: 1909
Boring Depth: 14'

Boring ID: B9
Sheet 1 of 1
Location: South center Area 1

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/4/03 - 0800
Finish (Date & Time): 6/4/03 - 0824
Weather: Overcast, upper 50's F
Elevation of Ground Surface: _____

Location Sketch:



Sample Interval	Sample No.	Rec Blows (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0				grass		
0-2	0802	1.4	0	Black (N1) SILT and f. SAND, trace f. gravel (moist		
1						
				Moderate yellowish brown (10YR 5/4) f. SAND, little silt (moist)		1" ϕ PVC riser
2						
2-4	0804	0.3	0	same		no sand or seal
3						
4					4'	
4-6	0806	0.5	0	Moderate yellowish brown (10YR 5/4) SILT and f. SAND (moist)		1" ϕ PVC 10 slot screen
5						
6						
6-8	0810	0.9	0	Moderate brown (5YR 3/4) f. SAND, little silt (moist)		Collected sample WB-B9(6-8) for VOCs, SVOCs, Pest, PCB, TAL (N)
7						
8						- water at 8.5' bg
8-10	0812	0.9	0	same - becomes (wet) at 8.5' bg		
9						
10						
10-12	0815	2.0	0	same		
11						
				-11.5 - becomes and SILT		
12						
12-14	0818	2.0	0	same		
13						
				Black (5Y 2/1) SILT and CLAY, trace f. gravel (moist)		
14						14'
				EOB at 14 ft bg, install 1-in ϕ PVC well		
15						

Soil Stratigraphy Summary _____

Driller: Parratt-Wolff
Inspector: S. Perdue
Rig Type: IR A300
Drilling Method: direct push

Dvirka and Bartilucci Boring Log

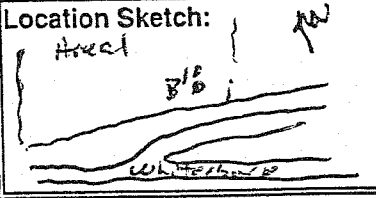
Project Name: Utica-Whitesboro Street
Project #: 1909
Boring Depth: 14'

Boring ID: B10
Sheet 1 of 1
Location: Southeast corner lawn

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/6/08-0825
Finish (Date & Time): 6/6/08-0850
Weather: Overcast, upper 50's F
Elevation of Ground Surface: _____

Location Sketch:



Sample Interval	Sample No.	Rec ~~Blows~~ (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	0830	0.6	0	grass Grayish black (N2) SILT and fine GRAVEL, some f. c sand (moist)		
2-4	0832	1.2	0	Moderate brown (5YR3/4) SILT, some clay, little f. m sand, trace f-m gravel (moist) trace red brick	1" Ø PVC Riser #0 sand or Seal	
4-6	0835	0.6	0	Moderate brown (5YR3/4) f. c SAND and SILT, trace f-m gravel (moist)	4'	
6-8	0837	0.8	0	same		collected sample WB-B10 (6-8) for VOCs, SVOCs, Pest, PCB, TAL, CN
8-10	0839	0.7	0	Moderate brown (5YR4/4) f. c SAND little silt, little f. c gravel (moist)		
10-12	0842	0.1	0	gravel fragments		- water at 10' bg
12-14	0845	1.0	0	Dark yellowish brown (10YR4/2) f. SAND, some silt, trace f. gravel (wet).	1" Ø PVC 10 slot screen	
				EOB at 14' bg. install 1-in Ø PVC well	14'	

Soil Stratigraphy Summary _____

Driller: Parratt-Wolff
Inspector: S. Pepling
Rig Type: IR A300
Drilling Method: direct push

Dvirka and Bartilucci Boring Log

Project Name: Utica - Whitesboro St.
Project #: 1909
Boring Depth: 14'

Boring ID: B11
Sheet 1 of 1
Location: NE corner Area 2

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/6/03-0943
Finish (Date & Time): 6/6/03 1005
Weather: Overcast, upper 50°sF
Elevation of Ground Surface: _____

Location Sketch: Water St, BH, Area 2, Division

Sample Interval	Sample No.	Rec Blows (Feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	0945	1.5	0	grass Dark yellowish brown (5YR 3/2) SILT, little f-c Sand (moist) Red brick		1" Ø PVC riser
2-4	6952	0.8	0	Red brick Black (N1) f-c SAND, some silt, trace f. gravel (moist) w/ash		Collect sample WB-B11 (2-4) for VOCs, SVOCs, Pest, PCB, TAL, CN
4-6	0954	0.2	0	same.	4'	
6-8	0956	0.1	0	Grayish brown (5YR3/2) f-c SAND, some silt, trace f. gravel (wet)		1" Ø PVC 10 slot screen
8-10	0958	1.0	0	Moderate brown (5YR3/4) f-m SAND, some silt, trace fine gravel (wet)		water at 8' bg
10-12	1000	1.2	0	same		
12-14	1003	2.0	0	same Grayish Red (10R 4/2) SILT and CLAY, trace f. gravel (moist)		14'
				EOB at 14' bg, install 1-in Ø PVC well		

Soil Stratigraphy Summary _____

Driller: Parratt-Wolff
Inspector: S. Peeling
Rig Type: IR A300
Drilling Method: Direct push / HSA

Dvirka and Bartilucci Boring Log

Project Name: Utica-Whitesboro street
Project #: 1909
Boring Depth: 14'

Boring ID: B12
Sheet 1 of ___
Location: Southeast corner Area 2

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/6/03 - 0858
Finish (Date & Time): 6/6/03 - 0933
Weather: Overcast, upper 50's F
Elevation of Ground Surface: ___

Location Sketch: Area 2, B12, Driveway

Sample Interval	Sample No.	Rec ~~Blows~~ (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	0859	0.3	0	grass Red brick		1-in ϕ PVC Riser No sand, or seal
2-4	0901	1.2	0	Light olive grey (5Y6/1) f. SAND and SILT (quarter like) layers 0.02' thick w/ paper like separations (moist)		Photo
4-6	0905	0.7	0	Same ~~Depth~~ Grayish brown (5YR 3/2) SILT, some f-c sand; some red brick (moist)	4'	1-in ϕ PVC 10 slot screen
6-8	0918	0.1	0	red brick		- refusal at 6 ft 3¼ HSA to 6.5 ft
8-10	0920	1.2	0	Moderate brown (5YR 3/4) f-c SAND, some silt, trace f. gravel (wet)		- water at 8' collect sample MW-B12(8-10) Semivocs, SVOCs, Pest, PCB, TAL, CN
10-12	0926	1.0	0	Same		septic-like odor
12-14	0930	1.4	0	Same becomes black (N1)		
				Black, Lined (5R 2/2) SILT and CLAY, trace f. gravel (moist)		14'
				EOB at 14 ft bg, install 1-in ϕ PVC well		

Soil Stratigraphy Summary ___

Driller: Parratt-Wolff
Inspector: S. Pasling
Rig Type: IR 200
Drilling Method: 2-in ODSS direct push

Dvirka and Bartilucci Boring Log

Project Name: Utica-Whitesboro
Project #: 1909
Boring Depth: 10'

Boring ID : B14
Sheet 1 of ____
Location: 25 ft SW of B5

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/1/05-1319
Finish (Date & Time): 6/1/05-1345
Weather: ____
Elevation of Ground Surface: ____

Location Sketch:

Sample Interval	Sample No.	REC ~~Blows~~ (ft)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1320	1.4	0	Lt grey MxC GRAVEL, some f. sand, trace silt (dry)		
				red brick		
2-4	1322	0.2	0	same		
4-6	1328	0.4	0	same		
				DK brown to black silt and wood fragments (damp)		
6-8	1330	1.4	0	Red brick		collected B14(6-8) for VOC/SVOC
				Med brown f. SAND and SILT, trace f. gravel (damp) 0.1' thick layer of coal mixers		
8-10	1332	0.3	0	Red brick and SILT, some wood		collected B14(8-10) for VOC/SVOC 1-4oz
				wet at 9.8 ft bg		
				EOB at 10 ft bg		

Soil Stratigraphy Summary ____

Driller: Prevost-Wolff
Inspector: SPeoline
Rig Type: IR 200
Drilling Method: 4¼" in HSA/2-inch direct push

Dvirka and Bartilucci Boring Log

Project Name: Utica Watertown
Project #: 1909
Boring Depth: ~~11.0~~ 10.0

Boring ID : BL5
Sheet 1 of ___
Location: 25' W of B-5

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/1/05 1348
Finish (Date & Time): 6/1/05-1406
Weather: clear, warm 60°s F
Elevation of Ground Surface: ___

Location Sketch:

Sample Interval	Sample No.	REC Blows/6inch	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1350	1.8	0	MD-DK brown SILT, some f.m sand, trace f. gravel (dry) becomes black		
				Red brick		
2-4	1351	1.3	0	Red brick Black f. SAND, some f. gravel, some silt (dry)		collect sample BL5 (2-4) for VOCs and SVOCs
				MD-DK brown SILT, some f. sand, trace m. gravel (dry)		
4-6	1355	1.2	0	Same -becomes med brown -becomes (moist)		
6-8	1359	1.6	0	Med brown f.m SAND, some silt, trace f-m gravel (moist)		collected sample BL5 (6-8) for VOCs + SVOCs
8-10	1405	1.8	0	Same -wet at 9 ft bg		
				EOB at 10 ft bg		

Soil Stratigraphy Summary ___

Driller: Parratt-Wolff
Inspector: S. Popkin
Rig Type: IR 200
Drilling Method: 4¼ HSA/2-¼ ODSS

Dvirka and Bartilucci Boring Log

Project Name: Utica Whitesboro
Project #: 1909
Boring Depth: 10'

Boring ID: B17
Sheet 1 of ____
Location: 25 ft NW of B5

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/1/05-1450
Finish (Date & Time): 6/1/05-1517
Weather: Partly cloudy, 70°F
Elevation of Ground Surface: ____

Location Sketch:

Sample Interval	Sample No.	REC ~~Blows~~ (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1452	1.0	0	DK brown SILT, trace m. gravel (dry)		
				Lt grey f-c GRAVEL, trace f. sand (dry)		
1				Md-Lt brown f-m SAND, trace silt (dry)		
				Red brick		
2				Red brick		
2-4	1455	1.7	0	Black Silt and m-gravel (dry)		collected B17(2-4) for VOCs/SVOCs
3				Med brown SILT, some f. sand, trace m-gravel (damp)		
4						
4-6	1509	1.6	0	DK brown SILT, trace f sand (damp)		
				Red Brick		
5				Med brown SILT, some f. gravel, little f. sand (damp)		
6						
6-8	1511	1.7	0	Same		collected B17(6-8) for VOCs/SVOCs.
7						
8						
8-10	1512	0.3	0	Same		
9						
10				EOB @ 10 ft bg		
11						

Soil Stratigraphy Summary ____

Driller: Parratt-Wolff
Inspector: S. Pepling
Rig Type: IR 200
Drilling Method: 4¼ HSA/2-in OD SS direct push

Dvirka and Bartilucci Boring Log

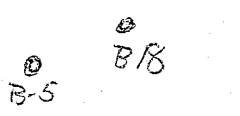
Project Name: Utica Waterfront
Project #: 1009
Boring Depth: _____

Boring ID: B18
Sheet 1 of ____
Location: 25 ft NW of B-5

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/1/05 - 1413
Finish (Date & Time): 6/1/05 - 1442
Weather: clear, warm 60°F
Elevation of Ground Surface: _____

Location Sketch:



Sample Interval	Sample No.	REC Blows (feet)	MD (feet)	Field Description	Well Schematic	Comments
0-2	1414	0.9	0	Med brown SILT, some f. Sand, trace m. gravel (dry)		
				Red brick		
2-4	1416	1.0	0	Med brown SILT, some f. Sand, trace f. gravel (damp)		
				Lt grey f. SAND and m. GRAVEL, trace silt (damp) - weathered concrete		
4-6	1428	1.2	0	DK brown to black SILT and f.-m. SAND, trace f.-m. gravel (damp)		collected B18(4-6) for VOCs + SVOCs
6-8	1430	0.9	0	Same w/ some coal fragments		
8-10	1432	1.0	0	Med brown f. SAND, some silt, trace f. gravel (moist)		collected B18(8-10) for VOCs + SVOCs
				-bec comes wet at 9.8'		
				EOB at 10 ft bg		

Soil Stratigraphy Summary _____

Driller: Parratt-Wolff
Inspector: S. Repling
Rig Type: ER A200
Drilling Method: 4 1/4 HSA

Dvirka and Bartilucci Boring Log

Project Name: Utica Whitesboro
Project #: 1909
Boring Depth: 14'

Boring ID: B3/MW
Sheet 1 of 1
Location: SW of B5 by 25'

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/1/05 1115
Finish (Date & Time): 6/1/05 1240
Weather: Clear, warm 60's F
Elevation of Ground Surface: _____

Location Sketch:

B5
MW1
existing 100,100

Sample Interval	Sample No.	REC Blows (ft)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1116	0.8	1.6	Grayish brown (5YR 3/2) SILT and f. SAND, trace f. gravel (dry-damp)		
2-4	1123	0.9	0	Red brick		2 3
4-6	1126	0.9	0	same		collected MW1 (4-6) for VOCs + SVOCs
6-8	1131	NR	0	Med brown SILT, some f. sand, trace f. gravel (damp)		
8-10	1133	0.7	0	Moderate brown (5YR 4/4) f. SAND, little f. gravel, little silt (moist)		collected MW1 (8-10) for VOCs + SVOCs
				-becomes wet at 9.8		
				EOB @ 14 ft bg install well		14.0

Soil Stratigraphy Summary _____

Dvirka and Bartilucci CONSULTING ENGINEERS
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Well Construction Log

Site Utica Whitesboro St Job No. 1909 Well No. MW-1

Total Depth 14 ft Surface Elevation _____ Top Riser Elevation _____

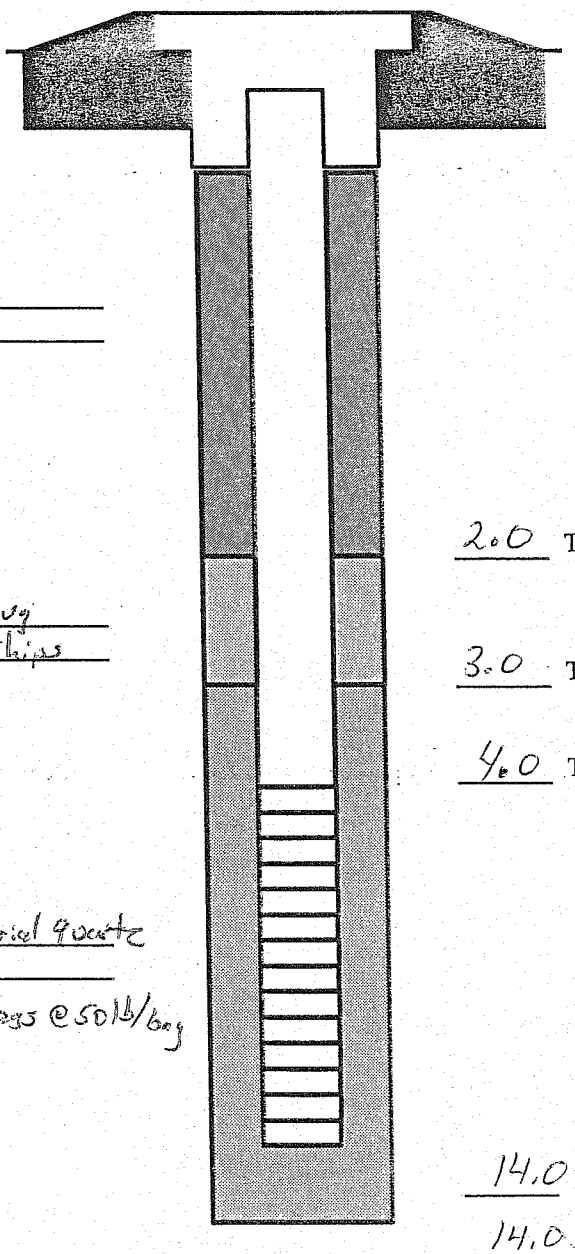
Water Levels (Depth, Date, Time) _____ Date Installed 6/1/05

Riser Dia. 2-in Material PVC Length 4 ft
Screen Dia. 2-in Material PVC Length 10 ft Slot Size 10

SCHEMATIC

Surface Seal Type _____

Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal



Grout Type _____

Seal Type Enviroplug
Medium Chips
1 bag

2.0 Top Seal

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial quartz
Size #1
6.5 bags @ 50lb/bag

14.0 Bottom Screen

14.0 Total Depth of Boring

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Well Construction Log

Site Utica Whitesboro St Job No. 1909 Well No. MW-2

Total Depth 14 Ft Surface Elevation _____ Top Riser Elevation _____

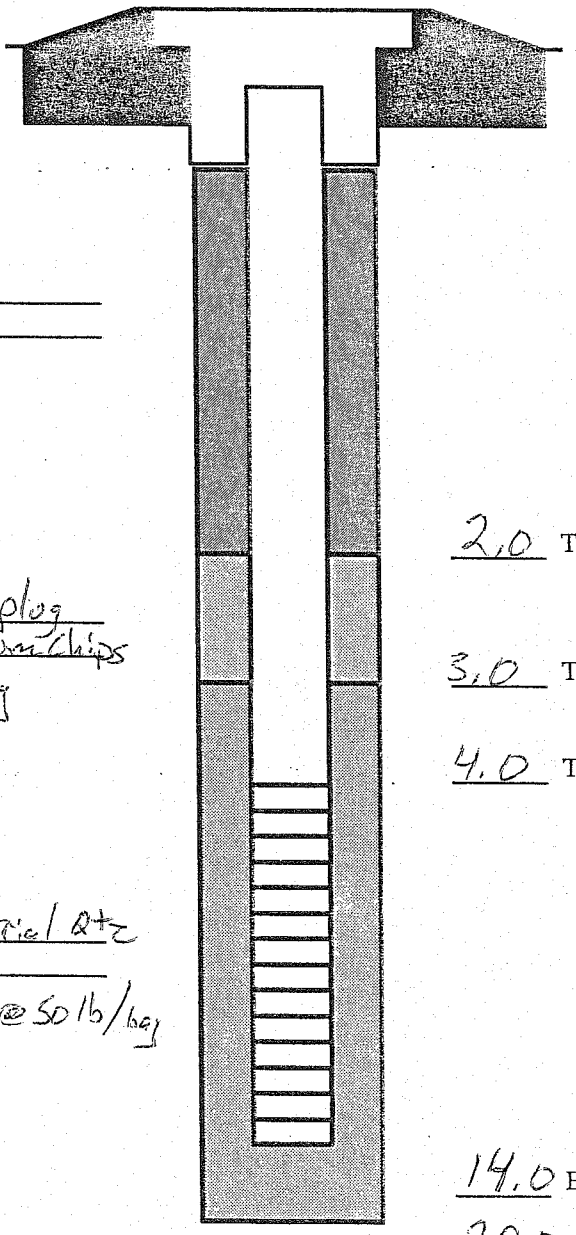
Water Levels (Depth, Date, Time) _____ Date Installed 6/1/05

Riser Dia. 2-in Material PVC Length 4 ft

Screen Dia. 2-in Material PVC Length 10 ft Slot Size 10

SCHEMATIC

Surface Seal Type
Concrete



Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal

Grout Type N.A

2.0 Top Seal

Seal Type Enviroplug medium chips
1 bag

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial Qtz
Size #1
6 bags @ 50 lb/bag

14.0 Bottom Screen

20.0 Total Depth of Boring

Driller: Parratt-Wolff
Inspector: S. Perkins
Rig Type: TR 200
Drilling Method: 4 1/4 HSA/2-in OD SS

Dvirka and Bartilucci Boring Log
Project Name: Utica-Whitesboro
Project #: 1909
Boring Depth: _____

Boring ID: B16/MW2
Sheet 1 of ____
Location: 25 ft NW of B5

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/1/05 - 1530
Finish (Date & Time): _____
Weather: clear, warm 60°s F
Elevation of Ground Surface: _____

Location Sketch:

Sample Interval	Sample No.	REC Blows (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1532	1.0	0	Mod brown SILT, trace m. gravel (dry) Redbrick		
2-4	1534	0.2	0	Red brick.		
4-6	1542	0.8	0	Dk brown f.-m SAND, some silt, little f.-c gravel (moist)		
6-8	1556	1.3	0.3	Lt grey f.-c GRAVEL and f.-c SAND, little silt (dry) weathered concrete		collect MW2 (6-8) for VOCs/SVOC
				Dark Brown f. SAND, some silt (moist)		
8-10	1558	0.9	0.1	Dark Brown f.-c SAND, some silt (moist)		collected MW2 (8-10) for VOCs/SVOCs
				wet at 9.5		
10-12	1605	0.8	0.0	Dark Brown f.-c SAND, some silt, trace m. gravel (wet)		
12-14	1610	0.8	0	Same		
14-16	1612	1.1	0	Same		
				becomes dark grey-brown		
16-18	1615	1.0	0	Same		
				~~Mod grey-brown SILT and CLAY, trace~~		
18-20	1618	2.0	0	Same		
				Mod grey brown SILT and CLAY, trace f.-c gravel (damp) (dense)		

Soil Stratigraphy Summary
EOB at 20' bg Install well

Driller: Parratt-Wolff
Inspector: S. Peeling
Rig Type: IR 200
Drilling Method: 4¼ HSA, 2-in OD SS direct push

Dvirka and Bartilucci Boring Log

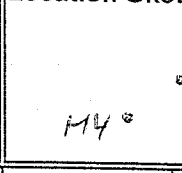
Project Name: Utica Whitesboro St.
Project #: 1909
Boring Depth: 14.0

Boring ID: MW3
Sheet 1 of 1
Location: SW of B1 NE of MW4

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/2/05-0910
Finish (Date & Time): 6/2/05-1053
Weather: Partly cloudy, 60's F
Elevation of Ground Surface: _____

Location Sketch:



Sample Interval	Sample No.	PID Blows (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	0914	0.5	0	Med brown SILT, little f.c sand, trace f. gravel (dry)		
2-4	0916	0.4	0	same, w/ red brick, wood		2.0
						3.0
4-6	0932	0.1	0			4.0 - 4-6' refusal at 4.1 - concrete
6-8	0945	0.9	0	Med brown f.c SAND, some silt, trace f.m gravel (damp)		collected MW3(6-8) for VOCs/SVOCs
8-10	0950	0.6	0	Med brown f.c SAND, some silt, little f.c gravel (wet)		- wet @ 8'
				EOB @ 14 ft. Install well.		14.0
						one sample only, due to poor recovery, lack of PID readings

Soil Stratigraphy Summary _____

Dvirka and Bartilucci CONSULTING ENGINEERS
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Well Construction Log

Site Hicca-Whitehorse St Job No. 1909 Well No. MW3

Total Depth 14.0 Surface Elevation _____ Top Riser Elevation _____

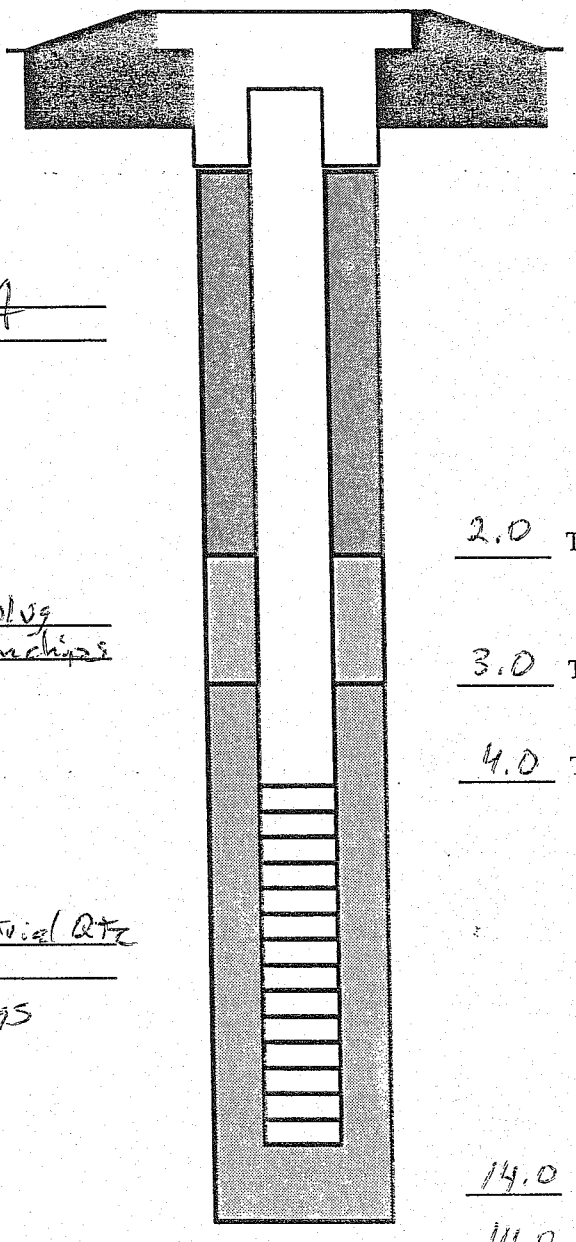
Water Levels (Depth, Date, Time) _____ Date Installed 6/2/05

Riser Dia. 2-in Material PVC Length 4 ft
Screen Dia. 2-in Material PVC Length 10 ft Slot Size 10

SCHEMATIC

Surface Seal Type Concrete flush mount

Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal



Grout Type NA

2.0 Top Seal

Seal Type Enviroplug Medium chips

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial Qtz
Size #1
6 bags

14.0 Bottom Screen

14.0 Total Depth of Boring

Driller: Parratt-Wolff
Inspector: Sean Replogle
Rig Type: IR 200
Drilling Method: 4 1/4 HSA · 2" ODSS direct push

Dvirka and Bartilucci Boring Log

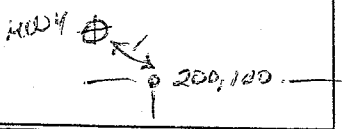
Project Name: Utica-Whitesboro St
Project #: 1909
Boring Depth: 14

Boring ID: MW4
Sheet 1 of 1
Location: NW of
grid 200,100

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/2/05 - 0730
Finish (Date & Time): 6/2/05 - 0900
Weather: Partly Cloudy, warm 60s
Elevation of Ground Surface: _____

Location Sketch:



Sample Interval	Sample No.	Rec Blows (per 6")	PID (ppm)	Field Description	Well Schematic	Comments
0-2	0730	0.8	0.3	Red brown SILT, trace f. gravel (dry)		
				Redbrick		
2-4	0733	0.9	0.7	Redbrick		2.0
						3.0
4-6	0735	1.1	3.1	DK brown to black SILT and f-c SAND, trace f-m Gravel (damp)		4.0 collect MW4 (4-6) for VOC/SVOC
6-8	0748	1.0	0	Red brown SILT, trace f. sand, trace f. gravel (damp-moist)		collect MW4 (6-8) for VOC/SVOC
8-10	0752	1.3	0	Same		
10-12	0808	1.2	0	Med brown f-c SAND, some silt, little f-c gravel (wet)		
				EOB @ 14 ft bg, install well		14

Soil Stratigraphy Summary _____

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Well Construction Log

Site Utica Whitesboro Street Job No. 1909 Well No. MW4

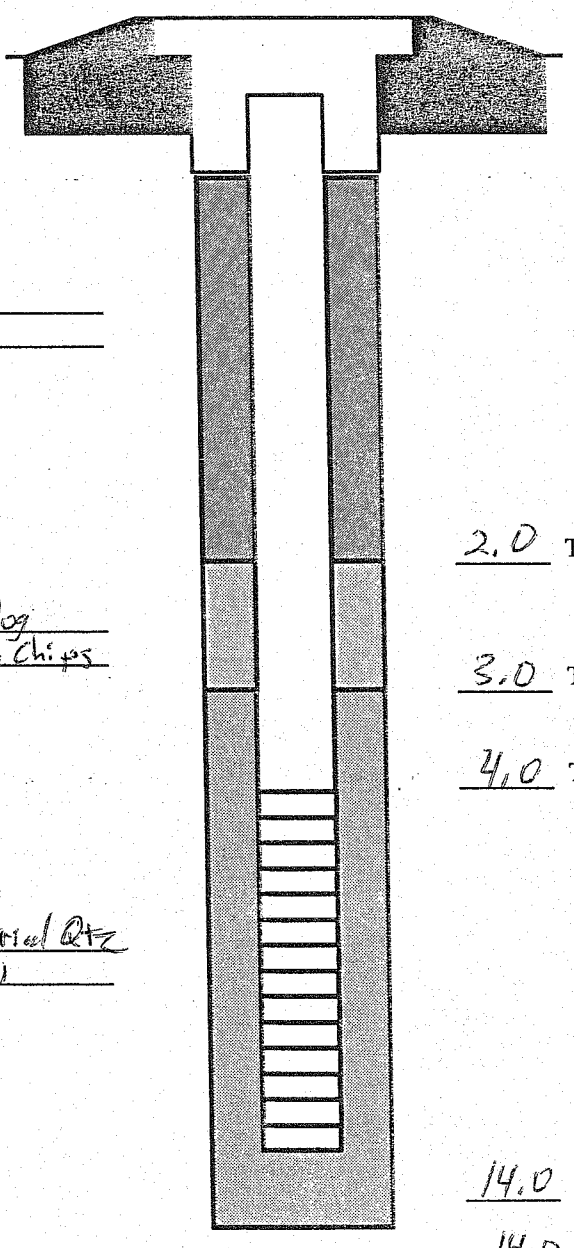
Total Depth 14.0 Surface Elevation _____ Top Riser Elevation _____

Water Levels (Depth, Date, Time) _____ Date Installed 6/2/05

Riser Dia. 2-in Material PVC Length 4 Ft
Screen Dia. 2-in Material PVC Length 10 ft Slot Size 10

SCHEMATIC

Surface Seal Type Concrete Flush mount



Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal

Grout Type NA

2.0 Top Seal

Seal Type Enviroplug Medium Chips

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial Qtz
Size #1
6 bags

14.0 Bottom Screen

14.0 Total Depth of Boring

Driller: Powell-Wolff
Inspector: S. Peeling
Rig Type: IR 200
Drilling Method: 4¼ HSA/2-in OD SS direct push

Dvirka and Bartilucci Boring Log

Project Name: Utica - Whitesboro St
Project #: 1909
Boring Depth: 14'

Boring ID : MW5
Sheet 1 of 1
Location:

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/2/05 - 1350
Finish (Date & Time): 6/2/05 - 1533
Weather: Partly cloudy 70°F
Elevation of Ground Surface:

Location Sketch:
MW6 o MW5
~~Water Tower~~ St

	Sample Interval	Sample No.	~~REC Blows~~ (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0	~~0-2 DS~~						
1							
2							2.0
3							3.0
4	4-6	1404	0.5	0	Red brown f. SAND and SILT, trace f. gravel (damp)		4.0
5							
6	6-8	1407	1.4	0	DK grey/brown SILT, some clay, trace f.-m gravel (moist)		
7							
8	8-10	1428	1.4	0	DK brown SILT, little clay (moist), organic		
9					Med brown f.-m SAND, some silt, trace f. gravel (wet)		- wet @ 9' bg
10							
11							
12							
13							
14							14.0
15					EOB @ 14 ft install well		
16							
17							
18							
19							
20							

Soil Stratigraphy Summary

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Well Construction Log

Site Utica Whitesboro St Job No. 1909 Well No. HW5

Total Depth _____ Surface Elevation _____ Top Riser Elevation _____

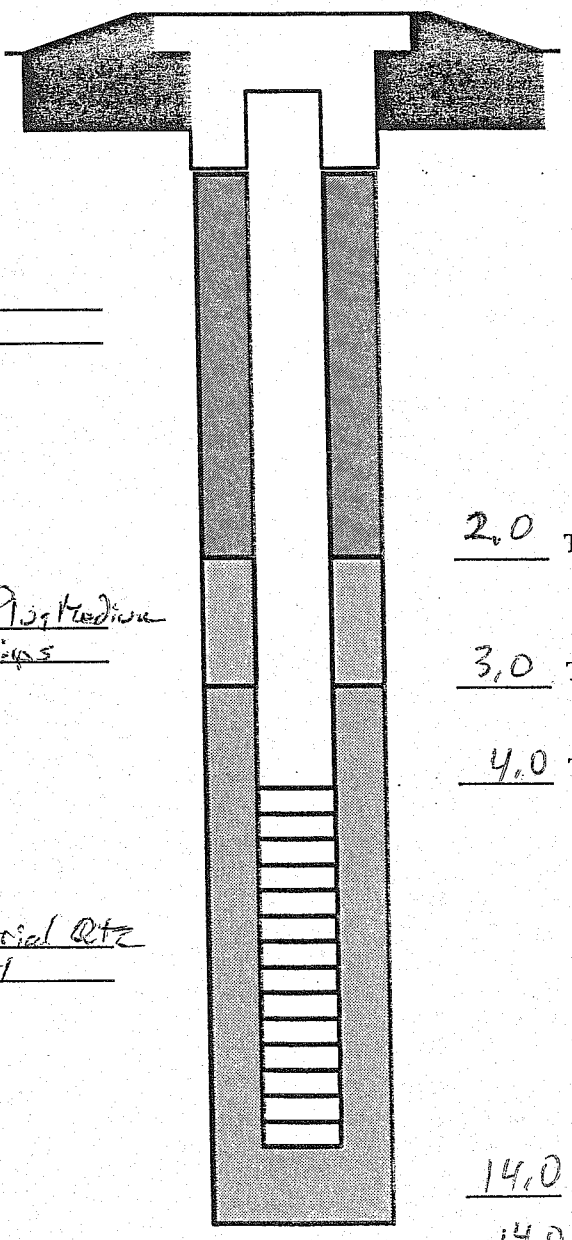
Water Levels (Depth, Date, Time) _____ Date Installed 6/2/05

Riser Dia. 2-in Material PVC Length 4 ft
Screen Dia. 2-in Material PVC Length 10 ft Slot Size 10

SCHEMATIC

Surface Seal Type
Concrete
Flushmount

Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal



Grout Type N/A

2.0 Top Seal

Seal Type Enviroplug Medium Chips

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial Qtz
Size #1

14.0 Bottom Screen

14.0 Total Depth of Boring

Driller: Parratt-Wolff
Inspector: S. Pepling
Rig Type: IR 200
Drilling Method: 4¼ HSA 2-in. OD SS

Dvirka and Bartilucci Boring Log

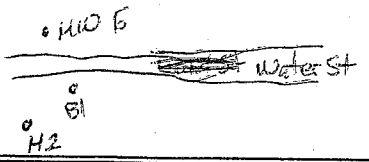
Project Name: Utica-Whitesboro St
Project #: 1909
Boring Depth: 14.0

Boring ID : MW6
Sheet 1 of 1
Location: NW of B1

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/2/05 - 1100
Finish (Date & Time): 6/2/05 - 1325
Weather: Partly Cloudy, warm 70°s F
Elevation of Ground Surface: _____

Location Sketch:



Sample Interval	Sample No.	REC ~~Blows~~ (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1102	2.0	0	DK brown to black, SILT, little f-c sand, little f-c gravel, coal (dry)		
				Med brown f-m SAND, little silt (dam)		
2-4	1104	0.9	0	Med-DK brown-grey SILT and CLAY (dam)		2.0
						3.0
4-6	1112	2.0	0	same		4.0
				DK brown to black f-m SAND and silt, (dam)		- petroleum-like odor begin ~5 ft bg
6-8	1115	2.0	2.4			collected MW6(6-8) for VOC/SVOC
				DK brown f-c SAND, some silt (moist)		
			53.1	wet at 7.5'		- water @ 7.5'
8-10	1120	1.1	29.1	same		petroleum-like odor
			49.0			"
10-12	1130	0.7	2.3	DK brown SILT, some clay, little f. sand (wet)		
12-14	1132	1.4	0	DK brown f-m SAND, little silt (wet)		slight petroleum-like odor
				EOB @ 14 ft bg		14.0
				Install well.		

Soil Stratigraphy Summary _____

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Well Construction Log

Site Utica - Whitesboro St Job No. 1909 Well No. MW6

Total Depth 14.0 Surface Elevation _____ Top Riser Elevation _____

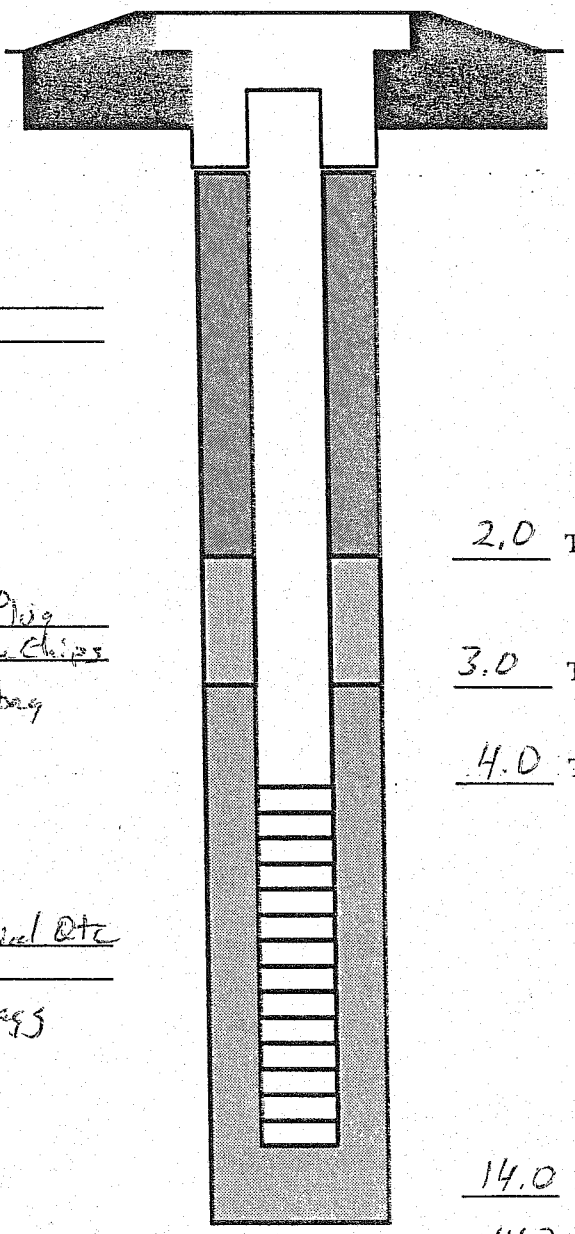
Water Levels (Depth, Date, Time) _____ Date Installed 6/2/05

Riser Dia. 2-in Material PVC Length 4 ft
Screen Dia. 2-in Material PVC Length 10 ft Slot Size #10

SCHEMATIC

Surface Seal Type Concrete flushmount

Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal



Grout Type NA

2.0 Top Seal

Seal Type EnviroPlug medium chips 1/2 bag

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial Qtz
Size #1
6 bags

14.0 Bottom Screen

14.0 Total Depth of Boring

Driler: Parratt Wolff
Inspector: S. Pepling
Rig Type: IR 200
Drilling Method: 4 1/4 HSA, 2" OD SS direct push

Dvirka and Bartilucci Boring Log

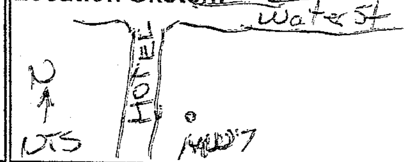
Project Name: Utica-Whitesboro St
Project #: 1909
Boring Depth: 14.0

Boring ID : MW 7
Sheet 1 of 1
Location: E side of Hotel Street

	Groundwater Observations		
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/2/05 - 1540
Finish (Date & Time):
Weather: Partly cloudy, 70°F
Elevation of Ground Surface:

Location Sketch:



Depth	Sample Interval	Sample No.	REC (feet)	PID (ppm)	Field Description	Well Schematic	Comments
0	0-2	1542	1.5	0	DK brown to black SILT and f-m SAND, some f-m Gravel (dry) (coal)		
1							
2	2-4	1544	0.7	0	Med Brown SILT, little f-c sand, trace f gravel, trace clay, brick (damp)		2.0
3							3.0
4	4-6	1548	1.2	0	Same		4.0
5					Med brown f-c SAND, some silt, little f-c gravel (damp)		
6	6-8	1550	0.8	0	Same		
7							
8	8-10	1552	1.2	0	Same - wet @ 8'		water @ 8'
9							
10							
11							
12							
13							
14							14.0
15					EOB @ 14 ft install well		

Soil Stratigraphy Summary

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Well Construction Log

Site Utica-Whitesboro St Job No. 1909 Well No. MW-7

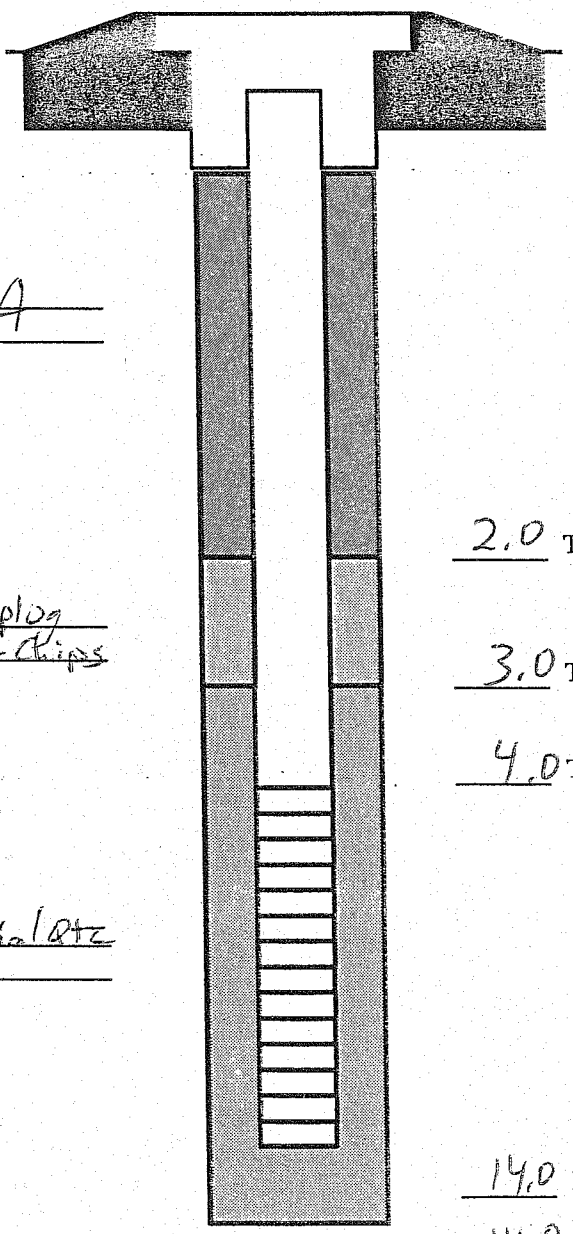
Total Depth _____ Surface Elevation _____ Top Riser Elevation _____

Water Levels (Depth, Date, Time) _____ Date Installed 6/2/05

Riser Dia. 2-in Material PVC Length 4-ft
Screen Dia. 2-in Material PVC Length 10 ft Slot Size 10

SCHEMATIC

Surface Seal Type Concrete Flushmount



Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal

Grout Type N/A

2.0 Top Seal

Seal Type Enviroplug Medium-Chips

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial Qtz
Size #1

14.0 Bottom Screen

14.0 Total Depth of Boring

Driller: Parratt Wolff
Inspector: S. Perkins
Rig Type: IR 200
Drilling Method: _____

Dvirka and Bartilucci Boring Log

Project Name: Utica Whitesboro St
Project #: 1909
Boring Depth: _____

Boring ID : MW-8
Sheet 1 of _____
Location: _____

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/1/05-0931
Finish (Date & Time): 6/1/05-1100
Weather: _____
Elevation of Ground Surface: _____

Location Sketch:

Sample Interval	Sample No.	Rec ~~Blows~~ (ft)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	0932	1.5	0	Dark Brown (5YR 2/1) SILT, little f. C Sand, trace m. gravel (damp) Red Brick		flush mount
2-4	0940	0.5	0	Lt grey f. SAND and m. GRAVEL, Asphalt (2") Black (N1) f.-c SAND, some silt, trace f. gravel (damp) trace brick and ash	2	collected MW8 (2-4) for VOCs + SVOCs
4-6	0945	1.8	0	same	3' 4	
6-8	0949	1.8	0	Dark Brown (5YR 2/1) SILT, some f. Sand, trace m. gravel, trace clay (moist) same		collected MW8 (6-8) for VOCs + SVOCs
8-10	0952	1.4	0	Med brown SILT and f. SAND, trace clay (moist) becomes wet		some wood at 7.5 water ~ 9' bg
					14.0	
				EOB @ 14 ft bg Install well		

Soil Stratigraphy Summary _____

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Well Construction Log

Site Utica - Whitesboro St Job No. 1909 Well No. MW-8

Total Depth 14 ft Surface Elevation _____ Top Riser Elevation _____

Water Levels (Depth, Date, Time) _____ Date Installed 6/1/05

Riser Dia. 2-in Material PVC Length _____

Screen Dia. 2-in Material PVC Length 10 ft Slot Size 10

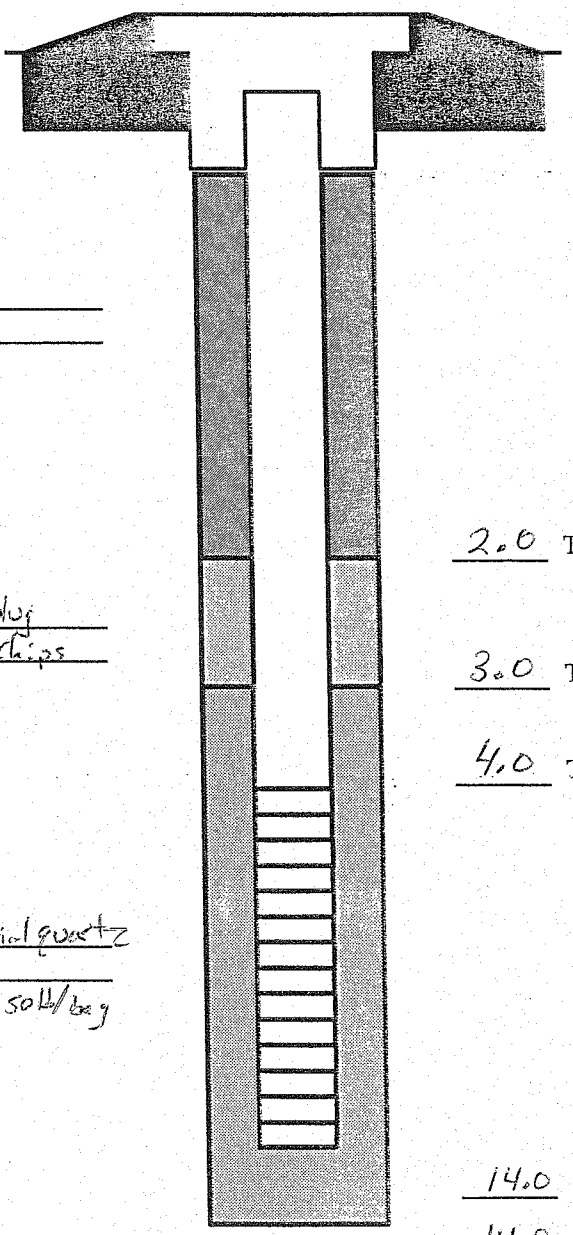
SCHEMATIC

Surface Seal Type _____

Ground Surface

_____ Riser Elevation

_____ Bottom Surface Seal



Grout Type _____

2.0 Top Seal

Seal Type Envirosplug medium chips 1 bag

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial quartz

Size #1

6 bags @ 50lb/bag

14.0 Bottom Screen

14.0 Total Depth of Boring

Well Development Data Sheet

Site Name: Utica Whitesboro Job Number: 1909 Date: 7/5/06 Well ID: MW-1

On Site Personnel: Sean Pepling / Jim Magda

Weather Conditions: See logbook

13.87
8.57
5.30
.16
3180
530
8480

Static water level before development: 8.57

Bottom of well: 13.87

Development Technique

- (bailing)
- peristaltic pump
- air lift
- other
- 12 volt submersible
- (surge block)
- ~~trash pump~~ w/foot valve

Date	Water Removal Start	Stop	Elapsed Time (min)	Flow Rate	Approx Vol. Removed	pH	Cond.	Turb	Temp	Observations/Comments
7/5/06	1019	1025	~~60~~ NA	0	0	—	—	—	—	Surged with surge block
7/5/06	1029	1029	NA	0	0	6.03	1.14	>999	12.3	Post surge / Pre-bail
7/5/06	1030	1035	5	~1 gpm	5	6.15	1.20	>999	11.9	
7/5/06	1036	1041	8 11	~1 gpm	5 (10)	6.05	1.38	>999	12.7	
7/5/06	1045	1052	22	~1 gpm	5 (15)	6.10	1.30	>999	12.9	

3/26/03

Well Development Data Sheet

Site Name: Utica Whiteboro Job Number: 1909 Date: 7/5/06 Well ID: MW-2

On Site Personnel: Jim Magda/Sean Repling

0940-0945 Surge w/ 3/4" ID PVC riser + 2" Surge block

Weather Conditions: Sea log door

Development Technique

(bailing) 12 volt submersible
peristaltic pump (surge block)
air lift trash pump w/foot valve
other

0936

Static water level before development: 7.87
Bottom of well: 13.90

3 well volumes 2.89 gallons

Date	Water Removal Start	Stop	Elapsed Time (min)	Flow Rate	Approx Vol. Removed	SU pH	MS/cm Cond.	NTU Turb	°C Temp	Observations/Comments
7/5/06	0947	0957	10		5	5.58	1.01	>999	13.3	water brown/very turbid
7/5/06	0959	1006	7		5	5.72	1.00	7999	12.7	Same as above
7/5/06	1008	1014	~~7~~ 6		5	5.69	1.17	>999	12.3	Same as above

Well Development Data Sheet

Site Name: Utica Whitesboro Job Number: 1909 Date: 7/5/06 Well ID: MW-3

On Site Personnel: Jim Magda / Sean Peplinski

1034 Surge well w/ 3/4" ID Pvc riser + 2" surge block
1039 Complete Surge

Weather Conditions: See logbook

Development Technique

- (bailing)
- peristaltic pump
- air lift
- 12 volt submersible
- (surge block)
- trash pump w/foot valve
- other

Static water level before development: 8.57 From logbook Page

Bottom of well: 13.90

13.90' - 8.57' = 5.33 x .16 = 0.85 gallons

Date	Water Removal Start	Stop	Elapsed Time (min)	Flow Rate	Approx Vol. Removed	pH	Cond.	Turb	Temp	Observations/Comments
7/6/05	1040	1055	15		3	6.06	1.99	>999	14.0	Turbid Brown/well dry @ 3 gallons
7/6/05	1057	1106	9		2	5.91	1.98	>999	13.0	Turbid Brown/well dry after 2 gallons

Well Development Data Sheet

Site Name: Univ. of Conn. Tech Job Number: 1909 Date: 7/5/06 Well ID: MW-4

On Site Personnel: Jim Magda / Seen Pooling

Weather Conditions: see logbook

Development Technique

- (bailing)
- peristaltic pump
- air lift
- 12 volt submersible
- (surge block)
- trash pump w/foot valve
- other

Static water level before development: 8.29" TPVC 0900

Bottom of well: 13.85

13.85' − 8.29 = 5.56 × .16 = 0.89 gallons

0901 Surge well w/ 3/4" ID PV riser + 2" block

0906 Stop Surg

0927 Stop Pu well dry Allow it recover

Date	Water Removal Start	Stop	Elapsed Time (min)	Flow Rate	Approx Vol. Removed	SU pH	ms/cm Cond.	ntu Turb	°C Temp	Observations/Comments
7/5/06	0917	0927	10		4 1/2	5.46	1.46	7999	13.3	water brown/very turbid/well dry

Well Development Data Sheet

Site Name: Utica Whitesboro Job Number: 1909 Date: 7/5/06 Well ID: MW-5

On Site Personnel: Jim Magda / Sean Pepling

Weather Conditions: See logbook

Static water level before development: 6.92

Bottom of well: 13.85

13.85
6.92
6.93
.16
4 15 S
693
1088

1.11 gal/vol

Development Technique

- (bailing)
- peristaltic pump
- air lift
- 12 volt submersible
- (surge block)
- trash pump w/foot valve
- other

Water Removal Date	Start	Stop	Elapsed Time (min)	Flow Rate	Approx Vol. Removed	pH	Cond.	Turb	Temp	Observations/Comments
7/5/06	1200	1205	5	—	—	5.96	0.746	>999	15.0	~~pre-surge~~ post surge / pre-bail
7/5/06	1210	1221	11		5	5.72	0.771	>999	13.0	Dark brown / turbid
7/5/06	1223	1237	14		5	5.49	0.848	>999	13.4	same as above / slow recharge

Well Development Data Sheet

Site Name: Utica Whitesboro Job Number: 1909 Date: 7/5/06 Well ID: MW-6

On Site Personnel: Sean Pepling / Jim Magda

Weather Conditions: See logbook

Static water level before development: 4.85

Bottom of well: 13.80

13.80
4.85
8.95
.16
5370
895
14320
1.43 gal/vol

Development Technique

- (bailing)
- peristaltic pump
- air lift
- other
- 12 volt submersible
- (surge block)
- trash pump w/foot valve

Water Removal Date	Start	Stop	Elapsed Time (min)	Flow Rate	Approx Vol. Removed	pH	Cond.	Turb	Temp	Observations/Comments
7/5/06	1209	1214	5	—	—	5.89	0.589	>999	13.9	post surge/pre bail - odor + sheen
7/5/06	1215	1228	19	~gpm	5	5.73	0.599	>999	13.7	
7/5/06	1229	1244	35	~liter/min	5 (10)	6.04	0.549	>999	13.9	well dry

Well Development Data Sheet

Site Name: Utica Whitesboro Job Number: 1909 Date: 7/5/06 Well ID: MW-17

On Site Personnel: Sean Pepling / Jim Magda

Weather Conditions: see logbook

Static water level before development: 6.05

Bottom of well: 13.85

13.85
6.05
7.80
.16
4.80
78.0
12.480
1.25 gal/vol

Development Technique

- (bailing)
- peristaltic pump
- air lift
- other

- 12 volt submersible
- (surge block)
- trash pump w/foot valve

Date	Water Removal Start	Stop	Elapsed Time (min)	Flow Rate	Approx Vol. Removed	pH	Cond.	Turb	Temp	Observations/Comments
7/5/06	1106	1111	5	—	—	6.66	0.620	>999	14.7	post surge/pre-bail
7/5/06	1115	1121	15	~1 gpm	5 gal	6.33	0.539	>999	15.1	
7/5/06	1122	1127	21	~1 gpm	5 (10)	6.04	0.518	>999	15.4	
7/5/06	1128	1133	27	~1 gpm	5 (15)	6.01	0.510	>999	15.7	

Well Development Data Sheet

Site Name: Utica Whitesboro Job Number: 1909 Date: 7/5/06 Well ID: MW-8

On Site Personnel: Sean Pepling / Jim Magda

Weather Conditions: see logbook

13.80
6.63
7.17
.16
4302
710
1172

1.15 gal/vol

Development Technique

- (bailing)
- peristaltic pump
- air lift
- other
- 12 volt submersible
- (surge block)
- trash pump w/foot valve

Static water level before development: 6.63

Bottom of well: 13.80

Date	Water Removal Start	Stop	Elapsed Time (min)	Flow Rate	Approx Vol. Removed	pH	Cond.	Turb	Temp	Observations/Comments
7/5/06	1140	1145	5	—	—	5.92	1.09	7999	13.3	Post Surge/Pre-bail
7/5/06	1146	1151	11	~1gpm	5	6.02	1.01	7999	12.8	
7/5/06	1152	1157	17	~1gpm	5 (10)	5.92	1.01	7999	13.1	
7/5/06	1158	1202	22	~1gpm	5 (15)	5.89	1.02	7999	13.3	

APPENDIX D
EXCAVATION WORK PLAN

APPENDIX D

EXCAVATION WORK PLAN

26-28 WHITESBORO STREET SITE
SITE # B00063
UTICA, NEW YORK

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY
ALBANY, NEW YORK 12233-7011

Prepared by:

URS Corporation
257 West Genesee Street
Suite 400
Buffalo, New York 14202

December 2018

D-1 NOTIFICATION

This Excavation Work Plan (EWP) applies to the seven parcels at the Site, which are as follows:

- Parcel 318.8-1-42;
- Parcel 318.8-1-43;
- Parcel 318.8-1-44;
- Parcel 318.8-1-45;
- Parcel 318.8-1-46;
- Parcel 318.8-1-47; and,
- Parcel 318.8-1-48.

At least 15 days prior to the start of any activity that is anticipated to encounter remaining impacted materials, the Site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). [Under emergency circumstances (e.g. work required to prevent loss of life or property; restoration of electrical and/or natural gas service) work may be conducted with no prior notification to the NYSDEC; the NYSDEC will be notified as soon as possible thereafter.] Table D-1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of Site-related contact information is provided in Appendix B of this SMP.

Table D-1: Notifications*

NYSDEC Central Office, Remedial Bureau C	(518) 402-9662 derweb@dec.ny.gov
NYSDEC Region 6 Office	(315) 785-2239 information.r6@dec.ny.gov

*Note: Notifications are subject to change and will be updated as necessary

Notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for Site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact the engineering controls (e.g., cover system, impacted material).
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the construction contractor's Health and Safety Plan (HASP), in electronic format, if it differs from the HASP provided in Appendix E of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required chemical testing results to meet 6 NYCRR Part 375 Table 375-6.8(b) Commercial Use.

D-2 SOIL SCREENING METHODS

Visual, olfactory, and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially impacted materials. Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the

material can be re-used on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Sections D-6 and D-7 of this Appendix.

D-3 STOCKPILE METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters, and other discharge points.

Stockpiles will be on poly liners and kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected, and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and be available for inspection by NYSDEC. Stockpiled material not being re-used will be scheduled for transportation to the appropriate disposal facility in a timely manner.

D-4 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of known utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).

A truck will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck

wash before leaving the Site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

D-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes will be approved prior to use. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes. This is the most appropriate route and takes into account:

(a) Limiting transport through residential areas and past sensitive sites;

(b) Use of city mapped truck routes;

(c) Prohibiting off-site queuing of trucks entering the facility;

(d) Limiting total distance to major highways;

(e) Promoting safety in access to highways; and

(f) Overall safety in transport.

Trucks will minimize stopping and idling in the neighborhood outside the Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

D-6 MATERIALS DISPOSAL OFF SITE

All material excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of material from this Site is proposed for unregulated off-site disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this Site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facilities if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include waste profiles, test results, facility acceptance letters, manifests, bills of lading, and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at a minimum as Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

D-7 MATERIALS REUSE ON-SITE

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site.

D-8 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including but not limited to excavation dewatering, decontamination waters, and groundwater monitoring well purge and development waters will be handled, transported, and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge, and development fluids will not be recharged back to the land surface or subsurface of the Site but will be managed off-site at an approved facility.

Discharge of water generated during large-scale construction activities to surface waters (i.e., a local pond, stream, or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.

D-9 COVER SYSTEM RESTORATION

After the completion of existing soil removal and any other invasive activities, the cover system will be properly restored in a manner that complies with the Record of Decision (ROD). The existing cover system is comprised of a demarcation layer (filter fabric) and a minimum of 1 foot of manufactured topsoil, topped with a hydro-seed mixture to enhance stabilization of the topsoil and expedite growth of a vegetative cover. If the type of cover system changes from that which currently exists prior to excavation (e.g., a soil/vegetative cover is replaced by gravel, concrete or asphalt), a modification of the cover element above the remaining contamination will be required. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the SMP.

D-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import to the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the Site. A Request to Import/Reuse Fill or Soil form, which can be found at

http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC Project Manager allowing a minimum of five business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR Part 375 Table 375(d) for Commercial Use criteria. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight-fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust emissions.

D-11 STORMWATER POLLUTION PREVENTION

Smaller-scale soil disturbances for future utility maintenance and landscaping conducted after the completion of Site redevelopment are not anticipated to require coverage under the general SPDES Permit or preparation of a Storm Water Pollution Prevention Plan (SWPPP). However, best management practices, such as the placement of silt fencing and hay bales at the perimeter of soil stockpiles and/or the use of polyethylene liners and covers, will be implemented during small-scale soil disturbance that have the potential to encounter impacted materials.

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and available for inspection by NYSDEC. All necessary repairs will be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor will be repaired quickly with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP will be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

D-12 EXCAVATION CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. The objectives during any emergency will be to protect human health and safety, and then the environment. A qualified environmental professional will determine the best course of action for dealing with the emergency and possible follow-up requirements that may result from implementing those actions (e.g., erosion of cover due to severe weather conditions, injury to Site inspection workers, discovery of an unknown source of contamination during future excavation activities that may require remediation).

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product and surrounding soils, etc., as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (Target Compound List [TCL] volatiles and semi-volatiles, and Target Analyte List [TAL] metals), unless the Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum will also be reported to the NYSDEC spills hotline. These findings will also be included in the Periodic Review Report.

D-13 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan (CAMP) will be consistent with the guidance provided in the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan obtained in Appendix 1A of DER-10. The locations of air sampling stations are based on generally prevailing wind conditions. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

D-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of odors on-site and off-site. Specific odor control methods. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted, and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on-site and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavation and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using odor suppressant foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and

handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

D-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

D-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing (if necessary), and during all work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX E

HEALTH AND SAFETY PLAN

AND CAMP

HAZWOPER
Health and Safety Plan

Groundwater Monitoring, Inspection and Landscaping

26-28 Whitesboro Street

26-28 Whitesboro Street
Utica, New York

Expiration Date: **December 24, 2019**
(Max. 1-Year from signature date)

Prepared for: New York State Department of Environmental Conservation

Prepared by: URS Corporation

257 West Genesee Street, STE 400
Buffalo, New York 14202

Prepared By: *Name* Kevin J. McGovern, PG, CHMM Signature: _____

Title Senior Environmental Scientist Date: 12/20/2018

Project Manager: *Name* Michael Gutmann, PG Signature: _____

Title Project Manager Date: 12/20/2018

Template Name:	DCS Americas HAZWOPER HASP
Template Version:	1.3
Last Modified:	November 8, 2017

Personnel Acknowledgement

By signing below, the undersigned acknowledges that he/she has reviewed the URS Health and Safety Plan for the 26-28 Whitesboro Street 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

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. This summary may be continually updated as tasks and personnel change. Use Continuation Sheets if necessary.

Project Name:	26-28 Whitesboro Street	**Project Number:**	60592094
Summary Revision Date:	12/19/2018	**Client Name:**	NYSDEC

Report ALL SH&E Incidents, no matter how minor, to the Incident Hotline: 800-348-5046
Injury, Property Damage, Vehicle, Security, Regulatory Inspection, Environmental Impact, and any potentially work-related injury, discomfort/ pain, or damage.

Identify the nearest Occupational Clinic and Hospital to the site that accepts URS Workers Compensation Insurance (see **Attachment A** for instructions). If the nearest such clinic or hospital is an unreasonable distance from the site, identify nearer hospitals or clinics. Attach maps and directions to the clinics and hospitals in **Attachment A**.

Occupational Clinic:	Primary Urgent Care	**Nearest Hospital:**	St. Elizabeth Medical Center
Address:	1904 Genesee St, Utica, NY 13502	**Address:**	2209 Genesee St, Utica, NY 13501
Phone Number:	(315) 804-6800	**Phone Number:**	(315) 801-8100

Key Personnel

Project Manager (PM):	Michael Gutmann, PG	**Cell Phone:**	(716) 345-4649
Site Supervisor (SS)	TBD	**Cell Phone**	TBD
Safety Officer (SSO):	TBD	**Cell Phone**	TBD
URS SH&E Mgr.	Stacy Wells, CSP, CHST, MPH	**Cell Phone:**	(917) 324-2554
Client PM:	David J. Chiusano	**Cell Phone:**	(518) 598-7753

List ALL Short-Service Employees, including subcontractors (<6 Months with Company in Current Area/Job Description):
TBD

List ALL Subcontractors and their Site Safety Officers:
TBD

PM must positively verify subcontractors are approved in Subport for the work described. If there were any limitations/ conditions of approval, describe them and how they are being met.

☐ I have verified that all subcontractors are approved in Subport, and that all conditions of approval are met.

Project Manager Name	Project Manager Signature	Date

Table of Contents

Figures

Attachments

Applicable References

This Health and Safety Plan (HASP) conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), Occupational Safety and Health Standards (with special attention to Section 120, Hazardous Waste Operations and Emergency Response).
- 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 URS's Safety for Life Program requirements as specified in the URS Safety, Health and Environment (SH&E) Manual.
- 26-28 Whitesboro Street Site Management Plan

Template Revision Log

Version	Revised By	Date	Summary of Revisions
1.0	Kevin J. McGovern, PG, CHMM	December 19, 2018	Initial Version

1. Introduction

This written HASP is designed to identify, evaluate, and control safety and health hazards, and to outline emergency response actions for URS-managed activities. This HASP must be kept on site during wok activities and made available to all workers including subcontractors and other site occupants for informational purposes. URS 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 URS SH&E Procedures that apply to all Design and Consulting Services (DCS) Americas jobs. See **Attachment B** for complete copies of applicable field SH&E Procedures. This template has been designed primarily for use in the United States; see procedure attachment S3AM-320-ATT2 for Canadian Specific Requirements on URS's ecosystem.

In October 2014, URS was acquired by AECOM Technical Services (AECOM) and continues to operate as a subsidiary of AECOM. Standby Contract D007622 predates this acquisition, and URS continues to perform work under this contract until the Contract expires (February 2019).

1.1 Applicable References

This Health and Safety Plan (HASP) conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), Occupational Safety and Health Standards (with special attention to Section 120, Hazardous Waste Operations and Emergency Response).
- 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 URS's Safety for Life Program requirements as specified in the URS Safety, Health and Environment (SH&E) Manual.
- 26-28 Whitesboro Street Site Management Plan

Project Assumptions

- No confined spaces will be entered on this project.
- No excavations will be entered.
- Work will be performed during daylight hours.

2. Site Information and Scope of Work

2.1 Site Description

The site is in an urban area in the City of Utica at 26-28 Whitesboro Street. The site is approximately 1.61 acres in size and is bounded to the north by a railroad line, to the east by Division Street, to the south by Whitesboro Street and to the west by commercial property. The Utica Harbor and Mohawk River are located approximately 0.25 miles north of the property.

Site Features: The site is vacant and covered with a mixture of concrete sidewalks, asphalt parking and weedy vegetation. Current Zoning/Uses: The site is currently inactive and is zoned for commercial use. The surrounding parcels are currently vacant or used for a combination of commercial, public recreation and light industrial.

2.2 Site Background/History

In 1997, Dames & Moore conducted two phases of remedial activities at the site. As a result of contaminants found at the site, the NYSDEC assigned Spill Number 97-09722 to the site. Additional investigative work was completed at the site by Hygia of New York in 1999, including the installation of shallow soil borings and monitoring wells. Volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) were found in both soil and groundwater.

Additional site characterization work was performed by Dvirka & Bartilucci of New York in 2008, followed by the development of a Remedial Alternatives Analysis Report in 2009. These reports expanded the list of constituents of concern (COCs) to include metals, pesticides, and chlorinated solvents. A Record of Decision (ROD) was developed in March 2011 to address the COCs at the site. A Remedial Action Plan (RAP) was issued in 2015.

A limited subsurface investigation was conducted by Nature's Way of New York in January 2016. The results were summarized in a report issued to the NYSDEC in March 2016 and confirmed the soil impacts at the site.

Precision Environmental Services, Inc. (PES) performed remedial work between April and August 2017 under contract C100614. A supplemental subsurface investigation was performed on April 24, 2017 consisting of the installation of ten shallow soil borings to collect soil samples from four pre-designated target excavations (i.e., Cells 1 through 4). Cells 1 through 4 were targeted for remediation based on results of the Remedial Investigation and Feasibility Study (RI/FS) performed by others. Grab samples were collected from each soil boring and composited to represent soil quality within each respective Cell.

PES performed a remedial excavation at the site between June 6 and 23, 2017. A total of 1,449 cubic yards (1,928 tons) of soil was excavated from the four cells. The excavated soil was characterized and transported off-site for disposal as non-hazardous waste at the Ava Landfill in Ava, New York as managed by the Oneida Herkimer Solid Waste Management Authority. The maximum depth of excavation in each cell was: 7 to 8 feet below ground surface (bgs) in Cell 1; 7 feet bgs in Cell 2; 5 to 6 feet bgs in Cell 3, and 2 to 3 feet bgs in Cell 4. Prior to backfilling, a physical demarcation layer consisting of geotextile fabric was placed along the excavation floor. Imported clean sand and gravel was applied to each excavation to fill the void to grade. The site was graded between June 26 and 28, 2017. A cover was constructed of manufactured topsoil in accordance with NYSDEC-supplied specifications. A 1-foot layer of topsoil was placed over a demarcation layer (felt fabric) over the completed excavation cells and the remainder of site (excluding concrete and paved areas) to establish vegetation growing media. A hydro-seed mixture was applied to the entire site to enhance stabilization of the topsoil and to expedite vegetation cover growth.

2.3 Client or Third-Party Operations at Site

There are no client or third-party operations at the site.

2.4 Scope of Work

Pursuant to the ROD, post remedial activities include annual groundwater monitoring, annual site inspections and landscaping (mowing) during the growing season. There are no plans for Site investigation or remediation activities. However, there is a possibility of monitoring well decommissioning and excavation in the future.

2.5 Scope of Work Risk Assessment

- ☒ **Low Risk** *(examples: non-intrusive work, occasional exposure and/or low risk hazards)*
- ☐ **Medium Risk** *(examples: intrusive work, heavy equipment use, frequent exposure and/or moderate hazards)*
- ☐ **High Risk** *(examples: complicated scope, large/ multiple work crews, and/or constant exposure to hazards).*

The following tasks/ hazards automatically trigger high risk ranking. Check all which apply. Include hazard mitigation procedures later in the appropriate Physical, Chemical, or Environmental section of the HASP.

- ☐ Asbestos Removal / Contact
- ☐ ATV Use
- ☐ Bridge / Dam Inspections/ Snooper Truck Use
- ☐ Confined Space
- ☐ Cranes and Rigging Use
- ☐ Demolition
- ☐ Diving – Scientific or Commercial
- ☐ High Speed Traffic Exposure
- ☐ Hot Work
- ☐ Conditions Immediately Dangerous to Life or Health (IDLH)
- ☐ Laboratory Operations
- ☐ LOTO or Live Energy Source Work
- ☐ On-rail / Near Rail Work
- ☐ Ordinance, Munitions, Explosives Use
- ☐ Pile Driving
- ☐ Radiation or Radioactive Instrument Use
- ☒ Remote Location or Lone Worker
- ☐ Respirator Use (does not include dust mask)
- ☐ Scaffolding Use
- ☐ Use or Exposure to Toxic Chemicals
- ☐ Trenching / Excavation
- ☐ Tunnel / Underground Work
- ☐ UXO / MMR
- ☐ Work at Heights >4 ft.
- ☐ Work at Angle >30 deg.
- ☐ Work On / Over Water

3. URS Safety Health and Environment Program

3.1 URS Policy

Safety, Health and Environment Policy Statement

AECOM

Purpose

This policy establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance for AECOM's employees in the global marketplace.

Commitment

AECOM is committed to exceptional levels of performance in safeguarding our people and the environment as one of our Core Values. Keeping our people safe is our most important measure of success. We strive to be the beacon of safety excellence in the industries and global communities in which we work.

To advance our SH&E program, we are committed to:

- Zero work-related injuries to AECOM employees and protection of the environment as a result of our activities.
- Providing a highly effective SH&E management system that drives continual review and improvement.
- Meeting client requirements and properly incorporating all safety, health and environmental rules and regulations at the local, state, provincial and national levels.
- Developing an exceptional safety culture where our people embrace ownership for the safety of themselves and others.
- Advancing our goals of pollution prevention, resource conservation and environmental sustainability.
- Setting and meeting aggressive SH&E performance goals and Core Value Metrics to promote continuous improvement.
- Working with employees and business partners in order to continuously improve SH&E performance.
- Recognizing and celebrating those who contribute to excellent SH&E performance.
- Striving to make AECOM the provider of choice for the safe execution of design, build, finance, operate and maintenance work globally.

The commitment to this policy by the leadership, management and employees of AECOM provides the foundation for a safe workplace, operational excellence and long-term business success.

Expectations

Safety is a core value and a key to our success. We demand continuous improvement in our journey toward a zero incident culture, where everyone is committed to safety, health and environmental excellence.

To that end, we demand:

- Our leaders, managers, supervisors and employees demonstrate their commitment in their actions and decisions to assure that every person goes home safe every day.
- Our employees embrace safety as a core value both on and off the job.
- Each employee is committed to his/her own safety and that of his/her fellow employees.
- We will incorporate AECOM's Life-Preserving Principles into our work planning and execution.
- We proactively and aggressively identify, manage and eliminate hazards in the workplace.
- We train and prepare our people to have the knowledge, skills, competency and equipment required to work safely.
- We stop our employees from working if the work cannot be executed safely or if conditions or behaviors on the work activity are unsafe.
- All employees immediately report safety, health and/or environmental incidents, near-misses, unsafe conditions, and at-risk behaviors to their supervisor; and that we diligently work to correct the problem.

Our SH&E expectations will be accomplished by the demonstrated leadership of management, compliance with regulatory requirements and participation of AECOM personnel.

Communication

This Policy will be reviewed annually to ensure it meets the needs of the company, and will be made available to all persons under the control of the company.

Sincerely:

M. Burke

Michael S. Burke
Chairman and Chief Executive Officer

04 March 2017
Date

Safety for life

S1-001-PR1 Rev. 3 March 4, 2017

3.2 Safety for Life

"Safety for Life" is a comprehensive integrated URS Safety Management System that drives our nearly 100,000 employees toward URS'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 URS activities.

3.3 Life Preserving Principles

Demonstrated Management Commitment
Our Executive, senior and project managers will lead the SH&E improvement process and continuously demonstrate support and commitment.

Employee Participation
Our employees will be encouraged and empowered to become actively engaged in our safety processes through their active participation in safety committees, training, audits, observations and inspections. Employees will be encouraged to participate in health initiatives and adopt a healthy lifestyle.

Budgeting and Staffing for Safety
Our safety staff will be competent, fully trained and qualified to provide technical resources to our internal and external clients. A budget to support safety activities will be included in project proposals.

Pre-Planning
Our design, engineering, project and construction management staff will deploy effective risk mitigation efforts to design, plan and build safety into every project. Pre-Project and Pre-Task planning will be an effective tool in protecting our employees and the environment.

Contractor Management
Our project staff will work closely with our sub-consultants, subcontractors, contractors and Joint Venture Partners to provide a safe work environment for employees and members of the public. Our goal of SH&E performance excellence will be equally shared by all project participants.

Recognition and Rewards
Our employees will be recognized for their efforts in working safely and their support of our safety efforts.

Safety Orientation and Training
Our employees will be provided with effective safety training in order to identify and mitigate hazards in the workplace to prevent injuries to themselves and others who may be affected by their actions.

Incident Investigation
Our managers and safety professionals will investigate all recordable incidents and serious near misses to identify contributing factors and root causes in order to prevent a reoccurrence. Lessons learned shall be identified, communicated and implemented.

Fit for Duty
Our employees are responsible to report to work each day fit for duty and not to pose a health and safety hazard to themselves or others.

3.4 Driving and Vehicle Safety

The proper operation of vehicles is critical to protecting the safety of URS 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 URS-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting URS business.

2. **Electronic Devices Prohibited**

URS prohibits use of all portable electronic devices while operating a motor vehicle/ equipment which includes being stopped at a traffic light or stop sign. This includes cell phones, two-way radios and other items whether hand-held or hands-free. Electronic devices include, but are not limited to, all mobile phones, 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 over 10,000 pounds gross vehicular weight are required to have a competent spotter in place when backing. A competent spotter is one that has received spotter training.
- 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 URS'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 report to work fit for duty and unimpaired by substances or fatigue. Supervisors must observe their employees and work with the employee, SH&E staff, and HR to address deficiencies. URS 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

URS'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.

3.5.2 Proactive Health

URS 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 URS on a corporate-wide basis (i.e. 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:

- Heart health;
- Stress management;
- Smoking cessation;
- Diabetes prevention;
- Diet; and
- Exercise benefits.

Topics and educational materials can be located on the URS 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 C) serve as guidance for the leader to follow.

3.5.3 Fatigue

One aspect of fit for duty is fatigue management. URS 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 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. URS 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. URS 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 URS-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 URS policy, and will subject an employee to disciplinary action up to and including termination in accordance with controlling law.

3.6 Rewards and Recognition

One of URS'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 acknowledgment, email, spot awards, luncheons, etc.
2. **Formal** – Safety Star Award nomination (link)
3. **Formal** – SH&E Challenge Coins (see local SH&E manager for details)

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 URS 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 Hazard Communication

Hazardous materials that may be encountered on-site as existing environmental or physical/health contaminants are addressed in this HASP. Their properties, hazards, and associated required controls will be communicated to all affected staff and

subcontractors in accordance with the requirements of URS Procedure S3AM-115-PR1 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 URS-controlled work site must first provide a copy of the item's SDS to the Site Supervisor (SS) or Site Safety Officer (SSO) for review and filing. The SS or SSO will maintain copies of all SDS on site and in **Attachment D**. SDS may not be available for locally obtained products, in which case an alternate form of product hazard documentation will be acceptable.

3.9 Hazardous Material Handling and Waste Management

If hazardous, solid, purge water, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, Provincial, Territorial and/or local regulations and SH&E Procedure S3AM-116-PR Hazardous Materials Shipping. A site-specific Entity Letter may be required for the site/client; if so, only persons named on the entity letter are allowed to sign waste shipping papers "***on behalf of [client name]***". Any individual signing shipping papers must have valid Department of Transportation and Resource Conservation and Recovery Act training for waste shipment. Consult the HZM/HZW & TDG page on ecosystem or the SH&E Manager for further guidance on URS and regulatory procedures and training requirements.

3.10 Housekeeping and Personal Hygiene

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 should 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:

Housekeeping:	*Inspection Frequency:*	Daily	*Inspector:*	SS/ SSO or designee
Eating, Drinking, Smoking:	Permitted only in designated area(s) located in nearby buildings or field vehicle			
Handwashing:	Water, soap and paper towels or equivalent supplies are located off site. Site staff will wash hands and face after completing work activities and prior to breaks or meals.			
Toilets:	**Toilets** are located off site *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 not required.*			

Water:	**Water** is located off site. A water supply meeting the following requirements will be utilized: *Potable Water:* 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. *Non-Potable Water:* Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating ***"Non-Potable Water, Not Intended for Drinking Water Consumption"***
Illumination:	**Illumination** will be provided in the form of battery operated lantern/flashlights if natural light or installed lighting fixtures are not sufficient in the work area, toilet, and/or break area.

3.11 Lone Worker

URS discourages employees from working alone (i.e. where URS personnel are out of visual and audio range of others) when performing field tasks (see SH&E Procedure S3AM-314-PR, Working Alone). If lone work is to be performed, a communications/check-in plan must be developed and implemented using the table below.

Lone Worker:	SS/SSO
Justification:	Monitoring well sampling, site inspection and mowing requires only one person.
Check-In Requirement:	Check in is required within 1 hour of end of each shift. Verbal contact is preferred, all messages- voicemail, email, text- must have an exchange confirming receipt by the check-in contact]
Check-In Contact:	Michael Gutmann (716) 345-4649; PM
Hazard Summary:	Traffic – the work will occur along streets.
Response Plan:	If a scheduled check-in is not performed, the PM will call the worker's cell phone. If there is no response on the workers; cell phone, the PM will then contact the local police.

3.12 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 the QR codes below can be used while off the URS network from a smartphone/ device.

LifeGuard

IndustrySafe
Safety Management Software

3.13 Short Service Employee

A Short Service Employee is an employee with fewer than 6 months experience working on field projects or an employee who has not completed the required training or received required certifications (see the Short Service Employee procedure, S3AM-002-PR). The Project Manager (PM) will identify all Short Service Employees working on the project, and each Short Service Employee will be assigned to an experienced team member, so all activities may be monitored. Short Service Employees shall be easily identified in the field environment, such as through wearing a specific colored hardhat, a manufacturer-approved orange stripe applied to their hardhat or be clearly identified by some other system. Any new employee shall wear the designated Short Service Employee identifier until the PM determines the employee has the knowledge, skills, and ability related to the specific hazard on the project.

3.14 Stop Work Authority

URS 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 URS 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.

4. Roles and Responsibilities

Roles and responsibilities for the project team are defined in SH&E Procedure S3AM-117-PR1, Hazardous Waste Operations. The 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 SSO 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 URS Incident Reporting Hotline (Incident Hotline 800-348-5046).

4.1 Project Manager

The 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:

- Verifying that personnel, to whom this HASP applies, including URS 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 SS or SSO to allow for the successful implementation of all necessary SH&E Procedures.
- Maintaining regular communications with the SS or SSO and, when necessary, the URS Client SH&E Program Manager.
- Coordinating the activities of URS 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 PM Self-Assessments on a regular basis.
- Approving amendments to the HASP (in conjunction with the SS or SSO).
- Coordinating activities with the client as needed to ensure the safe implementation of this HASP.

4.2 Site Supervisor

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

- Discussing deviations or drift from the work plan with the SSO and PM.
- Discussing safety issues with the PM, SSO, and field personnel.
- Assisting the SSO with the development and implementation of corrective actions for site safety deficiencies.
- Assisting the SSO with the implementation of this HASP and ensuring compliance.
- Assisting the SSO with inspections of the site for compliance with this HASP and applicable SH&E Procedures.
- Reviewing Pre-Job Hazard Assessments (Pre-JHAs), Job Safety Analyses (JSAs) 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 are in compliance with 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 SSO, the SH&E Manager, and the PM.

4.3 Site Safety Officer

The SSO supports the SS in providing a safe work environment. Not all sites will have a designated SSO; the decision should be made by the PM and SH&E Manager taking into consideration the complexity and risks of the scope of work. The SS may act as the SSO on sites without one. The SSO'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 SS to review JSAs/ Pre-JHAs and 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 SS and PM 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 SS, the SH&E Manager and the PM.
- Selecting an alternate SSO by name and informing him/her of their duties, in the event that the SSO must leave or is absent from the site.
- Verifying that all operations are in compliance with 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 PM.

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 SS or SSO 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 SS or SSO or the SH&E Manager at any time to discuss potential concerns.

4.5 Subcontractors

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in URS Procedure *S3AM-213-PR Subcontractor Management*. Each URS 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.

URS 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, 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 URS for review prior to the start of on-site activities.

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 URS PM or the SS prior to beginning work operations. The SS 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, URS management staff, etc.) requiring entry to any work location on the site will be briefed by the PM, SS, or SSO 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, all work activities within the EZ must be suspended.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

5. Training and Documentation

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

5.1 HASP/SITE Orientation

The PM shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, SSO, or SS. This meeting will involve representatives from all organizations with a direct contractual relationship with URS 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 Review

The SS, SSO or designee shall facilitate a tailgate meeting to discuss the specific requirements of this HASP, review the applicable JSAs/ Pre-JHAs and/or complete 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 URS. 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 SS or SSO on a Daily Tailgate Meeting form, a blank copy of which is included in **Attachment F**.

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 C 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 URS employees. In addition, S3AM-117-PR, Hazardous Waste Operations, explains the HAZWOPER training and S3AM-128-PR, Medical Screening and Surveillance, details the medical surveillance requirements.

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

Site-Specific Training Requirements	
Training	**Applies to**
☒ HASP Orientation	All Employees and Subcontractors
☒ HAZWOPER 40 –HR	On HAZWOPER sites, in EZ, exposed to hazardous contamination
☒ HAZWOPER Supervisor	Employees managing others in HAZWOPER activities
☒ Field Safety	Anyone visiting the field that does not require HAZWOPER
☒ Speak-Up/Listen Up	All Environmental Business Line Field Employees and Supervisors by end of FY2019
☐ Fit Test/ Respiratory Protection	Employees needing to wear respirators
☒ Hazardous Materials Shipping	Employee responsible for shipping Hazardous Materials/Waste and/or signing manifests
☐ Annual Medical Surveillance/ Clearance	Employees working in an exclusion zone and the regulatory required exposure

Site-Specific Training Requirements	
Training	**Applies to**
	limit **is** exceeded for 30 or more days a year
☐ Biennial Medical Surveillance/ Clearance	Working in an exclusion zone more than 30 days a year and the regulatory required exposure limit is **not** exceeded
☐ OSHA 10 hr. Construction	Employees working near heavy equipment
☐ OSHA 30 hr. Construction	Supervisor/SSO overseeing work with heavy equipment
☐ Local requirements:	
☐ Client requirements:	

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.

URS'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 a S3AM-202-FM1 Competent Person Designation Form for each URS competent person (subcontractors to use an equivalent process).

These activities require a competent person. Mark all that apply and list the name of the person.

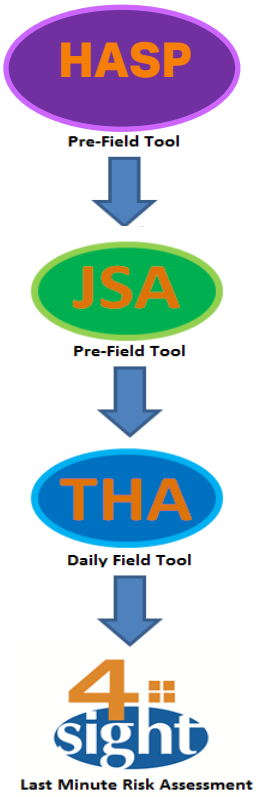
	Activity	Name of Person
☐	**Asbestos**	
☐	**Assured Equipment Grounding Conductor**	
☐	**Blasting & Explosives**	
☐	**Concrete & Masonry Construction**	
☐	**Confined Spaces**	
☐	**Control of Hazardous Energy (Lockout-Tagout)**	
☐	**Crane Assembly / Disassembly**	
☐	**Cranes & Derricks**	
☐	**Demolition**	
☐	**Electrical Wiring Design & Protections**	
☐	**Elevated Work Platforms & Aerial Lifts**	
☐	**Fall Protection**	
☐	**Hearing Protection**	
☐	**Heavy Equipment**	
☐	**Ionizing Radiation**	
☐	**Lead**	
☐	**Material Hoists & Personnel Hoists**	
☐	**Respiratory Protection**	
☐	**Rigging Equipment**	
☐	**Scaffolds**	
☐	**Stairways & Ladders**	
☐	**Steel Erection**	
☐	**Trench & Excavations**	
☐	**Underground Construction**	
☐	**Welding & Cutting**	

6. Hazard Assessment and Control

URS 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 URS operations. See S3AM-209-PR, Risk Assessment and Management, for details regarding URS's process. This approach involves the following:

6.1 SH&E Procedures

All URS SH&E procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures ecosystem page. Programmatic procedures referenced in this document (for example SH&E Training) do no need to be printed for inclusion in this HASP. Only procedures that are needed for field activity reference and application MUST be printed in full and included in this HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment B**.



6.2 Job Safety analysis/ Pre-Job Hazard Assessment

A JSA or pre-job hazard assessment (Pre-JHA) is to be developed for each discrete task planned as part of the project. This assessment lays out the steps of the job, potential hazards, and mitigation measures. Form S3AM-209-FM4 or an equivalent may be used. A blank copy is included in **Attachment F**.

6.3 Task Hazard Assessment

The THA is a handwritten field form which is based on "Stop and Think" as the first thing you do before starting work activities often paired with the daily tailgate meeting or work permit issuance. Not all risks can be anticipated in this HASP or the JSA/ pre-job hazard assessment process; therefore, the THA is used to assess, mitigate, and document the site-specific conditions and changes to the hazard profile prior to and throughout the work task. Proper implementation of the THA program protects worker health and safety. A blank THA form is included in **Attachment F**. The THA must be signed by all employees each day and initialed whenever a changed condition provokes a change in hazard controls.

6.3.1 Hazard Categories

JSAs/ Pre-JHAs and 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

6.4 4-Sight

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

1) **What am I about to do?**
2) **What could go wrong?**
3) **What could be done to make it safer?**
4) **What have I done to communicate the hazards?**

6.5 Speak Up/Listen Up

All URS 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
  - 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
  - Commit to performing the task the safer way

SULU conversations should happen consistently throughout the work day 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 Hazard Assessment

7.1 Physical Hazards

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 B** for implementation and reference.

Check all applicable hazards/ activities and add site specific description of the hazard.

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☐	**Abrasive Blasting**		S3AM-335-PR
☐	**Aerial Work Platforms**		S3AM-323-PR
☐	**All-Terrain Vehicles**		S3AM-319-PR
☐	**Blasting and Explosives**		S3AM-336-PR
☐	**Bloodborne Pathogens**		S3AM-111-PR
☐	**Cofferdams**		S3AM-344-PR
☒	**Cold Stress**	Working during winter.	S3AM-112-PR
☐	**Compressed Air Systems and Testing**		S3AM-337-PR
☐	**Compressed Gases**		S3AM-114-PR
☐	**Concrete Work**		S3AM-338-PR
☐	**Confined Spaces**		S3AM-301-PR
☐	**Corrosive Reactive Materials**		S3AM-125-PR
☐	**Cranes and Lifting Devices**		S3AM-310-PR
☐	**Demolition**		S3AM-339-PR
☐	**Diving (scientific and commercial)**		S3AM-334-PR
☒	**Drilling, Boring & Direct Push Probing**	Monitoring well decommissioning	S3AM-321-PR
☐	**Electrical Safety**		S3AM-302-PR
☒	**Excavation**	Excavation as part of potential site development	S3AM-303-PR
☐	**Fall Protection**		S3AM-304-PR
☐	**Flammable and Combustible Liquids**		S3AM-126-PR
☐	**Gauge Source Radiation**		S3AM-122-PR
☒	**Hand and Power Tools**	Accessing monitoring wells.	S3AM-305-PR
☐	**Hazardous Waste Operations**		S3AM-117-PR
☒	**Heat Stress**	Working during summer.	S3AM-113-PR
☐	**Heavy Equipment**		S3AM-309-PR
☐	**High Altitude**		S3AM-124-PR
☒	**Highway and Road Work**	Working alongside roadways and sidewalks.	S3AM-306-PR
☐	**Hoists Elevators and Conveyors**		S3AM-343-PR
☐	**Hot Work**		S3AM-332-PR
☐	**Ladders**		S3AM-312-PR
☐	**Lockout Tagout**		S3AM-325-PR
☐	**Machine Guarding Safe Work Practice**		S3AM-326-PR
☐	**Marine Safety and Vessel Operations**		S3AM-333-PR

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☐	**Material Storage**		S3AM-316-PR
☐	**Mine Site Activities**		S3AM-341-PR
☐	**Mining Operations**		S3AM-345-PR
☐	**Non-Ionizing Radiation**		S3AM-121-PR
☐	**Overhead Lines**		S3AM-322-PR
☐	**Powder-Actuated Tools**		S3AM-327-PR
☐	**Powered Industrial Trucks**		S3AM-324-PR
☐	**Radiation**		S3AM-120-PR
☐	**Railroad Safety**		S3AM-329-PR
☐	**Respiratory Protection**		S3AM-123-PR
☐	**Scaffolding**		S3AM-311-PR
☐	**Steel Erection**		S3AM-340-PR
☐	**Temp. Floors, Stairs, Railings, Toe-boards**		S3AM-342-PR
☐	**Underground Utilities**		S3AM-331-PR
☐	**Underground Work**		S3AM-330-PR
☒	**Wildlife, Plants and Insects**	Sampling monitoring wells, site inspection, mowing	S3AM-313-PR
☒	**Working Alone**	Sampling monitoring wells, site inspection, mowing	S3AM-314-PR
☐	**Working On and Near Water**		S3AM-315-PR

8. Chemical Hazard Assessment

URS will perform tasks that can expose personnel to a variety of hazards due to the operational activities, physical conditions of the work locations, and potential presence of environmental contaminants. This section presents a variety of potential chemical hazards, exposure pathways, and related mitigation actions. 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).

8.1 Potential Chemical Hazards

The chemicals in the table below are known or suspected to be present at the site.

Summary of Hazardous Properties of Contaminant Exposure Hazards

PEL:.....Permissible Exposure Limits

TLV:.....Threshold Limit Values

		Chemical Name	Media	Primary Routes of Exposure	PEL	TLV	IP electron volts (eV)
Metals	☒	Beryllium	Soil, GW	Dermal	2 µg/m^3	0.05 µg/m^3	n/a
	☒	Cadmium	Soil, GW	Dermal	0.005 mg/m^3	0.01 mg/m^3	n/a
	☒	Chromium III	Soil, GW	Dermal	0.5 mg/m^3	0.5 mg/m^3	n/a
	☒	Copper	Soil, GW	Dermal	1.0 mg/m^3	1.0 mg/m^3	n/a
	☒	Lead	Soil, GW	Dermal	0.05 mg/m^3	0.05 mg/m^3	n/a
	☒	Manganese	Soil, GW	Dermal	5 mg/m^3	0.2 mg/m^3	n/a
	☒	Mercury	Soil, GW	Dermal	0.1 mg/m^3	0.025 mg/m^3	n/a
	☒	Nickel	Soil, GW	Dermal	1 mg/m^3	0.5 mg/m^3	n/a
	☒	Selenium	Soil, GW	Dermal	0.2 mg/m^3	0.2 mg/m^3	n/a
	☒	Zinc	Soil, GW	Dermal	15 mg/m^3	10 mg/m^3	n/a
Common Site COCs	☒	1,2,4-Trimethylbenzene	Soil, GW	Inhalation	None	25 ppm	8.27
	☒	Benzene	Soil, GW	Inhalation	1 ppm	0.5 ppm	9.25
	☒	Coal tar pitch hydrocarbons PAH	Soil, GW	Inhalation	0.2 mg/m^3	0.2 mg/m^3	n/a
	☒	Ethylbenzene	Soil, GW	Inhalation	100 ppm	20 ppm	8.77
	☒	Polychlorinated biphenyls (PCBs)	Soil, GW	Absorption, ingestion	1 mg/m^3 (42% chlorine); 0.5 mg/m^3 (54% chlorine)	1 mg/m^3 (42% chlorine); 0.5 mg/m^3 (54% chlorine)	n/a
	☒	Trichloroethylene (TCE)	Soil, GW	Inhalation	100 ppm	50 ppm	9.45
	☒	Toluene	Soil, GW	Inhalation	200 ppm	20 ppm	8.82
	☒	Xylene	Soil, GW	Inhalation	100 ppm	100 ppm	8.45, 8.56
	☒	Vinyl Chloride	Soil, GW	Inhalation	1 ppm	1 ppm	9.99

8.2 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).

8.2.1 Inhalation

The primary risks associated with URS'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 volatile organic

compounds. If intrusive activities occur, air monitoring will be performed within the employee 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.

8.2.2 Skin Contact

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).

8.2.3 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.

8.3 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 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. Use of a decontamination pad 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 outer gloves (and boot covers, if used). Remove hardhat and eye protection. Remove inner gloves. Wash hands and face.	Alconox solution Deionized water

Equipment Decontamination Procedures		
Type Equipment	***Decontamination Solution***	***Procedure***
Water quality meter, oil/water interface probe, down-hole water sampling pumps, reusable sampling	Alconox solution and deionized water	**Washing**: Disassemble and wash with an Alconox solution in deionized water. **Rinsing**: Rinse in deionized water to remove all traces of

tools/ equipment		detergent.

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

8.4 Air Monitoring

No intrusive work is planned, but in such an event, air 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 in accordance with Exposure Monitoring Procedure S3AM-127-PR and specified in the work permit and/or JSAs/ Pre-JHAs 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.
- Personal monitoring and result evaluation must be directed by a Certified Industrial Hygienist or Certified Safety Professional.

8.4.1 Real-Time Exposure Measurement/ Equipment

If intrusive work is being performed, 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 JSAs/ Pre-JHAs as work is performed. All instrumentation need to be rated intrinsically safe to prevent fire or explosion.

Check which real-time monitoring equipment will be used and update the model type if needed:

	Instrument	Manufacturer/Model	Substances Detected
☒	**Photo Ionization Detector (PID)**	RAE Systems mini-RAE	• Petroleum hydrocarbons • Organic Solvents
☒	**Singer Gas Detector**	RAE Systems Multi-RAE	• Benzene and Vinyl Chloride

8.4.2 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 SS or SSO or the Safety Manager.

Reasons to Upgrade:

- Known or suspected presence of dermal hazards;
- Occurrence or likely occurrence of gas, vapor, or dust emission; or
- Change in work task that will increase the exposure or potential exposure to hazardous materials.

Reasons to Downgrade:

- New information indicating that the situation is less hazardous than was originally suspected;
- Change in site conditions that decrease the potential hazard; or

- Change in work task that will reduce exposure to hazardous materials.

8.4.3 Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. A reading in excess of action level outlined below will require additional ventilation for 30 minutes, followed by re-monitoring.

Monitoring Procedures and Action Levels

Volatile Organic Compounds (VOCs) and volatile hydrocarbons (total by PID)	Breathing zone, continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	< 5 ppm	Continue monitoring, may continue work in required PPE
		5- 25 ppm (sustained for 5 minutes)	STOP WORK and notify PM. Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). Work activities shall only continue once levels have decreased to or below 5 units above background. If levels continue above 5 units, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with PM 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 SSO, SS and PM.
Benzene (by PID with benzene-specific separation tube)	Breathing zone, continuously where indicated by VOC readings	> 0.25 ppm	Cease work, exit the area, and contact the SSO, SS and PM.
Vinyl Chloride (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 SSO, SS and PM.

9. Environmental Impact Prevention

URS 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.

9.1 Incidental Spill Prevention and Containment

Spill prevention and containment planning must be conducted, and appropriate control measures established, consistent with regulatory requirements. Personnel are not expected to perform a response action related to an uncontrolled release of a hazardous substance. However, in the event of an incidental release of a hazardous material, a response will be performed to absorb, neutralize or otherwise control the release within the immediate work area. Procedures contained in the SDS of the hazardous material will be implemented to perform the response. The Emergency Response section of this HASP contains information on spill reporting, pre- and post- spill evaluation, and response

9.1.1 Spill Prevention and Containment Practices

Work activities may involve the use of hazardous materials (i.e. fuels, solvents) or work involving drums or other containers. When these activities exist, the procedures outlined below will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers and labelled.
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- Drums/containers will be secured and handled in a manner which minimizes spillage and reduces the risk of musculoskeletal injuries.
- Equipment will be inspected daily for signs of leaks, wear, or strain on parts that, if ruptured or broken, would result in a spill.
- Refueling should occur in designated areas where incidental spills can be prevented from reaching permeable ground surfaces.
- Whenever possible, position parked or stationary equipment over secondary containment and/ or absorbent materials to prevent spills from reaching permeable ground surfaces.
- A spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e. speedy dri, absorbent pads, etc.) will be available on the project site and positioned for quick and easy access.

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 JSAs/ Pre-JHAs or THAs.

Minimum Required PPE (per URS PPE and HAZWOPER Procedures):

- Hard hat
- Safety glasses w/ side shields (may be clear or shaded)
- Safety toe work boots
- Long pants and shirts with sleeves (short or long- cover shoulders no tank or muscle shirt styles)

Complete the table below for site-specific PPE:

Additional PPE Needed On Site

(to encompass all task specific additions and upgrades)

Face/ Eyes		Head/ Ears	
☐ Spoggles (Safety Glasses with foam liner for dust protection)	☐ Chemical Goggles	☐ Helmet with Chin Strap	☐ Earplugs
☐ Welding Mask/Goggles	☐ Face Shield (splash)	☐ Wide Brimmed Hat	☐ Over-ear Hearing Protection
	☐ Face Shield (impact)		
Hands		**Legs/ Feet**	
☒ Nitrile	☐ Other Chemical Resistant: (*specify*)	☐ High Ankle Boots	☐ Metatarsal Guards
☐ Leather		☐ Snake Guards	☐ Electrically-resistant boots
☐ Cut, Abrasion and Puncture Resistant		☐ Rubber Boots/Waders	
☐ Impact-resistant			
Body		**Equipment**	
☒ Sunscreen		☐ **Air/Noise Monitoring Equipment:** (*specify*)	
☒ Insect Repellent (DEET)			
☐ Permethrin Applied to Clothing			
☒ Long-sleeved Shirt		☒ **Traffic/Work Zone Control Equipment:** (*specify*)	
☒ High-visibility Vest		Traffic Cones	
☐ High-visibility Pants			
☒ Disposable Coveralls		☐ **Communication Beyond Cell Phones:** (*specify*)	
☐ Flame Retardant Clothing			
☐ Fall Protection			
☐ Personal Floatation Device		☐ **Fire Controls:** (*specify*)	
☐ Other: (*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 URS 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 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 facility/ property, but access is not restricted via locks, guards, or gates

☒ Work area is on a property that is open and access by the public is likely

☐ Work area is on a property that is open but access by the public is unlikely

☒ 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:

_____

_____

Check and describe the site controls that need to be added to protect the public and the URS work team.

	Control Item	Description of Type and Application
☐	**Fence**	
☐	**Locks**	
☐	**Barricades**	
☒	**Cones**	Cones will be applied if working adjacent to a road.
☐	**Tape**	
☐	**Hole Covers**	
☐	**Other:**	

11.2 Site Control Map/ Diagram

See Figure 11-1.

11.3 Simultaneous and Neighboring Operations

Simultaneous and neighboring operations include an office occupied by an advertising firm to the west of the site, railroad to the north and warehouses to the east and south. These operations do not present a need for added coordination and communication to address hazards.

11.4 Site Security

All projects should be reviewed for the potential for personal security issues (e.g., assault, robbery, threat, etc.). Check all of the following that apply:

- ☐ Project site located in a higher crime area or has a history of security incidents
- ☐ Working outside of regular cellular telephone service
- ☐ Idle property with potential for trespasser(s) to shelter in buildings/structures and assault personnel
- ☐ Working at night

Detail the security measures to address the above risks: NA

12. Emergency Response

URS requires that all projects plan for reasonably foreseeable emergencies (see Emergency Response Planning Procedure S3AM-010-PR). Prior to the start of site operations, all personnel shall review the table below for site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures. An Incident Response Flow Chart is included in **Attachment A**.

12.1 Incident/ Emergency Contact Information

URS Contacts			
Name	**Title**	**Telephone Number**	**Mobile Phone**
Michael Gutmann	Project Manager	716 923-1120	716 345-4649
TBD	Site Supervisor	TBD	TBD
TBD	Site Safety Officer (unless when provided by client)	TBD	TBD
Peter Gregory, MPH, CSP, STS	Region SH&E Manager	973-883-8683	201-602-3511
Stacy Wells, CSP, CHST, MPH	Area SH&E Manager	212 377 8583	(917) 324-2554
Incident Reporting	DCS Incident Reporting & Help Line	800-348-5046	
URS Nurse direct	Use only after incident reporting line	877-878-9525	
Client Contacts			
Name	**Title**	**Telephone Number**	**Mobile Phone**
TBD		TBD	TBD
Organization/Agency			
Police Department (local)			911
Fire Department (local)			911
Ambulance Service (EMT will determine appropriate hospital for treatment)			911
Hospital: (Site personnel to use for emergency care) St. Elizabeth Medical Center, 2209 Genesee St, Utica, NY 13501			(315) 801-8100
Occupational Clinic: (Site personnel to use for non-emergency care) Primary Urgent Care, 1904 Genesee St, Utica, NY 13502			(315) 804-6800
Poison Control Center			800-222-1222
Pollution Emergency NYSDEC Spill Hotline			800-457-7362
INFOTRAC (URS's account number 74984)			800-535-5053
URS Hazardous Material Shipping Help Line			800-381-0664
Public Utilities			
Call Before You Dig			811

12.2 Muster Location

See Section 11.2

12.3 Communication Procedures

Air horn, cell phones, and others as dictated by the work assignment and THAs.

12.4 CPR/First Aid Trained Personnel

TBD – at least one AECOM field member will have current CPR/First Aid training

12.5 Incident Reporting

Incidents involving or affecting an URS employee or subcontractor will be reported in a prompt manner verbally to the site supervisor and project manager.

1. If the incident is a significant or life-threatening emergency, the employee or supervisor shall immediately dial 911 or the appropriate emergency contact phone number for your site.
2. The employee or supervisor shall contact the Incident Hotline (800-348-5046).
3. The employee or supervisor must notify their operational leaders and the Area SH&E Manager.
4. The supervisor, or delegate, must make initial notification in IndustrySafe within 4 hours for significant incidents, or 24 hours for less significant events event.
5. Client and account management notifications may also apply. The PM will make any necessary notifications.

Any injury, even if no treatment is required, and any incident for which assistance by SH&E Management is needed must be immediately communicated to the Incident Hotline at 1-800-348-5046.

All incidents are also to be reported to IndustrySafe within the timeframes listed below:

Incident Type	IndustrySafe Reporting Time Frame
Significant Incident, including any injury	➔ 4 Hours
All Other Incidents	➔ 24 Hours

Significant Incident:

- 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 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 (US) dollars;
- Any security-related incident that could have caused significant harm to an URS 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.

All Other Incidents:

- Any injury or illness to an URS employee or subcontractor, even if it does not require medical attention, including work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public, or clients, occurring on an URS-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 the requirements of a regulatory permit issued to URS.
- Scan the QR code below to access IndustrySafe reporting system from your smartphone/ device.

IndustrySafe
Safety Management Software

12.6 Medical Emergencies

In the event of a life-threatening or critical emergency, URS employees should dial 911 and follow the recommended instructions. However, in less serious situations, an injured employee or a co-worker should contact the Incident Hotline at 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 URS'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. A map to the designated hospital and clinic is attached as **Attachment A** and the locations and addresses are included in the table above as well as in the HASP Summary on Page i.

12.7 Vehicle Incidents

All vehicles should be rented through Carson Wagonlit Travel (accessible via Ecosystem) to ensure that URS insurance is included in the rental rate. All other insurances should be declined. URS'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**.

In the event of a vehicle incident (including collisions as well as mechanical difficulties such as breakdowns and flat tires) the following responses are recommended:

- For breakdowns and flat tires, contact an emergency provider.
- For rental vehicles, contact the rental company.
- To the extent possible, URS personnel should not change flat tires or perform similar repairs.
- If a collision has occurred, 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 and report the incident to the Incident Hotline at 800-348-5046 as soon as practical. If appropriate, wait for police to arrive before moving vehicles. Provide insurance information to other drivers if necessary or requested and collect the same. If

possible, obtain names and phone numbers of witnesses. Take photographs of the scene if possible. DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE, OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.

12.8 Spill or Release

URS 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.

12.8.1 Environmental Spill/Release Reporting

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 SS 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, URS has 15 minutes from the time of the spill/release to officially report it.**

Chemical-specific Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantities for the known chemicals onsite are shown in the table below.

CERCLA Reportable Quantities

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
Vinyl Chloride	VC	1
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.

12.8.2 Spill Evaluation and Response

The SSO is 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. Section 12.8.1 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 require evacuation of at least Enter Distance feet 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 is 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 Enter QTY pounds) in approved drums for proper storage or disposal as hazardous waste; and

12.8.3 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 is 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.

12.9 Fire

URS employees are not expected to attempt to put out fires. Stop work; notify all URS 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:

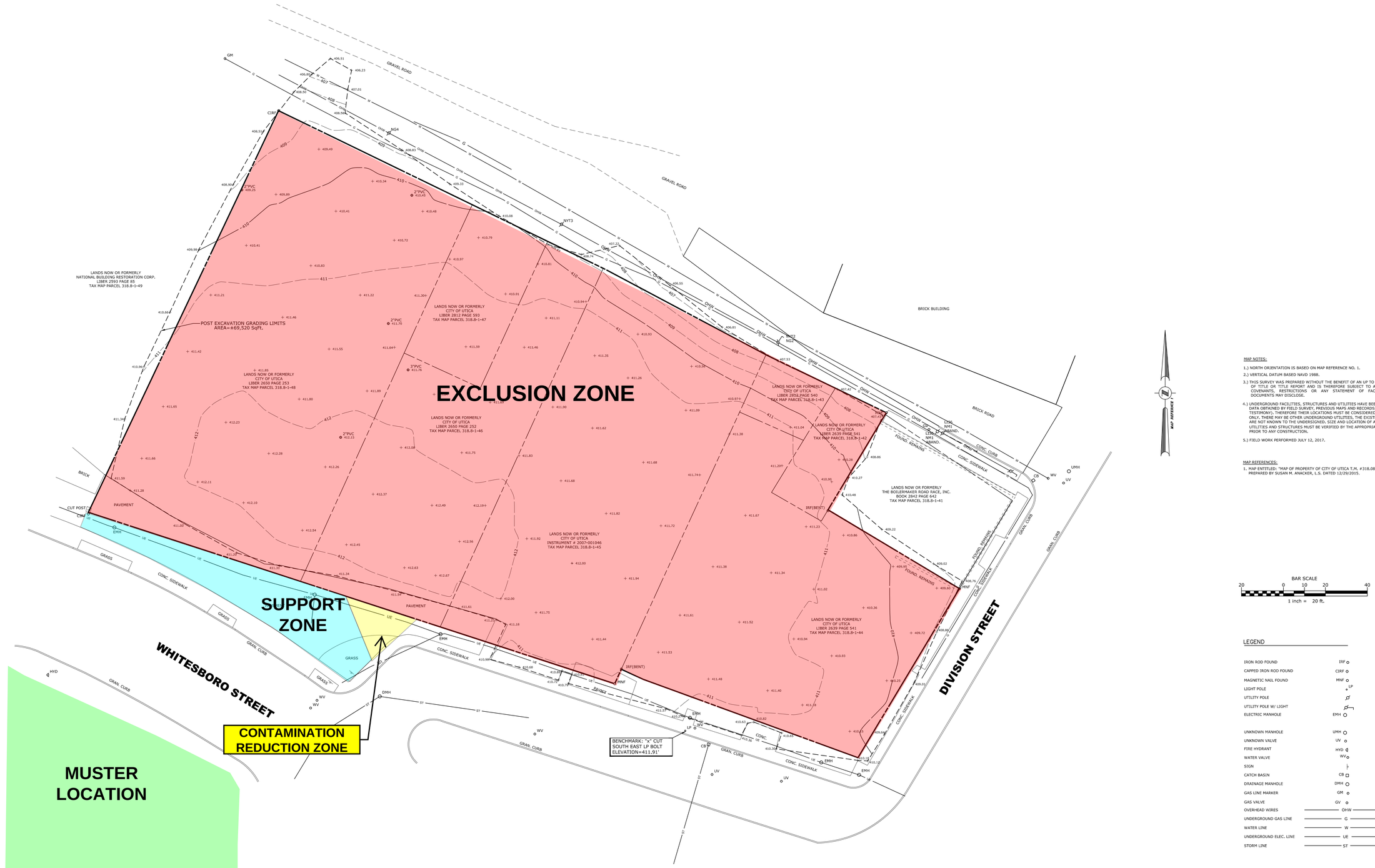
- The fire must be small (i.e., smaller than a trash can) and in its early stages
- The employee must have an escape route
- The employee must be trained and know they have the right type of extinguisher
- The employee must be safe from toxic gases
- There must be no hazardous conditions that could quickly 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

Figures

XREFS: NONE

PROJECT NUMBER: 17.7234

CAD DWG. FILE NAME: CTM NYSDEC SITE #B00063 Post Cap.dwg



MAP NOTES:

1.) NORTH ORIENTATION IS BASED ON MAP REFERENCE NO. 1.

2.) VERTICAL DATUM BASED NAVD 1988.

3.) THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN UP TO DATE ABSTRACT OF TITLE OR TITLE REPORT AND IS THEREFORE SUBJECT TO ANY EASEMENTS, COVENANTS, RESTRICTIONS OR ANY STATEMENT OF FACT THAT SUCH DOCUMENTS MAY DISCLOSE.

4.) UNDERGROUND FACILITIES, STRUCTURES AND UTILITIES HAVE BEEN PLOTTED FROM DATA OBTAINED BY FIELD SURVEY, PREVIOUS MAPS AND RECORDS, (AND PAROL TESTIMONY), THEREFORE THEIR LOCATIONS MUST BE CONSIDERED APPROXIMATE ONLY, THERE MAY BE OTHER UNDERGROUND UTILITIES, THE EXISTENCE OF WHICH ARE NOT KNOWN TO THE UNDERSIGNED, SIZE AND LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES MUST BE VERIFIED BY THE APPROPRIATE AUTHORITIES PRIOR TO ANY CONSTRUCTION.

5.) FIELD WORK PERFORMED JULY 12, 2017.

MAP REFERENCES:

1. MAP ENTITLED: "MAP OF PROPERTY OF CITY OF UTICA T.M. #318.08-1-42 THRU 48" PREPARED BY SUSAN M. ANACKER, L.S. DATED 12/29/2015.

MAP REFERENCE

BAR SCALE

20 0 10 20 40

1 inch = 20 ft.

LEGEND

IRON ROD FOUND	IRF
CAPPED IRON ROD FOUND	CIRF
MAGNETIC NAIL FOUND	MNF
LIGHT POLE	LP
UTILITY POLE	
UTILITY POLE W/ LIGHT	
ELECTRIC MANHOLE	EMH
UNKNOWN MANHOLE	UMH
UNKNOWN VALVE	UV
FIRE HYDRANT	HYD
WATER VALVE	WV
SIGN	
CATCH BASIN	CB
DRAINAGE MANHOLE	DMH
GAS LINE MARKER	GM
GAS VALVE	GV
OVERHEAD WIRES	OHW
UNDERGROUND GAS LINE	G
WATER LINE	W
UNDERGROUND ELEC. LINE	UE
STORM LINE	ST

DAVID J. UHRINEC, PLS
P.L.S. NO. 050052

STATE OF NEW YORK · DAVID JOSEPH UHRINEC · 050052 · LICENSED LAND SURVEYOR

DATE		REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				

APPROVED: dju
DRAFTED : dju
CHECKED : dju
PROJ. NO : 17.7234
SCALE : 1"=20'
DATE : 07/12/17

SITE CONTROL MAP

CITY OF UTICA — ONEIDA COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture & Landscape Architecture, D.P.C.
200 GATEWAY PARK DRIVE, BLDG. C, P.O. BOX 3246
SYRACUSE, NY 13220-3246
315.458.6498 * FAX 315.458.4427

FIGURE 11-1

SHEET 1 OF 1

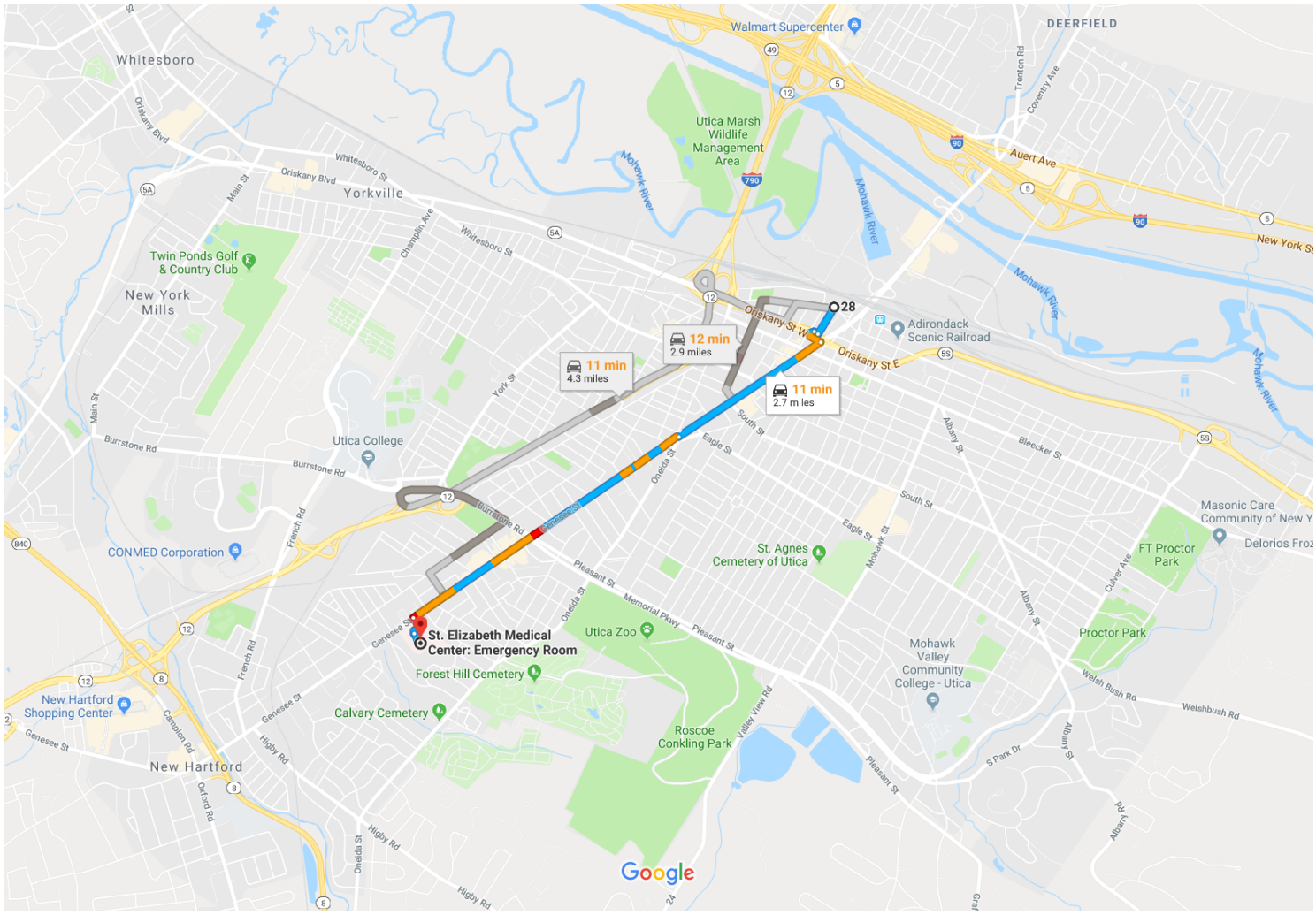
DWG. NO: 17-0416

"ONLY COPIES OF THIS MAP SIGNED IN RED INK AND EMBOSSED WITH THE SEAL OF AN OFFICER OF C.T. MALE ASSOCIATES OR A DESIGNATED REPRESENTATIVE SHALL BE CONSIDERED TO BE A VALID TRUE COPY".

Attachment A

Hospital and Clinic Directions/ Maps
Incident Reporting and Response Flow Chart

Google Maps 26 Whitesboro St #28, Utica, NY 13502 to St. Elizabeth Medical Center: Emergency Room Drive 2.7 miles, 11 min



26 Whitesboro St #28

Utica, NY 13502

Follow Hotel St to Liberty St/Oriskany St W

31 s (0.1 mi)

1. Head west on Whitesboro St toward Hotel St

30 ft

2. Turn left onto Hotel St

0.1 mi

Follow Genesee St

9 min (2.5 mi)

3. Turn right onto Liberty St/Oriskany St W

118 ft

4. Sharp left onto Oriskany St W

492 ft

5. Turn right onto Genesee St

Pass by NBT Bank Utica Financial Center (on the right in 0.5 mi)

0.8 mi

6. At the traffic circle, continue straight to stay on Genesee St

Pass by McDonald's (on the right in 0.9 mi)

1.5 mi

Drive to your destination

1 min (0.1 mi)

7. Turn left

259 ft

8. Turn right

292 ft

9. Turn left

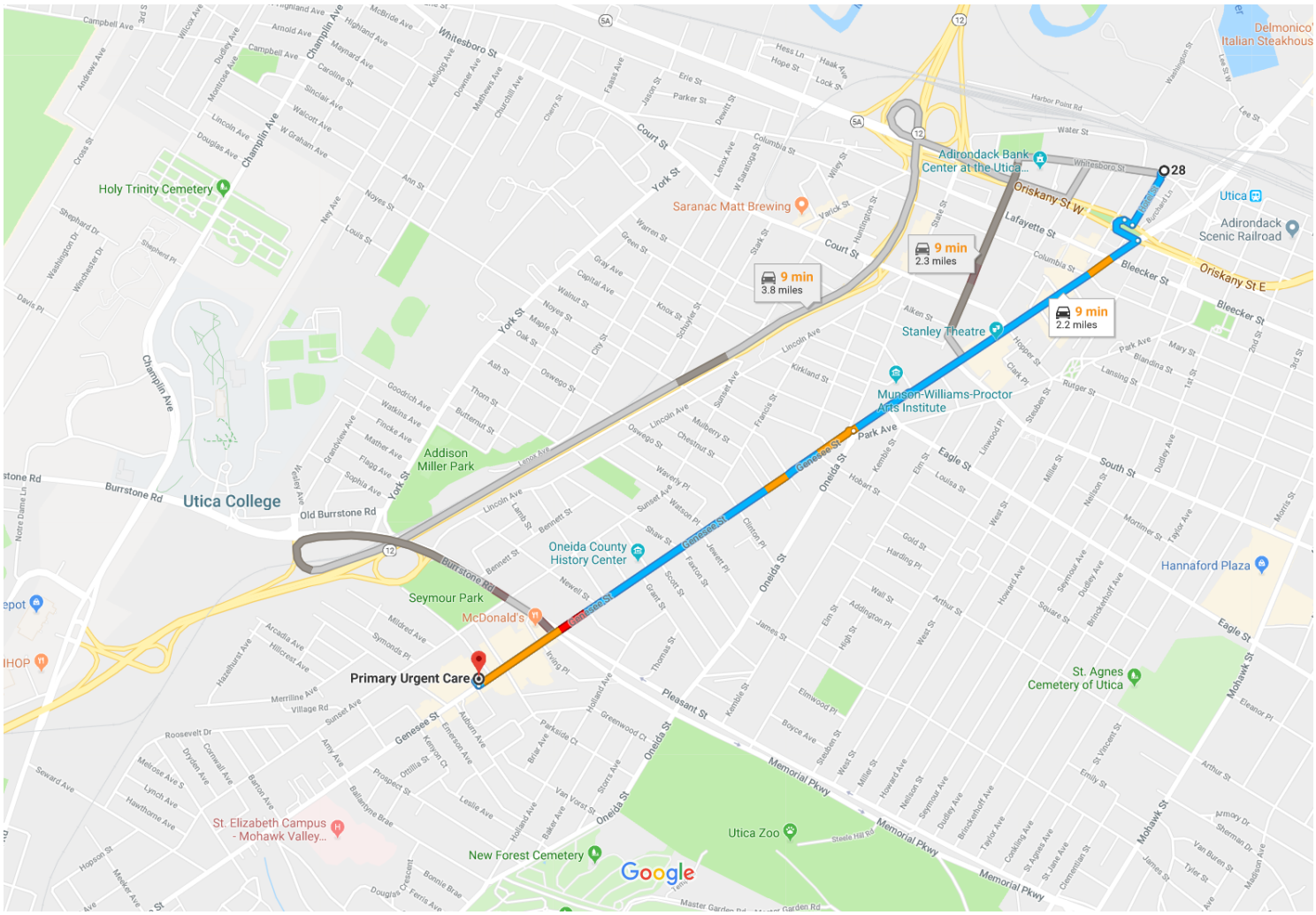
187 ft

St. Elizabeth Medical Center: Emergency Room

2209 Genesee St, Utica, NY 13501

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

Google Maps 26 Whitesboro Street #28, Utica, NY to Primary Urgent Care Drive 2.2 miles, 9 min



26 Whitesboro St #28

Utica, NY 13502

1. Head west on Whitesboro St toward Hotel St
   30 ft
2. Turn left onto Hotel St
   0.1 mi
3. Turn right onto Liberty St/Oriskany St W
   118 ft
4. Sharp left onto Oriskany St W
   492 ft
5. Turn right onto Genesee St
   Pass by NBT Bank Utica Financial Center (on the right in 0.5 mi)
   0.8 mi
6. At the traffic circle, continue straight to stay on Genesee St
   Pass by McDonald's (on the right in 0.9 mi)
   1.1 mi
7. Turn right
   Destination will be on the right
   72 ft

Primary Urgent Care

1904 Genesee St, Utica, NY 13502

AECOM

Work-Related Incident Flowchart for Employees | *Updated October 2016*

DCS - Americas

Work-Related Incident Occurs:

» Check that scene is safe before entering «

Injury / Illness

- Non-Emergency Medical including First Aid
  - Seek First Aid responder
  - Contact Supervisor/ Responsible Manager*
    - AND
    - Enter IndustrySafe within 24 hours
    - Call AECOM Incident Reporting Hotline within 60 minutes: 1-800-348-5046 - Hotline will route to AECOM nurses**
  - Injured Person completes Written Statement and uploads to IndustrySafe within 24 hours
- Emergency Medical
  - Call 911 immediately
  - Seek First Aid responder
  - Call AECOM Incident Reporting Hotline: 1-800-348-5046**
  - AND
  - Contact Supervisor/ Responsible Manager immediately*
    - AND
    - Call Regional SH&E Manager immediately
    - AND
    - Contact next tier Manager
    - AND
    - Enter Industry-Safe within 4 hours

Go to "Claims + Injury Management Flowchart"

Non-Injury

- Critical or Emergency Non-Medical
  - Call 911 immediately
  - Call AECOM Incident Reporting Hotline: 1-800-348-5046
  - AND
  - Contact Supervisor/ Responsible Manager immediately*
  - Enter IndustrySafe within 4 hours
- Non-Emergency Non-Medical
  - Contact Supervisor/ Responsible Manager*
  - AND
  - Call AECOM Incident Reporting Hotline: 1-800-348-5046
  - If motor vehicle accident, contact AECOM fleet manager***
  - Enter IndustrySafe within 24 hours

NOTE: The direct number to AECOM nurses, 1-877-878-9525, is active and can be used by employees. However, the AECOM SH&E team prefers that employees call the AECOM Incident Reporting Hotline. The Hotline will route all medical cases to AECOM nurses, AND they will trigger text messages directly to the SH&E team.

* Supervisor or Responsible Manager will initiate Client or Site Notification Process as appropriate

** If injured person is an AECOM subcontractor, call AECOM's nurses at 877-878-9525, or direct sub to their own provider.

*** For all AECOM vehicles, call Element at 1-800-446-7052.

Attachment B

URS SH&E Field Applicable Procedures

Attachment B. URS SH&E Field Applicable Procedures

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☒	**Cold Stress**	Working during winter.	S3AM-112-PR
☒	**Drilling, Boring & Direct Push Probing**	Monitoring well decommissioning	S3AM-321-PR
☒	**Excavation**	Excavation as part of potential site development	S3AM-303-PR
☒	**Hand and Power Tools**	Accessing monitoring wells.	S3AM-305-PR
☒	**Heat Stress**	Working during summer.	S3AM-113-PR
☒	**Highway and Road Work**	Working alongside roadways and sidewalks.	S3AM-306-PR
☒	**Wildlife, Plants and Insects**	Sampling monitoring wells	S3AM-313-PR
☒	**Working Alone**	Sampling monitoring wells	S3AM-314-PR

Americas

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 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^{o}F (35^{o}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^{o}F or -12^{o}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^{o}F (15^{o}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^{o}F (-1^{o} C).
- If the air temperature falls below 60^{o}F (15^{o}C) for sedentary work, 40^{o}F (4.4^{o} C) for light work, or 20^{o}F (-6^{o}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^{o}F (4.4^{o}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^{o}F (-12^{o}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 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 of 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	5	-26° to -28°
-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				-32° to -34°
-30° to -34°	55 min	3	40 min	4	30 min	5	Cease Work						-35° to -37°
-35° to -39°	40 min	4	30 min	5	Cease Work								-38° to -39°
-40° to -44°	30 min	5	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^{o}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 increases 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

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 food, is frostbitten.

1.1.7 If exposure occurs in temperatures that are below freezing (32ºF 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 (102ºF to 105ºF) 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.

Americas

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.

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 devises, 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 70ºF (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

Americas

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

	Step 2 - Risk Factor Adjustment	
Write in value	What is the HUMIDEX value from the table in Step 1?	
	Radiant Heat	**Adjustment**
	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
	Clothing: Pick One Only	
	Short/long sleeve shirt and pants – no overalls	None
	Overalls (e.g., Nomex suit)	Add 3
	Double layer overalls	Add 5
Stop	Impermeable clothing	Perform Physiological Monitoring
	Acclimatization	
	Have been working at least 5 of last 7 days in heat stress conditions.	Subtract 4
	Work Load & Miscellaneous Factors	
	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
	TOTAL – Compare to Heat Index Response Plan	

- Step 3: Compare adjusted Heat Index Total to the Heat Index Response Plan table to obtain guidance for work/rest.

Heat Index Response Plan*

TOTAL NUMBER	Final Step 3 - HEAT INDEX Response
30-33	alert & information & water
34-37	warning & increase water
38-39	75% work - 25% rest & monitor for signs of heat stress
40-41	50% work - 50% rest & monitor for signs of heat stress
42-44	25% work - 75% rest & monitor for signs of heat stress
45+	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[1]	+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 (*ignore if indoors or wearing CPC*)	
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 (*ignore if wearing CPC*)	
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[2]
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

[1] This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

[2] 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)
Stop Work	**>120** (48.88°C)	**>110** (43.33°C)	**>100** (37.77°C)	**>95** (35°C)

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths.

Americas

Symptoms & Treatment

S3AM-113-ATT2

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. Symtpoms 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 104ºF (40ºC). 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 (38ºC);
- 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.

Americas

Dehydration Chart

S3AM-113-ATT3

GUIDANCE TOOL FOR MONITORING DEHYDRATION

URINE COLORATION CHART

1 2	3 4	5 6
Target	Dehydration	Severe Dehydration
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.	STOP WORK! 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.

AECOM

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.

Project Name:					**Foreman/Supervisor:**						**Work/Rest Schedule1:**		IN *(min)*		OUT *(min)*	
Date:	**Water Provided**[1]		**Acclimated**[2]		**Initial Vitals**[3]	**Vital Signs and Time In/Out**[3]					**Celcius** ☐ / **Farenheit** ☐ (select one)					
Employee Name	Yes	No	Yes	No	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)
					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**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					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**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		

1. Each Employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.
2. Am 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.
3. “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.

Americas

Excavation

S3AM-303-PR1

1.0 Purpose and Scope

1.1 To evaluate all excavation operations to provide proper protective systems for employee protection from associated hazards.

1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 **Benching (Benching system)** – One or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels to protect employee from cave-ins.

2.2 **Cave-in (collapse)** – The separation of a mass of soil or rock material from the side of an excavation or the loss of soil from under a trench shield or support system and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

2.3 **Competent person** – Person, who, by way of training, knowledge, and/or experience, is capable of classifying soils and is also capable of identifying existing and predictable hazards in excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. The person shall also be familiar with the requirements in the regulation.

2.4 **Excavation** – A manmade cut, cavity, trench, or depression in an earth surface formed by earth removal. Examples include trenches, tunnels, shafts, caissons and open cut holes.

2.5 **Faces (or sides) –** The vertical or inclined earth surfaces formed as a result of excavation work.

2.6 **Failure** – A structural member's integrity and supportive capabilities is compromised, causing a breakage, displacement, or permanent deformation.

2.7 **Hazardous Atmosphere** – An atmosphere that by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful may cause death, illness, or injury.

2.8 **Protective Systems** – Devices or methods in protecting employees in an excavation from cave-ins, a collapse or falling material. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

2.9 **Ramp** – An inclined walking or working surface that is used to gain access to one point from another and is constructed from earth or from structural materials such as steel or wood.

2.10 **Professional Engineer** – A registered engineer who can authorize any state of work by his professional designation. A **Professional Engineer** registered in the State, Province, or territory is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

2.11 **Shield (Shield system)** – A structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

2.12 **Shoring (Shoring system) –** A structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and that is designed to prevent cave-ins.

2.13 **Sloping (Sloping system)** – An alternative to shoring is trench sloping. This means that the trench walls are cut back to decrease the possibility of cave-ins. The angle of incline required to prevent a cave-in varies with such factors as soil type, environmental conditions of exposure, and application of surcharge loads.

2.14 **Stable rock** – A natural solid mineral material that can be excavated with vertical side wall; unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against cave-in or movement by rock bolts or by another protective system that has been designed by a **Professional Engineer**.

2.15 **Support system** – A structure such as underpinning, bracing, or shoring that provides support to an adjacent structure, underground installation, or the sides of an excavation.

2.16 **Trench** – An open narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width (measured at the bottom) is often not greater than 15 feet (4.57 meters). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.57 meters) or less (measured at the bottom of the excavation), the excavation is also considered a trench.

2.17 **Trench Box –** A trench box is a unit of shoring that is an engineered shoring system capable of protecting workers in case of cave-in of trench walls. The space between the trench wall and the trench box shall be backfilled.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-202-PR1 Competent Person Designation

3.3 S3AM-218-PR1 Permit to Work

3.4 S3AM-322-PR1 Overhead Lines

3.5 S3AM-331-PR1 Underground Utilities

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers**

- Shall confirm that all projects under their direct control or authority and which involve excavations or trenching are conducted in a safe and efficient manner and in accordance with the requirements of this procedure and local legislation.
- Shall confirm that all projects under their direct control or authority have a written Safe Work Plan (SWP)/Health and Safety Plan (HASP) prepared for the activity.
- Confirm the applicable *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* or equivalent has been completed and is reviewed prior to commencing any excavation activities.

4.1.2 **Professional Engineer**

- The professional status and the actual practice of professional engineering is legally defined and protected by law. In some jurisdictions, only licensed engineers (sometimes called registered engineers) are permitted to "practice engineering.
- For the purposes of this procedure, determination of soil condition and the safe management of the shoring, sloping or benching may require consultation, specifications and/or design by a Professional Engineer.

4.1.3 **Competent Person**

- Shall be present during all work that involves entry by AECOM personnel into trenches or excavations greater than 5 feet (1.52 meters) in depth (as above).
- Does not have to be an AECOM employee; however, an AECOM competent person shall be qualified per *S3AM-202-PR1 Competent Person Designation*.
- Shall identify prompt corrective measures to eliminate recognized present or anticipated hazards.
- The competent person shall be identified in the SH&E Plan for the location or project, and the Task Hazard Assessment for the particular task.
- The competent person:
  - Will determine the maximum allowable slope for the walls of the trench or excavation.
  - Will classify the soil in the trench or excavation in accordance with the requirements specified in the applicable legislation prior to determining that a maximum allowable slope, other than 34 degrees with the horizontal is selected.
  - Will inspect the excavation or trench on a daily basis when the potential for employee exposure to the hazards of the trench or excavation exists (*S3AM-303-FM1 Daily Excavation Checklist*).

4.1.4 **Employees**

- Maintain appropriate training for the excavation and the applicable tasks, and competency in the associated procedures (e.g. communication, rescue, etc.) and use of the necessary personal protective equipment (PPE). Refer to *S3AM-003-PR1 SH&E Training* and *S3AM-208-PR1 Personal Protective Equipment.*
- Know the location specific Emergency Response Plan and be able to recognize the potential for real hazards associated with the Excavation.
- Refrain from making any attempt to enter an excavation without approval and first meeting the requirements of this procedure and the applicable SH&E Plan (SWP)/Health and Task Hazard Assessment (THA).

4.2 Restrictions

4.2.1 Because of their inherent dangers, entry into trenches and excavations shall not be performed if there are means other than entry to perform the work. Where entry into trenches and excavations is necessary, strict adherence to the procedures specified below is extremely important. Whenever there are questions regarding the safety of trench or excavation entry, contact shall be made with the Competent Person or the SH&E Manager.

4.2.2 No one shall enter any trench or excavation until the walls have been adequately cut back or temporary protective structures have been installed unless the trench or excavation is shallower than stabilized.

4.2.3 Excavation work shall be completed and inspected in accordance with the written instructions of a qualified professional and in accordance with jurisdictional legislative regulations.

4.3 Excavation and Trenching Permit

4.3.1 If required by the applicable jurisdiction, confirm notification of the proposed excavation is provided within the required timeframe to the appropriate agencies or governing bodies prior to commencing excavation (e.g. California – CAL/ASHA Excavation Permit for the construction of trenches or excavations that are 5 feet (1.5 meters) or deeper that will be entered; Manitoba WHS Branch notification in order to obtain registration number, etc.).

4.3.2 An Excavation and Trenching Permit (*S3AM-303-FM2 Excavation & Trenching Permit* or equivalent) shall be completed prior to all excavation or trenching activities

4.3.3 The Excavation and Trenching Permit shall be completed and signed by all applicable parties as indicated on the permit. The Project Manager shall determine which signatures are required.

4.3.4 Excavation and Trenching Permits may be valid for up to one week; however the permit shall be reviewed at the beginning of each shift.

4.3.5 Refer also to *S3AM-218-PR1 Permit to Work* for additional guidance related to Safe Work Permits.

4.4 Planning and Preparation

4.4.1 Prior to beginning any excavation work at a site, the location of all underground and overhead utilities shall be identified and work locations will be carefully planned to avoid any potential for inadvertent contact with them.

4.4.2 Clearance, including hand exposure, of underground utilities shall be completed in accordance with *S3AM-331-PR1 Underground Utilities*. The associated *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* or equivalent shall be available and reviewed with all employees expected to be involved in the excavation prior to commencing any excavation activities.

4.4.3 Identify any overhead power lines and de-energize or protect by other appropriate means. Refer to *S3AM-322-PR1 Overhead Lines*.

4.5 Excavation Requirements

4.5.1 A Professional Engineer shall be engaged if specified by the applicable jurisdiction and as appropriate to the soil conditions and proposed excavation considerations (e.g. wall slope, shoring requirements, load calculations, etc.).

4.5.2 All personnel involved in the excavation activities shall be appropriately trained to their respective activities and associated hazards. Refer to *S3AM-003-PR1 SH&E Training*.

4.5.3 All personnel involved in the excavation activities shall wear the required PPE, including reflective clothing if mobile equipment or vehicular traffic. Refer to *S3AM-208-PR1 Personal Protective Equipment.*

4.5.4 The Task Hazard Assessment (THA) or Safe Work Plan (SWP) identifying applicable hazards and appropriate control measures shall be completed and clearly communicated to all involved personnel as well as to any concurrent operations potentially affected. The work environment shall be monitored for changing conditions and the THA / SWP updated accordingly.

4.5.5 Excavation shall be conducted in a manner that minimizes environmental impact.

4.5.6 Excavated (spoil) material shall be kept at least 3.2 feet (1 meter) from the edge of the excavation, or further if local regulations are more stringent.

- Excavated (spoil) material shall be piled in a manner to prevent sloughing of loose material. Various jurisdictions provide specific spoil pile sloping requirements.

4.5.7 If the walls of an excavation or trench are not sloped or cutback, barriers shall be placed around the perimeter. The barrier shall be at least 3.6 feet (1.10 meters) in height.

4.5.8 If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored regularly to confirm proper operation.

4.5.9 If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require regular inspections.

4.5.10 All excavations shall be appropriately secured at the end of the day to prevent unauthorized entry or inadvertent entry into the excavation. This may require a protective covering, barriers, fencing, signage or other measures appropriate to the excavation and associated conditions.

4.5.11 Backfill trenches as soon as reasonably possible after work is complete.

4.6 Soils Classifications

4.6.1 Soil classification shall be conducted to confirm appropriate measures are taken to protect workers and to secure excavation walls. Measures may include, but are not limited to:

- Sloping, shoring or shielding.
- Relocation of equipment or materials.
- Scheduling to minimize concurrent operations.

4.6.2 Soil characteristics evaluated when classifying include, but are not limited to:

- Cohesiveness / compaction / compressive strengths (e.g. fissured, hardpan, fractured rock, etc.).
- Composition (sand, clay, gravel, layered, etc.).
- Moisture content / submersion.
- Compaction.
- Exposure to vibration (e.g. traffic, pile driving, etc.).
- Previous disturbances.

4.6.3 Consult the applicable jurisdictional requirements as classification methods, definitions and terms can vary. In general classifications or types include:

- Stable soil that is dense and heavy and consists primarily of clay.
- Soil with a medium level of stability and generally includes soils such as silt, sandy loam, and medium clay.
- Unstable soil which generally includes gravel, loamy sand, and soft clay.

4.7 Protective System Requirements

4.7.1 Protective systems shall be used to protect workers entering an excavation when there is a potential for cave in, and is required when:

- An excavation is greater than 4 feet (1.22 meters) in depth and is not entirely in stable rock.
- A worker is required to be closer to a trench wall than the height of the trench wall.
- A worker will approach closer to the side or edge of the excavation that the distance equal to the depth of the excavation.

4.7.2 The protective system may include sloping the excavation walls, shoring the excavation walls, and/or installing a shielding system. The protective system(s) chosen shall have the capacity to resist, without failure, all loads to be applied to the system.

4.7.3 Slope angle, or type of shoring or shielding shall be determined by:

- Soil classification – including structure, strength, moisture content.
- Depth of the excavation
- Weather and environmental conditions.
- Anticipated duration of excavation activities.
- Loading of soil and soil stress (e.g. proximity of structures, location of equipment, stored material, anticipated vibration, etc.)

Factor	Description / Examples
Soil Structure and Strength	Proper classification of soil is necessary in order to select appropriate protection methods. Trench walls, at first glance, may appear to have strength, particularly if rock is encountered. Fractures in the rock can develop because of construction and soil strength may fail when subjected to undercutting or high-energy impacts. Irregular slopes on stratified soils that appear stable can fail if lower materials do not have adequate strength.
Excavation Depth	Jurisdictional requirements may specify the type of protective methods that are required at given depths. Additionally, consultation of a professional engineer may be necessary.
Soil Moisture Content	Soil may be moist even though the weather has been dry. Care shall be taken and appropriate protection methods employed if the soil appears to be moist.
Weather and Humidity	These can have a significant impact on excavation wall stability and effectiveness of protection methods. Frozen stable soil may collapse if warm mild weather persists. Percolation of water into the soil can increase the load on shoring due to the increased weight and mobility of saturated soils. Frozen ground does not preclude the need to appropriately slope, shore or shield unless the freezing process is designed and approved by a Professional Engineer.
Loading and Soil Stress	Stress can originate from many sources. Heavy machinery passing close to the excavation creates vibrations that decrease the soil strength and can result in wall collapse or shoring failure if it is inadequate to these conditions. Stationary equipment at the edges of the excavation can transmit loads and additional stresses to the excavation wall and method of protection.
Trench Depth and Width	These directly influence the choice of materials and the spacing of support bracing. The shoring requirements of a wide and deep trench differ substantially from those of a narrower trench.
Erosion Time	If excavations are to be left for extended periods, different methods of protection may be required and shoring materials may have to be increased.

4.7.4 If an excavation may affect the stability of an adjacent building or structure, precautions shall be taken to prevent damage to the structure. The precautions shall be specified in writing by a Professional Engineer.

4.7.5 All sloping, shielding, or shoring shall be conducted in accordance with applicable Federal, State, Provincial, Territorial or Legislative regulations.

4.7.6 Exceptions. Each individual in an excavation shall be protected from cave-ins and trench collapse by an adequate protective system except when:

- Excavations are made entirely in stable rock.
- Excavations are less than 4 feet (1.22 meters) in depth and an examination of the excavation by a Competent Person reveals no indication of a potential cave-in.

4.7.7 The depth of the excavation or trench is to be measured at its greatest vertical dimension. Be aware that crouching or kneeling in a trench that is less than 3 feet (0.91 meter) in depth may still pose significant hazard for the employee involved.

4.7.8 Consult the applicable jurisdiction's requirements concerning the standards that protective systems shall meet; this may include design and certification by a Professional Engineer.

4.7.9 A Professional Engineer can properly assess the need for and the type of shoring required for specific applications. Shoring may not be needed in all cases, but failure to recognize the need for shoring can be catastrophic.

4.8 Use of Sloping as a Means of Protection

4.8.1 Sloping the walls of the trench or excavation is the preferred, and typically simplest, means of protecting employees who shall enter trenches or excavations which are greater than 4 feet (1.22 meters) in depth or where there is danger of collapse.

4.8.2 If sloping is used as the means of protection, the trench or excavation walls shall be sloped back so that the ratio of the horizontal distance to the vertical rise (H:V ratio) of the sloped wall or degree from horizontal is appropriate to the soil type and in compliance with jurisdictional requirements.

4.8.3 In many cases, determining the maximum allowable slope may allow the use of a steeper slope, which will result in a narrower excavation. However, determination of soil classification is complicated and requires that the Competent Person be familiar with the manual and visual tests. Since incorrect soil classification may result in the use of a steeper, and potentially unsafe, slope, it

is recommended that an angle of 34 degrees (or less given specific jurisdictional requirements and unstable soil types) with the horizontal typically be selected.

4.9 Use of Shoring or Shielding as a Means of Protection

4.9.1 Where sloping the walls of the trench or excavation is unfeasible (e.g., when there are dimensional constraints or adjacent structures), the use of shoring or shield systems (e.g., trench boxes) may be necessary.

4.9.2 Soil classification is required. The excavation shall comply with one of the four options below:

- The soil shall be classified and the timber shoring be constructed in accordance with applicable legislative regulations.
- Other protective systems meeting applicable legislative regulations shall be utilized (e.g., shield systems, trench jacks, aluminum hydraulic shoring, etc.) and the manufacturer's data shall be explicitly followed.
- A protective system meeting applicable legislative regulations shall be utilized based on tabulated data which has been approved by a Professional Engineer.
- A protective system meeting applicable jurisdictional requirements and designed by a Professional Engineer shall be utilized and installed in accordance with the engineer’s written plans.

4.9.3 In all cases listed above, the SH&E Manager shall be contacted before proceeding.

4.9.4 Workers shall be protected whenever shoring is being installed or removed.

4.9.5 Shoring, stringers or bracing shall be installed from the top of the trench or excavation down. Removal shall be completed from the bottom up unless conditions exist that would make doing so unsafe. A removal method shall be developed that does not require worker entry.

4.9.6 Check hydraulic shoring once per shift at a minimum (leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, other damaged or defective parts) and more frequently as required.

4.9.7 Hydraulic or pneumatic trench jacks shall have a means of ensuring that they will not collapse in the event of loss of internal pressure.

4.9.8 Shielding and Trench Boxes differ from shoring in that their design is intended primarily to protect workers from cave-ins and similar incidents. They may be used in combination with sloping and benching.

- The excavated area between the outside of the trench box and the face of the trench should be as small as possible and may be backfilled to prevent lateral movement of the shield.
- The box shall extend at least 18 inches (0.45m) above the surrounding area, or as specified by the applicable jurisdiction, if there is sloping toward excavation. This can be accomplished by providing a benched area adjacent to the box.
- Earth excavation below the shield is permitted only if:
  - The excavation does not exceed a depth of 2ft (0.61m) below the shield,
  - The shield is capable of withstanding the forces calculated for the full depth of the trench, and
  - There are no indications while the trench is open of possible loss of soil from behind or below the bottom of the support system.
- A shield shall not be subjected to loads exceeding those for which it was designed to withstand.

4.9.9 Bell-bottom pier holes that are to be entered by workers shall be designed and supported according to written instructions of a registered professional engineer.

- Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, should wear a harness with a retrieval line securely attached to it.
    - Retrieval lines shall not be used to handle materials.
    - Rescue equipment shall be individually attended at all times while the employee wearing the retrieval line is in the excavation.

4.10 Work Around the Trench/Excavation

4.10.1 Structural ramps used for excavation access or egress of equipment shall be constructed in accordance with jurisdictional requirements and the instructions or designs of an individual competent and qualified in structural design.

4.10.2 If the ramp has an open side, it shall have a curb or a restraining device.

4.10.3 Confirm equipment placement does not compromise the integrity of the excavation wall and optimizes visibility of work zone and any contact hazards (spoil placement should also take these into consideration). Use wheel chocking or barricades as necessary to prevent encroachment of edge.

4.10.4 If the appropriate setback of equipment is not possible confirm appropriate blocking or matting is used to disperse weight. These requirements may need to be determined by a professional engineer.

4.10.5 While workers are in a trench, an aboveground observer or spotter shall be present to warn of earth movements and to advise equipment operators of the presence and location of those in the trench so as to avoid vibrating equipment near trenches or excavations.

4.10.6 If there is a danger of a worker or equipment falling into an excavation, or whenever the edge is not clearly visible, identify the trench or excavation perimeter with visual markers (e.g., barricade tape, wooden railings, stop logs, etc). If the trench or excavation is 4 feet (1.22 meters) or greater in depth, the visual barrier shall be a minimum of 6 feet (1.83 meters) from the edge.

4.10.7 Personnel shall notify workers of the excavation through flagging, marking, safeguards, or other appropriate and effective means.

4.10.8 If walkways are permitted over excavations or trenches (e.g. trench over 6 feet [1.8 meters] in depth and wider than 30 inches [76 centimeters]), the installation shall be in such a manner as to not compromise the stability of the excavation.

4.10.9 Walkways shall be equipped with guardrails and constructed in accordance with jurisdictional requirements.

4.10.10 If vehicle crossings over excavations are required, they shall be designed by and installed under the direction of a Professional Engineer.

4.10.11 Precautions shall be taken to isolate or remove loose rocks, trees, or other materials that may slide, roll, or fall into the trench and onto workers prior to entry by workers into an excavation.

4.10.12 While operating heavy equipment in the work area, the equipment operator shall maintain communication with a designated signal person through either direct voice contact or approved standard hand signals.

4.10.13 When mobile equipment is operated adjacent to an excavation or when such equipment is required to approach the edge of an excavation and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or stop logs shall be used. If possible, the grade should be away from the excavation.

4.10.14 All site personnel should maintain a safe distance and remain clear of the swing of operating excavation equipment.

4.10.15 Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles

being loaded or unloaded when the vehicles are equipped to provide adequate protection for the operator during loading and unloading operations.

4.10.16 All materials such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Materials and equipment shall be stored in a designated area so as not to endanger personnel at any time.

4.10.17 A flagman with roadwork, signs, cones, and high-level warning signs shall be provided when it is necessary to control normal vehicular traffic due to vehicles, such as end-dumps, entering, or leaving the site.

4.11 Work Within the Trench/Excavation

4.11.1 Personnel shall not be permitted on the faces of sloped or benched excavations at levels above other workers unless those workers at lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

4.11.2 Employees shall not work in excavations in which there is accumulated water or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and retrieval line.

4.11.3 A stairway, ladder, ramp, or other safe means of egress shall be located in excavations or trenches that are 4 feet (1.22 meters) or more in depth so as to minimize lateral travel for employees. Jurisdictional maximum lateral travel distances vary between 25 feet (7.6 meters) and 49 feet (15 meters). In the absence of jurisdictional specification, travel distance shall not exceed 25 feet (7.6 meters). Ladders should extend at least 3 feet (0.91 meters) above the trench top.

4.11.4 Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design and shall be constructed in accordance with the design.

4.11.5 Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement. Structural members used for ramps and runways shall be of uniform thickness. Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping. Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

4.12 Confined Spaces and Hazardous Atmospheres

4.12.1 An excavation may contain hazardous gases, vapors, dusts, fumes or an oxygen deficient or enriched atmosphere.

- To prevent exposure to harmful levels of atmospheric contaminants, the hazard assessment shall evaluate atmospheric hazards when workers are required to enter trenches and excavations:
    - Greater than 4 feet (1.22 meters) in depth in which a hazardous atmosphere exists, or could reasonably be expected to exist, such as in excavations in landfill areas, where equipment is exhausting nearby, or where hazardous substances are stored nearby.
    - Less than 4 feet (1.22 meters) in depth if workers could be exposed to a hazardous atmosphere (e.g. crouching).
- Appropriate atmospheric testing is necessary to accurately identify these hazards. Ongoing atmospheric monitoring, use of attendants and rescue equipment may be necessary to address the identified hazards.

4.12.2 Confined spaces may exist in excavations where there is limited access or egress and in which a hazardous gas, vapor, dust, or fume or an oxygen-deficient atmosphere may occur. Confined

space entry shall be performed in accordance with the requirements specified in *S3AM-301-PR1 Confined Spaces*. Consult the applicable jurisdictional requirements as the excavation may or may not be subject to confined space requirements.

4.12.3 Adequate precautions, such as mechanical ventilation or appropriate respiratory protection, shall be taken prior to entry into trenches and excavations in which hazardous atmospheres exist or could reasonably be expected to exist.

4.12.4 When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to confirm that the atmosphere remains safe. Atmospheric testing will be conducted in the anticipated breathing zone of the work area to determine oxygen content, combustible gas, and toxic gases and vapors, if applicable.

4.12.5 Appropriate respiratory protection shall be donned prior to entry into any trench or excavation in which airborne levels of toxic substances are present at concentrations in excess of their Threshold Limit Value/Occupational Exposure Limit or Permissible Exposure Limit.

4.12.6 Confirm appropriate emergency response measures are in place as necessary, including but not limited to:

- Location Specific Emergency Response Plan shall include procedures applicable to the potential emergencies the excavation work may present.
- Communication methods shall be established.
- Equipment such as spill kits, breathing apparatus, and retrieval equipment, shall be readily available.
- Where hazardous atmospheres are present rescue equipment shall be attended when workers have entered the excavation.

4.13 Stability of Adjacent Structures

4.13.1 Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to confirm the stability of such structures for the protection of employees.

4.13.2 Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall not be permitted except when:

- A support system, such as underpinning, is provided to confirm the safety of employees and the stability of the structure; or
- The excavation is in stable rock; or
- A Professional Engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or
- A Professional Engineer has approved the determination that such excavation work will not pose a hazard to employees.

4.13.3 In addition, sidewalks, pavements, and secondary structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

4.14 Inspections

4.14.1 Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a Competent Person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. Refer to *S3AM-303-FM1 Daily Excavation Checklist.*

4.14.2 An inspection shall be conducted by the Competent Person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-

increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

4.14.3 Where the Competent Person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to confirm their safety and the permit reissued or revised.

4.15 Backfilling

4.15.1 Perform any required notifications within the necessary timeframes prior to backfilling.

4.15.2 Confirm accurate classification of soil types of backfill material and absence of signs of contamination, discoloration and smell.

4.15.3 Confirm the re-establishment of the original soil integrity using the original material (if suitable) or designated fill material(s). A small cap of material on top of the ditch/hole should be left to allow for sloughing and settling of material.

4.15.4 Backfilling shall be done with care to prevent damage to any exposed utilities or facilities.

4.15.5 A spotter may be necessary to avoid encroachment (e.g. working around other equipment, traveling under overhead lines, working in close conjunction to underground facilities and other workers, compromised line of vision) and to watch for any rocks falling into the excavation, which may damage exposed facilities. If fill contains rocks or hard material, a shield or alternate fill material may be used to protect the facilities

4.15.6 Confirm piping or facilities are properly supported prior to backfilling.

4.15.7 If shoring was used, remove from the bottom up.

4.15.8 If a trench box has been used it should be placed no more than 24” above the base of the excavation or a sub-trench bed containing the pipe.

4.15.9 Appropriate measures shall be taken to confirm proper backfilling and compaction of the soil below the trench box. Removing and reinserting the trench box multiple times may be necessary to accomplish this.

4.15.10 Dragging of a trench box shall only be permitted if it will not damage facility or disturb the backfill, otherwise it shall be lifted vertically. No worker shall occupy a trench box while it is being moved.

4.15.11 If compaction is required confirm the appropriate method is employed and compaction testing is conducted in a manner that does not damage any facilities or pipelines in the excavation.

4.15.12 Final grading and cover of the ground disturbance should confirm corrosion control. Original state of the area and access shall be considered in completion of backfilling.

4.15.13 Any excess excavation material shall be properly disposed of.

5.0 Records

5.1 Completed Daily Excavation Checklist, Permits and applicable notifications shall be retained in the project files for +1 year.

6.0 Attachments

6.1 S3AM-303-FM1 Daily Excavation Checklist

6.2 S3AM-303-FM2 Excavation & Trenching Permit

Americas

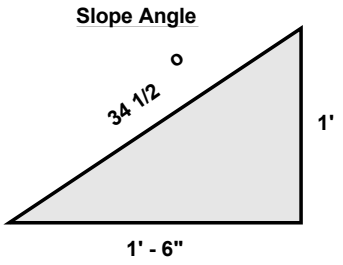
Daily Excavation Checklist

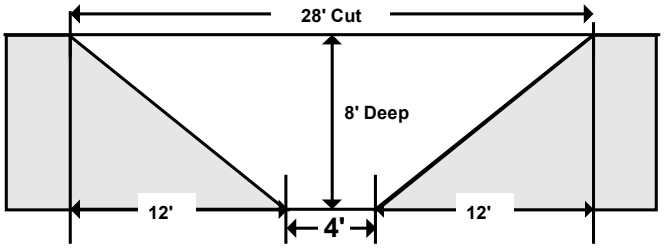
S3AM-303-FM1

Daily Excavation Checklist			
Competent Person Name:		Date:	
Competent Person Signature:			
Site Location:		Project Number:	
Soil Type:	Excavation Depth:	Excavation Width:	
Type of Protective System Used:			
Indicate for each item: Yes – No – or N/A for not applicable:			

1. General Information:	**Yes**	**No**	**N/A**
a. Is there a potential for a cave-in? ***IF YES, excavation must be sloped, shored, or shielded.**			
b. Is excavation deeper than (enter jurisdictional requirement)? *** IF YES, excavation must be sloped, shored, or shielded.**			
c. Is sloping used as your protective system?			

Slope information to keep in mind:





Example of a Simple 34-degree Slope commonly used around the site for cave-in protection.

d. Was a manual method utilized to determine Soil Classification? Type			
e. Was a visual method utilized to determine Soil Classification?			
Soil classification comments:			

2. Training:	Yes	No	N/A
a. Have all individuals had Excavation Safety Awareness Training?			
b. Have all individuals reviewed the site specific Emergency Response Plan?			
3. Inspection of Job Site	**Yes**	**No**	**N/A**
a. Are excavations, adjacent areas, and protective systems inspected by a competent person daily before the start of work?			
b. Does the competent person has the authority to remove all individuals from the excavation immediately?			
c. Are surface encumbrances removed or supported?			
d. Are all individuals protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation?			
e. Are hard hats, safety-toed boots, and safety glasses worn by all individuals?			
f. Is spoil pile set back at least 3.2 feet (1.0 m) from the edge of the excavation and sloped to prevent sloughing and according to jurisdictional requirements?			
g. Are adequate barriers provided at all excavations, wells, pits, shafts, etc.?			
h. Are warning vests or other highly visible clothing provided and worn by all individuals?			
i. Are all individuals required to stand away from vehicles being loaded / unloaded?			
j. Are warning system established and utilized when mobile equipment is operating near the edge of the excavation (e.g., barricade tape, signalpersons, stop logs, etc)?			
k. Are all individuals prohibited from going under suspended loads?			
l. Are materials and equipment set back 3.2 feet (1.0 m) or greater from the edge of the excavation?			
4. Utilities	**Yes**	**No**	**N/A**
a. Are locations of utilities marked. *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* available and reviewed?			
b. Prior to the use of equipment, have underground utilities been located by hand exposure?			
c. Are underground utilities protected, supported, or removed when excavation is open?			
d. Are overhead lines are de-energizes or protected by other appropriate means?			
5. Means of Access and Egress:	**Yes**	**No**	**N/A**
a. Is travel distance to means of egress no greater than (enter jurisdictional requirement) in excavations 4 feet (1.2m) or more in depth?			
b. Do straight ladders used in excavations extend at least 3 feet (0.9m) above the edge of the trench?			
c. Have ramps being used for employee access been designed by the competent person?			
d. Are all individuals are protected from cave-ins when entering / exiting the excavation?			
Protection description:			

6. Wet Conditions:	Yes	No	N/A
a. Have precautions been taken to protect workers from the accumulation of water?			
b. Is water removal equipment monitored by a competent person?			
c. Is surface water or runoff diverted or controlled to prevent accumulation in the excavation?			
d. Have inspections have been conducted after every rainstorm or other hazard-increasing occurrence (freeze/thaw, local demolition, rerouting of traffic, etc)?			
7. Hazardous Atmosphere: The atmosphere within the excavation must be tested where there is a reasonable possibility of an oxygen deficiency or a combustible or other harmful contaminant exposing any individual to a hazard.	**Yes**	**No**	**N/A**
a. Are there exposed sewer or natural gas lines in excavation?			
b. Is equipment operating nearby that may produce introduce exhaust into the excavation?			
c. Is the excavation near a landfill area, or are hazardous substances being stored close to the excavation?			
If you answered YES to A,B, or C then treat the excavation as a confined space. **See *S3AM-301-PR1 Confined Spaces***			
d. Has an emergency rescue plan been developed and are rescue services in place?			
8. Support Systems:	**Yes**	**No**	**N/A**
a. Are materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads?			
b. Have materials and equipment used for protective systems been inspected and are they in good condition?			
c. Have materials and equipment in unsatisfactory condition have been removed from service?			
d. Are protective systems installed without exposing all individuals to the hazards of cave-ins, collapses, or the threat of being struck by materials or equipment?			
e. Are members of support system securely fastened to prevent failure?			
f. Are support systems provided to ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.?			
g. Have excavations below the level of the base of a footing been approved by a registered Professional Engineer?			
h. Does removal of support systems progress from the bottom, and are members released slowly to allow for detection of any indications of possible failure?			
i. Does backfilling progress with the removal of the support system?			
j. Is material excavated to a level no greater than 2 feet (0.6m) below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth?			
k. Has a shield system been placed to prevent lateral movement?			
l. Are all individuals prohibited from remaining in the shield system during movement?			

Americas

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.

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

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 usafe 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 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

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 (groves 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.

Americas

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).

Americas

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

TOOL	DATE	INSPECTED BY	RESULTS	ACTION REQUIRED	ACTION COMPLETED (DATE)

Americas

Highway & Road Work

S3AM-306-PR1

1.0 Purpose and Scope

1.1 To address potential hazards that may occur during highway construction or during work within the right of way of a public or private roadway.

1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 **Competent Persons** – are those who are knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed, and who have the authority to propose and implement corrective measures to eliminate hazardous situations associated with temporary traffic control.

2.2 **Personal Protective Equipment (PPE)** – Safety clothing and equipment worn by workers in traffic areas to provide protection and heightened visibility from physical hazards including moving vehicles and construction equipment.

2.3 **Traffic areas** – Any work area where workers are located within 20 feet (6.1 metres) of moving traffic, existing or anticipated.

2.4 **Traffic Protection Plan** – A detailed plan for the protection of workers in a work zone. The plan shall contain a written description of the traffic hazards to which workers may be exposed and measures used to protect them meeting local legislation. A Traffic Control Plan shall be included as applicable.

2.5 **Traffic Control Plan** – A detailed plan for the control of traffic during construction, maintenance, or utility operations on a highway/road, taking into account the organized, systematic, safe conduct of the project, including, as applicable, detours, staging sequences, work vehicle access and egress from work sites, temporary barriers, removal of old pavement markings and selection and planned implementation of appropriate typical layouts for traffic control. Plan shall be written to meet local legislation.

2.6 **WOF –** Workers on foot.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-208-PR1 Personal Protective Equipment

3.3 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager or Supervisor**

- Verify development and administration of the procedures, communication methods, and the measures and configuration of the temporary traffic control zone in accordance with specifications for workers, motorists, and pedestrians, and the protection of AECOM employees.
- Confirm the SH&E Plan and Traffic Protection Plan are developed and communicated to all involved and affected employees.
- Confirm compliance with the SH&E Plan, Traffic Protection Plan, and this procedure.
- Confirm employees assigned to work in traffic areas are trained in the use of traffic control

systems, communication systems, and Personal Protective Equipment (PPE). Assist with any inspections or investigations as appropriate.

- Identify the Competent Person for traffic control or on the project.

4.1.2 **Flag Person**

- Comply with the applicable SH&E Plan, Traffic Protection Plan (including Traffic Control Plan), and communication requirements.
- Use appropriate PPE.
- Maintain training and competency in traffic control and flagging procedures.
- Converse with motorists only to provide clear instructions.
- Maintain alertness at their points of duty until relieved.

4.1.3 **SH&E Representative**

- Assist the Manager/Supervisor with implementation of SH&E Plan, internal Traffic Protection Plan, Traffic Control Plans, and determined communication methods within a highway/road worksite.
- Coordinate traffic safety on the specified project.
- Have training in the requirements of the governing transportation authority and the applicable Occupational Health and Safety legislation.
- Be involved in conducting hazard assessments, developing the mitigating strategies and reviewing their implementation for any project where traffic is identified as a hazard to AECOM staff.
- Assist with any inspections or investigations as appropriate.

4.2 Training

4.2.1 Employees shall be appropriately trained to the potential exposures to highway and road hazards and the applicable control measures. Refer to the *S3AM-003-PR1 SH&E Training*.

4.2.2 All staff shall receive on-site orientation to the hazards and controls, including as applicable, Traffic Protection Plan, Traffic Control Plan, and communication requirements

4.2.3 Only staff with appropriate flag person (traffic control) training shall act as a flag person.

4.2.4 Flag persons shall be instructed on the specific project Traffic Protection Plan and Traffic Control Plan.

4.2.5 Flag persons shall be trained / certified in signaling methods required by the competent person.

4.2.6 WOF, equipment operators, and drivers in internal work zones shall be trained to their respective tasks and know the routes that construction vehicles shall use.

4.2.7 Equipment operators and signal persons shall know the hand signals to be used, and communication methods and requirements applicable to the worksite.

4.2.8 Operators and WOF shall know the visibility limits and the "blind spots" for each vehicle on site.

4.2.9 Workers should be made aware of the ways in which hazards associated with shift work and night work may affect their performance.

4.3 Planning

4.3.1 The SH&E Plan, Traffic Protection Plan and Task Hazards Assessment shall be completed and communicated to all involved and affected workers. In addition to the traffic hazards identified in this procedure, the hazards associated with the highway or road work tasks shall be addressed. These may include, but are not limited to:

- Potential health hazards from asphalt fumes, concrete and rock dust.
- Lead paint on old bridge work and overpasses.
- High noise levels.
- Heat or cold stress.
- Work over water (bridges, causeways)
- Work at elevation (overpasses and bridges).
- Tunneling and blasting.

4.3.2 Applicable procedures shall be consulted and appropriate control measures established. Additional specific plans may be necessary for specialized work.

4.3.3 PPE selection shall be based on the THA. Refer to the *S3AM-208-PR1 Personal Protective Equipment*.

4.4 Traffic accommodation equipment, as required by the Traffic Protection Plan

4.4.1 The *traffic* accommodation equipment may entail:

- A rooftop beacon light for the vehicle,
- Pylons, Glo-posts, flags, barricades and/or flagging tape, warning lights, flashing light boards
- Advance signage
- Flagging equipment, as required:
  - Daytime:
    - Flag person's "Stop and Slow" paddle.
    - PPE including high-visibility clothing meeting local legislation.
    - Drinking water.
    - Bug repellent and/or sun screen as conditions warrant.
    - Optional radio communication (if required).
  - Night time (additional requirements):
    - A retro-reflective "Stop and Slow" paddle.
    - A flashlight fitted with a red signaling baton.
    - Flashing yellow beacons set up in advance of the flag person.
    - Additional night time PPE as per jurisdictional requirements.

4.5 Traffic Protection Plan

4.5.1 Each Manager shall prepare a project Traffic Protection Plan addressing traffic controls and worker protection appropriate for the team's exposures. PPE requirements for all types of workers on the road project shall be specified including surveyors, environmental, QA, inspectors and engineers. The Traffic Protection Plan may be a stand-alone document, or contained within the safety plan if allowed by legislation. Plans shall address the following if applicable:

- Closure zones within the project boundaries
- Work zone protections: various styles of concrete, water, sand, collapsible barriers, crash cushions, and truck mounted attenuators.
- Guide vehicles.
- Communication methods and systems.

- Night operations work within traffic controls.
- PPE.
- Sanitation.
- Traffic Control Plans and permits.
- Training.
- Worker and heavy mobile equipment interface.

4.5.2 A Traffic Control Plan shall be completed for the movement of vehicles in areas where workers are conducting other tasks.

4.5.3 Drivers, WOF and pedestrians shall be able to see and understand the routes they are to follow.

4.5.4 Where there are several projects, coordinated vehicle routes and communication between contractors shall reduce vehicular struck-by incidents.

4.5.5 Hazard identification and plan development shall be performed in accordance with this procedure. The plans shall include the identification of the responsibility for personnel and implementation of the safety program under highway construction activities.

4.5.6 Other requirements for supporting activities such as excavations, heavy equipment usage, personal protective equipment, etc. shall be applicable and addressed in accordance with other procedures.

- A Traffic Protection Plan shall be an integral part of the SH&E Plan whenever staff shall be exposed to the hazards of vehicular traffic during project work (this may include surveys, wetland delineation, drilling and soils inspections, bridge or overpass inspections, inspection of roadway construction projects).
- Requirements of jurisdictional departments of transportation have varying and specific requirements related to safety and traffic plans. Lighting, signage, information boards and PPE shall comply with the requirements of transportation entity applicable to the project.
- Work duration, road width, and traffic volume are some of the key considerations to be contemplated when designing a Traffic Protection Plan. The Traffic Protection Plan shall address the specific vehicular hazards and describe the measures that shall be implemented to protect employees.
- Traffic Protection Plan and Traffic Control Plan shall be developed in consultation with a qualified supervisor or manager experienced in traffic control. In addition, a supervisor shall be designated to oversee the implementation of the protection plan until work is completed.
- Occupational Health and Safety regulations and associated standards or guidebooks provide instruction on the use of traffic control devices in temporary construction, maintenance, and utility work zones for worker and motorist safety and to minimize the disruption of traffic flow.
- Schedule work to avoid periods of heavy traffic.
- Alert traffic of work ahead, by placing signs or cones well ahead of the work area.
- If the work area is being managed under a Traffic Control Plan or Traffic Protection Plan, obtain copies of these plans before commencing work.
- Traffic accommodation that is adequate in good weather conditions and daylight may not be adequate under adverse weather conditions and/or hours of darkness. Reassess the accommodation based on conditions.
- Traffic accommodation shall be planned to provide safe conditions for the protection and safe passage of motorists, pedestrians, and employees at all work sites. It shall include all areas located within the traveled portion of a roadway including shoulders, ditches, and boulevards.

4.6 Restrictions

4.6.1 Applicable legislated requirements governing all aspects of traffic safety, including directing traffic, signage, PPE, traffic control devices in temporary construction, maintenance and utility work zones, shall be reviewed in preparation for the site-specific traffic control, protection or accommodation plan.

4.6.2 No personnel shall be allowed onto the site without first reviewing the project-specific Traffic Control Plan or Traffic Protection Plan.

4.6.3 No Roadwork/Highway work shall be performed without appropriately addressing the traffic hazards present at the site in a Traffic Control Plan or Traffic Protection Plan.

4.7 Short-Term Traffic Protection

4.7.1 Always wear the appropriate PPE to maintain worker visibility to vehicular traffic. Wear a tear-away fluorescent reflective vest (and retro-reflective stripes on the arms and legs for night work or during periods of limited visibility) at all times. Refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.7.2 Set out signage to signify workers are performing work on the side of the road.

4.7.3 Pull vehicles off as far to the right of the travelled portion of the road as possible. Confirm the ground is stable where the vehicle is parked; note that parking at the top of earthen ditches should be avoided. Confirm that the shoulder of the highway or street where parking the vehicle is wide enough to allow for safe access to and egress from the vehicle.

4.7.4 Always park a vehicle at least 100 feet (30 meters) from the flag person station. The vehicle should be positioned between the flag person and the work crew. Position vehicles to protect workers from traffic. See information related to Attenuator Vehicles in this procedure.

4.7.5 Activate the four-way flashers and rotating beacon for the vehicle prior to exiting the vehicle.

4.7.6 Plan an escape route prior to exiting the vehicle.

4.7.7 Load and unload materials or equipment from the passenger side of the vehicle.

4.7.8 Always use the buddy system in heavy traffic areas. Employees shall avoid turning their back to oncoming traffic.

4.7.9 Be aware of mobile equipment that may be operating in the work area.

4.7.10 Do not enter onto the travelled portion of the road except to cross the road. Road crossings should be made at a 90 degree angle to the direction of the road.

4.8 Long-Term Traffic Protection

4.8.1 Traffic accommodation shall be provided BEFORE the work starts and shall be maintained until the work is completed.

4.8.2 Generally, for long-term duration work activities that are performed at construction projects, the constructor of the project is required to develop a Traffic Protection Plan.

4.8.3 If AECOM has assumed the role of constructor for the project, the Traffic Protection Plan shall be developed and implemented prior to the commencement of work activities at the project.

4.8.4 If AECOM is not the constructor for the project, the Traffic Protection Plan for the project shall be developed by our client or a constructor designated by the client.

4.8.5 The Traffic Protection Plan should be reviewed with AECOM employees during orientation to the project.

4.9 Signage

4.9.1 Standard highway signs for information, speed limits, and work zones shall assist drivers in identifying designated traffic paths or conditions ahead.

4.9.2 Provide appropriate instructional signage such as: EVACUATION ROUTE; DO NOT ENTER; REDUCED SPEED AHEAD; ROAD CLOSED; WORKERS AHEAD; and NO OUTLET.

4.9.3 Using standard highway signs for internal construction worksite traffic control shall assist workers in recognizing the route they are to use at the construction site.

4.9.4 Traffic Signs

- Signage shall be of acceptable standards, in good condition, clean, legible, suited to the purpose, and meeting local legislation requirements.
- Signage shall be secured or weighted.
- Routinely inspect signage for placement, cleanliness, and physical damage.
- Cover road traffic control signage when no activity is present.

4.10 Traffic Control Devices

4.10.1 Standard traffic control devices, signals, and message boards shall instruct drivers to follow a path away from where work is being done.

4.10.2 The competent person shall determine the approved traffic control devices such as cones, barrels, barricades, and delineator posts that shall be used as part of the Traffic Control Plan.

4.11 Work Zone Protections

4.11.1 Various styles of concrete, water, sand, collapsible barriers, crash cushions, and truck-mounted attenuators shall be used to limit motorist intrusions into the construction work zone, as appropriate.

4.11.2 All AECOM staff shall be made aware of controls established by the AECOM and the constructor.

4.11.3 AECOM staff shall wear the required safety apparel at all times.

4.11.4 In the absence of a constructor, when AECOM is the constructor, or when AECOM staff are in the field alone—e.g., investigations, surveys—all appropriate Department of Transportation traffic control standards and devices shall be observed and placed in position.

4.11.5 The work zone shall be made safe by its separation from traffic.

4.12 Flagging

4.12.1 Flag persons and others providing temporary traffic control shall wear high visibility retro-reflective clothing in compliance with local legislation.

4.12.2 Flag persons shall be provided with sufficient breaks, and shall not be permitted to work alone for extended periods as per local legislation.

4.12.3 Flag persons shall stand in a safe position, be clearly visible, have an unobstructed view of approaching traffic, and be positioned a suitable distance away or from the work area (a distance permitting vehicles to slow down or stop before reaching the work area) unless circumstances or space requirements, such as working at or near an intersection, dictate otherwise.

4.12.4 Drivers should be warned in advance with signs that there shall be a flag person ahead.

4.12.5 Flag person should use STOP/SLOW signs or paddles. The STOP sign should be octagonal with a red background and white letters and border. The SLOW sign should be octagonal with an orange background and black letters and a border.

4.12.6 "Flag Person Ahead" signs shall be posted in advance of each flag person's station. Such signs shall be removed promptly when the flagging operation terminates.

4.13 Lighting

4.13.1 Flag person stations should be illuminated. Lighting for workers on foot and equipment operators is to be at least 5 foot candles (54 Lux) or greater.

4.13.2 Where available lighting is not sufficient, flares or chemical lighting should be used.

4.13.3 Glare affecting workers and motorists should be controlled or eliminated.

4.14 Driving

4.14.1 Seatbelts and rollover protection shall be used on equipment and vehicles as stated by the manufacturer.

4.14.2 When pulling off to the side of the road, AECOM personnel shall park their vehicles at minimum of 20 feet (6 meters) or the width of two traffic lanes from moving traffic.

4.14.3 Vehicles and equipment operated in work zones shall be equipped with back up alarms and/or object detection devices to prevent back-over injuries and equipment damage. Spotters should be used to direct equipment and vehicles backing up on work sites.

4.15 Night Operations and Work within Traffic Controls

4.15.1 Night work on roadways should not be done unless absolutely necessary and unless the work area is adequately lit.

4.15.2 Operations with night activities shall have a written plan that addresses the safety issues of working at night. The plan shall address, but is not limited to:

- Reflectivity
    - All equipment used in the work zone shall have reflective material placed to increase the visibility of the equipment.
    - All reflective surfaces shall be cleaned as required so that the reflectivity of the material is not degraded. Any areas of reflective surface that is damaged or obscured shall be replaced.
    - Personnel working at night shall have reflective tape on their hardhats and shall wear retro-reflective vests and each limb that meet the legislative requirements. Refer to *S3AM-208-PR Personal Protective Equipment*.
    - Additional measures such as white disposable coveralls, reflective bands, flashlights with red cones and personal battery-operated strobe lights may be used when practical.
- Illumination
    - Whenever feasible and practical, light plants shall be used to illuminate the work area. Balloon or diffuse lighting portable light towers should be used along highways and where possible to provide glare free illumination.
    - On mobile operations, additional lighting on equipment may be used to illuminate the work area.
    - All equipment shall have working lights and at a minimum, have working strobe or warning beacon lights.
    - All flag persons shall be placed in illuminated areas only.
    - All lighting is to be checked after setup to confirm that it is not interfering with approaching traffic, other equipment in the work zone, and meets the legislative requirements.
- Task Hazard Analysis and Communication
    - Prior to the start of any night operation, a detailed task hazard assessment (THA) shall be made addressing the possible hazards of night work. Refer to the *S3AM-209-PR1 Risk Assessment & Management.*
    - The THA shall be reviewed with the crews and updated as needed. At the start of each shift, a daily safety reminder shall be used to reaffirm the provisions of the night work requirements as found in the THA and this procedure.
    - The task THA should also provide for:
        - The selection of a competent person responsible for maintaining surveillance on the

work area to alert other workers of vehicles encroaching on the work zone.

- A method to signal workers when vehicles encroach on the work zone.
- A system to account for workers at all times, which may include a buddy system.
- Emergency communication or warning signals used by a worker such as a radio, signal horn, or whistle, which shall be used to call for help.

4.16 Attenuator Vehicles

4.16.1 It is good construction practice to place an attenuator truck or pick-up truck (minimum) an appropriate distance and immediately in advance of workers in a work zone to protect workers from vehicle intrusions and to warn approaching drivers that the shoulder or travel lane is occupied by work activities.

4.16.2 The vehicle of choice should be placed an appropriate distance from the work activities to provide the best protection for workers based on potential speed of traffic.

4.16.3 The tires should be placed so that should the vehicle be struck, it shall turn away from workers.

4.17 Closures within a Closure

4.17.1 On occasion, satellite operations may be performed under full freeway traffic closures. For this type of work, special precautions referred to as a "closure within a closure" is to be implemented in accordance with the following:

- Posted speed limits within closures should be set at 15 miles (24 kilometers) per hour.
- Signs are to be installed approximately 250 feet (76 meters) in advance of and behind the work zone to alert drivers who may approach from either direction of the upcoming work zone.
- The work area is to be completely delineated with Type 1 barricades (candlesticks).
- Any vehicle used for AECOM field work shall be equipped with a functioning four way flashers and rotating beacon placed on the roof of the vehicle.

5.0 Records

5.1 Traffic Protection Plans, Traffic Control Plans and completed Equipment Checklists shall be maintained in project files.

6.0 Attachments

6.1 S3AM-306-FM1 Equipment Checklist

Americas

Equipment Checklist

S3AM-306-FM1

Name of Contractor (or N/A): _____ Project Name: _____

Location: _____ Project #: _____

Date: _____ Time: _____ Weather: _____

Person Conducting Inspection _____ Title: _____

*Note: As you conduct your inspection you should be able to answer each question with a **YES**. If the answer to any question is **NO,** this deficiency should be corrected as soon as possible.*

	YES	NO	Deficiency Corrected? OK	N/A
Are accident prevention signs, tags clearly visible?	☐	☐	☐	☐
Are danger signs used where immediate hazards exist?	☐	☐	☐	☐
Are caution signs used to warn against potential hazards or to caution against unsafe practices?	☐	☐	☐	☐
Are exit signs posted at all exit locations?	☐	☐	☐	☐
Are proper visual warning signs posted prior to (in advance of) the work area?	☐	☐	☐	☐
Are flaggers provided with signs, signals, and barricades to provide the necessary protection?	☐	☐	☐	☐
Are flaggers using red lights when signaling during periods of darkness?	☐	☐	☐	☐
Are flaggers wearing highly visible warning garments?	☐	☐	☐	☐
Are the flaggers trained in proper flagging procedures?	☐	☐	☐	☐
Are warning garments worn at night reflectorized?	☐	☐	☐	☐
Are highly visible flags used by the flaggers at least 18 inches (45 centimeters) square?	☐	☐	☐	☐
Are barricades used to totally obstruct the passage of people and vehicles to protect the work area?	☐	☐	☐	☐
Do barricades meet the requirements set forth in the Manual of Uniform Traffic Control Devices?	☐	☐	☐	☐

COMMENTS:

Americas

Working Alone

S3AM-314-PR1

1.0 Purpose and Scope

1.1 This procedure establishes the requirements for communication and accountability between personnel at a work site to reduce the potential for incidents occurring to one employee without help readily available and to facilitate the rapid mustering of assistance to employees in the event of an emergency.

1.2 This procedure applies to all AECOM America-based employees and operations.

2.0 Terms and Definitions

2.1 **Buddy System** – A system of organizing employees at a work site in such a manner that each employee is accompanied by or in communication with at least one other employee or is escorted by a client or contractor representative during work site activities.

2.2 **Controlled Work Areas** – One or more designated work areas on a field project site where hazardous activities and/or strictly defined operations take place. Such controlled work areas include, but are not limited to, remediation or construction sites; a restricted radius where a critical lift operation will take place could be declared a controlled work area. On a HAZWOPER site, the controlled work area is divided into the exclusion zone, the contaminated reduction zone, and the support zone.

2.3 **Working Alone** – Performing work with no line of sight or direct voice communication with another person who is aware of your assignment and capable of initiating emergency response.

3.0 References

3.1 S3AM-005-PR1 Driving

3.2 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager or Supervisor**

- Establish if employee is permitted to work alone, through evaluation of employee's experience, training and any personal limitations (e.g. life-threatening allergic reactions).
- Provide the resources, communication devices, emergency response plans, and check-in procedures as listed in the Task Hazard Assessment (THA) or SH&E plan, etc. necessary so that employees are not working alone or have a buddy system in place.
- Act as point of contact if employees miss their check-in.

4.1.2 **Employees**

- Complete training as required to prepare for working alone.
- Confirm emergency contacts are provided to the Manager or supervisor in case of an emergency.
- Establish a buddy system and check in procedure in accordance with the THA or SH&E Plan provided by the Manager and Supervisor.

4.1.3 **SH&E Managers**

- Review and approve relevant planning documents entailing employees working alone and on remote travel.

4.2 General

4.2.1 All projects/programs shall conduct a review of all tasks performed by AECOM to establish specific work alone procedural requirements as defined here. They shall have at minimum a THA and SH&E Plan that has been reviewed by the SH&E Manager.

4.2.2 Employees are discouraged from working alone on any site due to the risk of delayed assistance in the event of an incident. If they will be out of contact with other employees, they shall establish a buddy system or check-in procedure with another employee or responsible person.

4.2.3 Employees working alone or in small crews in remote isolation shall have an effective means of communication including cell/radio/satellite phone as well as established check-in times.

4.2.4 When traveling alone, staff shall take appropriate precautions, including notifying someone of their travel plans as well as carrying a communication device and safety equipment, as appropriate. See *S3AM-005-FM1 Journey Management Plan*.

4.3 No employee shall work by themselves or without a buddy system established if they are conducting a hazardous job task.

4.3.1 The following tasks are considered hazardous:

- Working at heights.
- Working in a confined space.
- Working in a trench.
- Lock out/tag out tasks.
- Work on energized equipment.
- Working with electricity.
- Working with hazardous substances or materials.
- Working with material under pressure.
- Working where there is a possible threat of violence, including civil unrest.
- Working in avalanche areas.
- Working on water or ice.
- Working in remote or wilderness isolation.
- Working in a controlled area.
- Extreme heat or cold stress environments.
- Working with power tools/equipment.
- Working with/operating heavy equipment or machinery.
- Working in isolation from first aid services or immediate/emergency assistance.
- Working around mobile equipment.
- Highway and road work.

4.3.2 The following tasks (identified as hazardous) may permit working alone provided it can be demonstrated there is no substantial increased risk associated with working alone:

- Working with power tools/equipment (e.g. power drill versus chainsaw).
- Working with material under pressure (e.g. small air compressor versus compressed gasses).

4.4 Office Work

4.4.1 The supervisor shall have in place and shall communicate as part of location specific orientation, its procedures for the safety and security of an employee working alone in the office. Contact numbers to be used in case of emergency are posted at all common gathering areas or major exits.

4.4.2 Employees working in the office after regular working hours or in situations where they are working alone shall keep the entrance to the office locked.

4.4.3 If the building is monitored by a security service, employees working in the office after regular working hours or working alone shall notify the security guard of their presence and anticipated hours. If the building does not have a security service, the employee working alone shall notify their supervisor or a family member or friend if agreed to by their supervisor.

4.4.4 During all working hours, employees shall stay alert to unauthorized entries into the building and to other suspicious activities and shall report them to security or their supervisor immediately.

4.5 Field Work

4.5.1 Prior to work commencing, a THA shall be prepared for all assignments on which employees are to work alone (in accordance with *S3AM-209-PR1 Risk Assessment & Management*). The THA shall consider travel time, weather, available communications, and the impact of working alone when establishing risk ratings of the hazards associated with the task and work environment.

4.5.2 The THA should also consider whether the employee assigned to work alone has sufficient training and qualifications in the tasks to be performed to allow the employee to work safely alone. The employee's personal medical conditions may be considered if the employee has voluntarily made the medical condition known to the Manager or Supervisor.

4.5.3 The THA should identify the controls required for the safety of employees as applicable to the job task and location. Some controls associated with working alone or in remote isolation include a buddy system, standardized check-in times, what to do if a check-in is missed (e.g. worker in proximity attends site, utilizing secondary communication method, etc.), specialized communication devices, and enhanced emergency supply kits.

4.5.4 The THA is completed in addition to the SH&E plan which details the work activities and the procedures to manage the hazards and in accordance with *S3AM-209-PR1 Risk Assessment & Management*.

4.6 Buddy System

4.6.1 When conducting non-hazardous work, employees shall work with a buddy (another responsible individual) or follow check –in procedures listed in the THA or SH&E Plan.

4.6.2 When conducting hazardous work, employees shall work with a buddy (another responsible individual) at all times.

4.6.3 Once assigned as buddies, personnel shall remain in contact.

4.6.4 When electronic communication devices are used, prior to starting work, a protocol shall be established and agreed to by each buddy to confirm that periodic effective and faultless communications are maintained

4.6.5 When unanticipated conditions develop that do not permit line of sight and direct voice contact, and alternate communication was not established in the THA, Stop Work and notify the Supervisor. If permission from the Supervisor is obtained to continue the work, voice contact shall be achieved using reliable electronic communication devices such as, but not limited to, hand-held radio or cell phone. The THA shall be updated to reflect this change.

4.6.6 If crews will separate once they reach their work site, they shall then be considered to be "working alone". The buddy system or check-in procedures shall be established, as determined by the work being hazardous or non-hazardous and as identified in the THA.

4.6.7 Client or contractor personnel may be substituted for an AECOM employee's buddy only if they are designated by the client or contractor and the AECOM manager or supervisor, and are properly trained to the tasks and the site's emergency response procedures.

4.6.8 A missed communication event shall initiate the applicable missed check-in actions established in the THA (e.g. worker in proximity attends site, utilizing secondary communication method, etc.) and may trigger emergency response procedures. The results of each communication event shall be documented in the program or project files.

4.7 Check-In Procedures

4.7.1 All field crews shall establish check-in procedures as part of the THA or SH&E Plan prior to leaving the office. These procedures shall be reviewed daily as part of the Task Hazard Assessment review or more frequently if there is a change in work arrangements that could adversely affect a worker's well-being or a report that the system is not working effectively. These procedures shall be confirmed with the assigned Check-In Person daily.

4.7.2 The timing and frequency of those check-in procedures schedule shall be established prior to the initiation of field operations and shall vary depending on the task and location of the work.

4.7.3 If communication is lost between buddies or a check-in time is missed, it shall be assumed that an emergency situation exists, and the site's emergency response procedures shall be implemented. Site work shall cease until the emergency is resolved and the Supervisor directs personnel to restart work.

4.7.4 If crews will separate once they reach their field site, they will then be considered to be "working alone" and will establish a buddy system with the other members of the crew.

4.7.5 Employees working alone or in small crews in remote isolation will have an effective means of communication system including cell/radio/satellite phone as well as established check-in times.

4.7.6 The Check-In Procedure will be reviewed daily as part of the THA review or more frequently if there is a change in work arrangements that could adversely affect a worker's well-being or a report that the system is not working effectively.

4.8 Emergency Response Procedures

4.8.1 All field employees and the Check-In Person shall be provided with the location specific Emergency Response Plan (may be included in the THA or SH&E plan, or exist as a separate document).

4.8.2 The Check-In Person shall have access to a route map or understands their anticipated route of travel.

4.8.3 The established contact person shall follow the procedures below, with specifics established in the SWP Plan or THA, if a field employee has missed a check-in:

- First, they shall attempt to make contact with the field employee directly.
- If that fails to provide a response, they shall contact other persons who may have been on site, including client supervisors, or other locations where the field employee might be (e.g., hotel, home, office).
- If the field employee still cannot be located, the emergency contact person notifies the manager or supervisor responsible for the employee.
- Depending on the location and situation, they shall then dispatch another employee, another supervisor, or an appropriate emergency response agency (e.g., police) to travel to the last known location of the field employee.
- If the dispatched responder arrives at the site but cannot locate the field employee, the appropriate public emergency contacts (e.g., police, search and rescue) shall be made and the employee's personal contacts shall be notified by Human Resources.

- If the dispatched responder finds the crew in an emergency situation (medical, environmental, structural, etc.), the appropriate steps shall be taken to isolate the hazard, administer first aid, and contact emergency support services.

4.9 Training

4.9.1 All employees shall receive an initial orientation that includes the hazards and controls associated with working alone.

4.9.2 If working in wilderness, all field employees will be able to orienteer using a map and compass—if not, the basic skills of orienteering will be provided by an experienced employee before work commences. Refer to the *S3AM-314-ATT1 Wilderness Isolation* instruction for more specifics.

4.9.3 Employees working alone should be trained in First Aid. Consideration should be given to Wilderness First Aid training based on the anticipated work environment.

4.9.4 Employees regularly working in remote, isolated wilderness locations will either participate in a wilderness survival course from a qualified provider (one or two day) or will obtain management approval based on their level of experience/competence in wilderness situations.

5.0 Records

5.1 None

6.0 Attachments

6.1 S3AM-314-ATT1 Wilderness Isolation

Americas

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.

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.

Americas

Pre-Drilling, Boring & Direct Push Probing Flow Chart

S3AM-321-ATT2

Before Any Drilling, Boring and Direct Push Probing Activities

PERMITS and ACCESS AGREEMENTS

- **Government and Utility/Infrastructure Permits**
- **Client Permits and Procedures**
- **Access Agreements**

KEY POINT: Obtain all permits and sign Access Agreement (if required).

GENERAL HEALTH and SAFETY

KEY POINT: Prepare SH&E Plan, as well as Task Hazard Assessments (THA).

IDENTIFICATION and MAPPING OF UTILITY and SUBSURFACE STRUCTURES

KEY POINT: Generate a comprehensive site map illustrating known locations of overhead/subsurface utilities, subsurface structures, and proposed boring locations.
Review completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.

SITE WALK

KEY POINT: Perform a site walk utilizing site map and 360 degree view to verify known conditions, including overhead obstructions or hazards, and identify potential issues. Add discovered items/issues to map for use in location confirmation.

PROPOSED SUBSURFACE INVESTIGATION LOCATIONS

KEY POINT: Confirm that locations meet the minimum required set-back distances.

UTILITY CLEARANCE INVESTIGATION LOCATION CONFIRMATION

KEY POINT: Visually verify hand clearance. Review completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.

DRILL RIG INSPECTIONS

KEY POINT: Drill rig inspected and documented daily by operator prior to drilling.

BEGIN DRILLING, BORING OR DIRECT PUSH PROBING

KEY POINT: Prior to commencing any intrusive subsurface work, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* shall be completed.
Upon commencing the work, if unanticipated conditions or events are encountered (e.g. concrete/debris, void encountered, etc.) stop work and notify the Manager. Authorization to proceed shall have the concurrence of the Manager, Site Supervisor and SH&E Manager.

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 ☐ Direct Push Type (DPT) ☐

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).	☐ Pass ☐ Fail ☐ 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. **NEVER BYPASS, DISABLE, OR REMOVE KILL DEVICES.**	☐ Pass ☐ Fail ☐ N/A
First aid kit adequate and on equipment / readily available.	☐ Pass ☐ Fail ☐ N/A
Absorbent materials on equipment / readily available (spill response).	☐ Pass ☐ Fail ☐ N/A
A fire extinguisher of appropriate size is located on drill rig and readily available/accessible for drilling crew (recommended 20 lb).	☐ Pass ☐ Fail ☐ N/A
Protective Guards	
Drive shafts, belts, chain drives, and universal joints are guarded to prevent accidental insertion of hands, fingers, or tools.	☐ Pass ☐ Fail ☐ N/A
Cables	
Cables on drill rig free of kinks, frayed wires, birdcages, flat spots, grease, and worn or missing sections.	☐ Pass ☐ Fail ☐ N/A
Cables are terminated at the working end with a proper eye splice; either swaged, coupled, or using cable clamps.	☐ Pass ☐ Fail ☐ 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.	☐ Pass ☐ Fail ☐ N/A
Wire ropes are not allowed to bend around sharp edges without cushion material.	☐ Pass ☐ Fail ☐ N/A
Pulleys and Cable Winches	
Pulleys are not bent, cracked, or broken.	☐ Pass ☐ Fail ☐ N/A
Pulleys operate smoothly and freely, without resistance.	☐ Pass ☐ Fail ☐ N/A
Motor is mounted in correct location and tightly secured to drill rig.	☐ Pass ☐ Fail ☐ 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.	☐ Pass ☐ Fail ☐ N/A
Safety Latches	
Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation.	☐ Pass ☐ Fail ☐ 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.	☐ Pass ☐ Fail ☐ 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.	☐ Pass ☐ Fail ☐ N/A

Flights are blunt to prevent the risks of cuts.	☐ Pass ☐ Fail ☐ N/A
Auger keys are not bent, cracked/fractured, excessively worn, or otherwise damaged.	☐ Pass ☐ Fail ☐ N/A
Auger bolt holes and threads are not damaged.	☐ Pass ☐ Fail ☐ N/A
Inspect flights/augers for metal burns. NOTE: Burrs must be filed to flat surface.	☐ Pass ☐ Fail ☐ N/A
Augers / Reamers lying flat on the ground (avoid stacking).	☐ Pass ☐ Fail ☐ N/A
Augers / Reamers over 50lbs (22.7kg) moved mechanically. (Avoid manual lifting).	☐ Pass ☐ Fail ☐ N/A
Drill String	
Appropriate break out tool(s) available.	☐ Pass ☐ Fail ☐ N/A
Rod box and power vice operating smoothly and freely.	
Drill string are not bent and do not have any cracks/fractures.	☐ Pass ☐ Fail ☐ 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.	☐ Pass ☐ Fail ☐ N/A
Swivel connectors (for trailing horizontal drill stem) lubricated and freely rotating.	☐ Pass ☐ Fail ☐ N/A
Mast	
Mast is free of bends, cracks, or broken sections.	☐ Pass ☐ Fail ☐ N/A
All mounting hardware (pins, bolts, etc) in place.	☐ Pass ☐ Fail ☐ N/A
No moving of drill rig or maintenance/repairs while mast is in vertical position.	☐ Pass ☐ Fail ☐ N/A
Hammering Device	
Hammer free of cracks, fatigue, or other signs of excessive wear.	☐ Pass ☐ Fail ☐ N/A
Hammer connections are secure.	☐ Pass ☐ Fail ☐ N/A
Leveling Devices	
Outriggers move in/out and up/down smoothly and freely while using controls on drill rig, with no hydraulics leaks.	☐ Pass ☐ Fail ☐ 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).	☐ Pass ☐ Fail ☐ N/A
Outriggers are properly supported on the ground surface to prevent setting into the soil (use of outrigger support pads).	☐ Pass ☐ Fail ☐ N/A
Controls	
Controls are intact, properly labeled, have freedom of movement, and have no loose wiring or connections.	☐ Pass ☐ Fail ☐ N/A
Controls are not blocked or locked into an operating position.	☐ Pass ☐ Fail ☐ N/A
Installed lights, signals, gauges, and alarms operate properly.	☐ Pass ☐ Fail ☐ N/A
Lifting Devices	
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.	☐ Pass ☐ Fail ☐ N/A
Shackles/Clevises are in proper working order with pins/screws in place that is to be used while lifting.	☐ Pass ☐ Fail ☐ N/A
Cables and lifting devices are not operated erratically or with a jerking action to overcome resistance.	☐ Pass ☐ Fail ☐ N/A
Hydraulic System	
Hydraulic lines are secure, in good condition with no signs of excessive wear, and not leaking. NOTE: Check while pressurized.	☐ Pass ☐ Fail ☐ N/A
Hydraulic lines are not in a bent or pinched position causing additional fluid restrictions/pressures.	☐ Pass ☐ Fail ☐ N/A
Hydraulic oil reservoir has appropriate amount of oil and not leaking.	☐ Pass ☐ Fail ☐ N/A
Documentation available to confirm that pressure relief valve was checked during shop maintenance activity and noted on maintenance log.	☐ Pass ☐ Fail ☐ N/A
Pump Lines (water, grout, etc)	
Suction/Discharge hoses, pipes, valves, and fittings are secured and not leaking.	☐ Pass ☐ Fail ☐ N/A
High pressure hoses have a safety chain, cable, or strap at each end to prevent whipping in the event of a failure.	☐ Pass ☐ Fail ☐ N/A

Ladders	
Drill rig has a permanently attached or proper portable ladder to be used for access to drilling platform.	☐ Pass ☐ Fail ☐ N/A
Ladders and platforms not to be used for tool storage- keep ladders and operator platforms clear during drilling.	☐ Pass ☐ Fail ☐ N/A
Tires / Tracks	
Tires / Tracks on rig are not excessively worn and free of any debris or foreign material.	☐ Pass ☐ Fail ☐ N/A
General	
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.).	☐ Pass ☐ Fail ☐ N/A
Rig is of appropriate size to meet job requirements.	☐ Pass ☐ Fail ☐ N/A
Maintenance log available for previous 3 months to confirm proper maintenance/inspection.	☐ Pass ☐ Fail ☐ N/A
Exhaust	
Exhaust system is free from defect and routes engine exhaust away from drill rig workers.	☐ Pass ☐ Fail ☐ N/A
Fuels	
Fuel stored in an approved and properly labeled container.	☐ Pass ☐ Fail ☐ N/A
Fuel transfer lines free from signs of excessive wear and not leaking.	☐ Pass ☐ Fail ☐ N/A
Refueling and transferring of fuel is performed in an approved area with sufficient containment to prevent spillage.	☐ Pass ☐ Fail ☐ N/A
Exclusion/Work Zones	
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).	☐ Pass ☐ Fail ☐ N/A
The exclusion/work zone is clear of tripping hazards.	☐ Pass ☐ Fail ☐ N/A
The exclusion/work zone communicated to concurrent/adjacent operations to prevent overlap of work zones or line of fire.	☐ Pass ☐ Fail ☐ N/A
Subsurface Utilities / Installations and Overhead Obstructions	
Subsurface utilities / installations have been confirmed as identified and cleared through site observation and review of the completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist.*	☐ Pass ☐ Fail ☐ 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).	☐ Pass ☐ Fail ☐ N/A
Rig Repairs	
Repairs, when possible, are conducted offsite to reduce the risk of any onsite incidents.	☐ Pass ☐ Fail ☐ N/A
Specialized PPE	
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).	☐ Pass ☐ Fail ☐ 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.	☐ Pass ☐ Fail ☐ N/A

Comments:

Signature of Inspector: _____ Date: _____

Americas

Drilling, Boring & Direct-Push Equipment Maintenance Inventory

S3AM-321-FM2

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

Attachment C

Stretch/Flex Poster

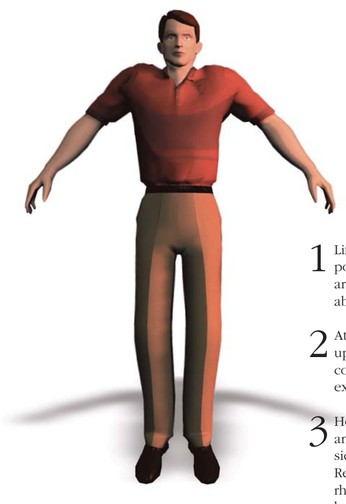
URS

Stretch & Flex Program

WARM-UP BEFORE STRETCHING

Run in place for 30 seconds, 10 jumping jacks, chicken dance, hokie pokie, Macarena, etc. to warm your muscles up.

SHOULDER SHRUG WITH HIGH REACH *Reach High*



1 Lift (shrug) shoulders as high as possible while slowly raising your arms to fully extended position above head.

2 At the same time, lift the body up onto your toes (for as long as comfortable). While reaching high, extend and spread fingers.

3 Hold this position for 10 seconds and then slowly lower arms to the side into a neutral body position. Relax while breathing slowly and rhythmically. Concentrate on your breathing rate for at least five breath cycles.

TARGET: Biceps, lats, forearms, and muscles that support the spine. Particularly good for using hand tools and light lifting tasks.

NECK STRETCH *Bobblehead*

1 Keep your neck as straight as possible while relaxing your shoulders. Tilt your head to the right. Slowly lower head toward right shoulder.

2 Repeat in four positions: right; left; front, and back each time returning to the upright position.

3 Be sure to do this slowly and do not hold your breath. There should be a complete breath cycle with each position of the head!

TARGET: Neck muscles and stress reducer. Particularly good for equipment operators, office personnel, drafters, CAD operators, and engineers.

TRICEP STRETCH *Backscratch*

1 Bring right hand to upper back between shoulder blades from above shoulder.

2 Place left hand on the tricep (muscle on the underside of the arm) near the elbow.

3 Gently pull right elbow up and back with left hand, moving the right hand down center of upper back as far as comfortable. This should not cause pinching in the neck. Repeat on opposite side.

TARGET: Triceps and shoulders. Particularly good for light lifting, carrying or pushing such as laborers, and mail clerks.

UPPER TRUNK STRETCH *Back Bend*

1 Place hands on back of hips.

2 Slowly arch upper body backward to a comfortable position. Hold while continuing to breath.

3 Return to neutral position and repeat two more times.

TARGET: Lower back, abdominals. Particularly good for truck drivers, equipment operators, laborers.

SHOULDER ROTATION STRETCH *Can Opener*

1 Keeping knees slightly bent, clasp hands behind back.

2 Slowly bend forward from the waist to a comfortable angle while lifting arms upward and behind your back.

3 Hold position for one breath cycle and slowly return to upright position. Repeat two more times.

TARGET: Shoulders and upper back. Particularly good for carpenters, office workers.

TRUNK ROTATION *Sprinkler*

1 Extend left arm out to side and grasp left hip with right hand.

2 Rotate upper body to the left while pulling on hip with right hand.

3 Release tension and change to other side. Repeat on opposite side.

TARGET: Lower back and trunk support muscles. Particularly good for laborers, mechanics, iron workers.

LATERAL ROTATION STRETCH *Take a Bow*

1 Stand upright, feet slightly apart for balance. Extend left arm out to side and grasp left hip with right hand.

2 Rotate upper body to left while pulling on hip with right hand, then bend slowly from waist to left side to a comfortable angle.

3 Return to upright position and change hand locations to other side. Repeat on opposite side.

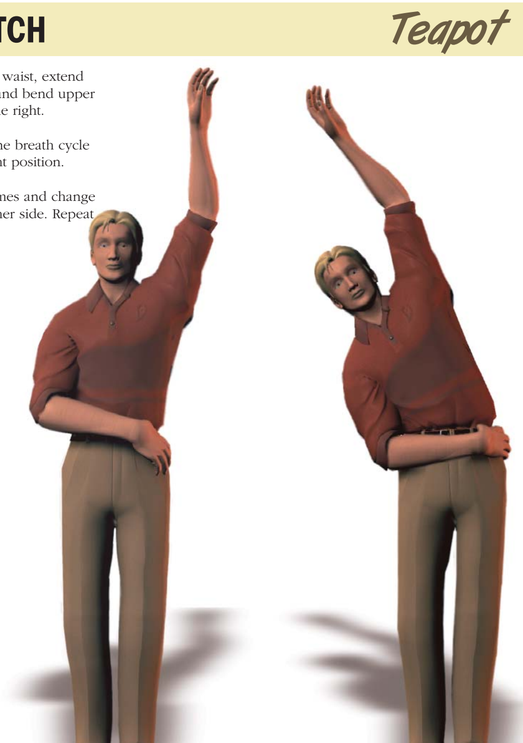
TARGET: Lats, lower back muscles, abdominals, upper leg muscles. Particularly good for laborers, iron workers.

LATERAL STRETCH *Teapot*

1 Place right hand on waist, extend left arm over head and bend upper body sideways to the right.

2 Hold position for one breath cycle and return to upright position.

3 Repeat two more times and change hand position to other side. Repeat on opposite side.



TARGET: Lats, and triceps plus shoulder mobility. Particularly good for masons, riggers, machinists.

SINGLE LEG STRETCH *Touch Your Toes*

1 Cross legs, keeping both knees slightly flexed.

2 Bend forward slowly from the waist and place both hands on the forward knee. Continue bending forward as far as possible.

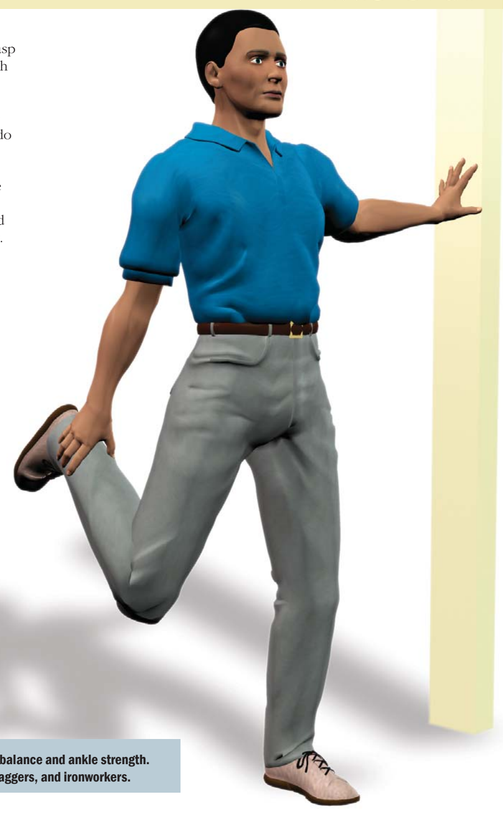
3 Hold position for one breath cycle. WARNING: discontinue this exercise if you become dizzy or lose your balance. Change leg position and repeat.

TARGET: Hamstrings, lower back muscles and stability. Particularly good for laborers, masons, mechanics.

SINGLE QUADRICEPS STRETCH *Ankle Grab*

1 With your left hand hold onto a stationary object for support, grasp your right ankle behind hips with right hand.

2 Pull ankle upward to stretch the quadriceps muscle. WARNING: do not attempt this exercise if you have problems with balance or severe knee injuries. If you have knee injuries, you may elect to lift the lower leg behind you and hold the position for 10 seconds. Repeat on opposite side.



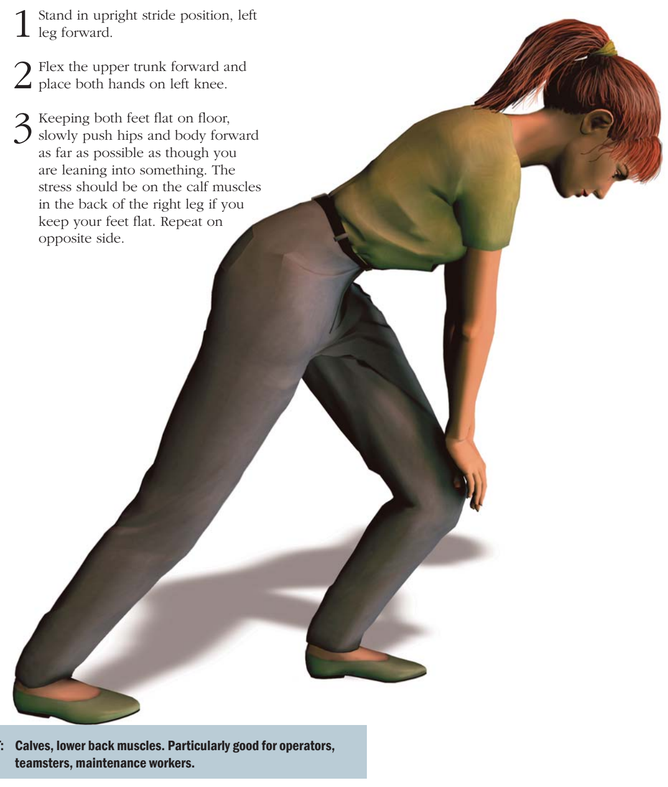
TARGET: Quadriceps and also helps body balance and ankle strength. Particularly good for laborers, flaggers, and ironworkers.

CALF STRETCH *Starting Line*

1 Stand in upright stride position, left leg forward.

2 Flex the upper trunk forward and place both hands on left knee.

3 Keeping both feet flat on floor, slowly push hips and body forward as far as possible as though you are leaning into something. The stress should be on the calf muscles in the back of the right leg if you keep your feet flat. Repeat on opposite side.



TARGET: Calves, lower back muscles. Particularly good for operators, teamsters, maintenance workers.

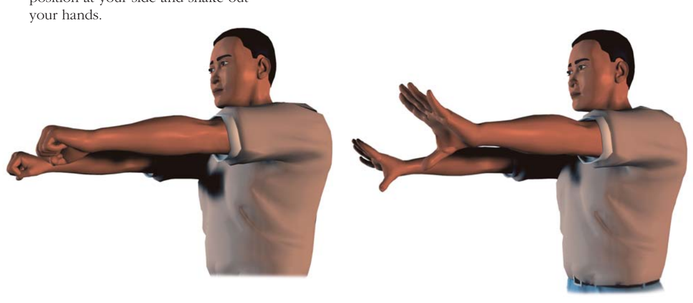
WRIST EXTENSION *Magic Hands*

1 Palms together with fingers apart, press momentarily together and release.

2 Stretch arms out forward and make a fist in each hand. Hold 5 seconds and open hand wide.

3 Force your thumbs down while keeping fingers pointing up towards the sky, wrists are bent back and elbows should be locked. You should feel a slight burn in the upper arm muscles (extensor muscles) of the forearm. These muscles are frequently less used and developed than the flexor muscles in the forearm which leads to unbalance and potential wrist injuries.

4 Hold 10 seconds and release. Return your arms to the neutral arm position at your side and shake out your hands.



TARGET: Extensor muscles. Particularly good for carpenters, administrative professionals, CAD operators, machinists, and maintenance workers.

Attachment D

Safety Data Sheets (SDSs)

SAFETY DATA SHEET

Version 4.11
Revision Date 02/02/2018
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,2,4-Trimethylbenzene

Product Number : T73601
Brand : Aldrich
Index-No. : 601-043-00-3

CAS-No. : 95-63-6

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 3), H226
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

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 measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	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.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C_9H_{12}
Molecular weight	:	120.19 g/mol
CAS-No.	:	95-63-6
EC-No.	:	202-436-9
Index-No.	:	601-043-00-3

Hazardous components

Component	Classification	Concentration
1,2,4-Trimethylbenzene		
	Flam. Liq. 3; Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H226, H304, H315, H319, H332, H335, H411	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. 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
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

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
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

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 inhalation of vapour or mist.
Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,2,4-Trimethylbenzene	95-63-6	TWA	25.000000 ppm 125.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
	Remarks	hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.		
		TWA	25 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Hematologic effects Asthma		

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

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.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 30 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, 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 and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., 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 respirator with multi-purpose 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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-43.69 °C (-46.64 °F)
f)	Initial boiling point and boiling range	168.0 - 169.0 °C (334.4 - 336.2 °F)
g)	Flash point	48.0 °C (118.4 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 6.4 %(V) Lower explosion limit: 0.9 %(V)
k)	Vapour pressure	2.3 hPa (1.7 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.88 g/cm3
n)	Water solubility	0.057 g/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	515.0 °C (959.0 °F)
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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - 6,000 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
in vitro assay
S. typhimurium
Result: negative

Mutagenicity (micronucleus test)
Rat - male and female - Bone marrow
Result: negative

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

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

Additional Information
RTECS: DC3325000

prolonged or repeated exposure can cause:, narcosis, Bronchitis., Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 7.72 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 3.6 mg/l - 48 h (OECD Test Guideline 202)

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 3295 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: HYDROCARBONS, LIQUID, N.O.S.

IATA
UN number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

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.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Asp. Tox.	Aspiration hazard
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	2
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	2
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.11 Revision Date: 02/02/2018 Print Date: 11/10/2018

SAFETY DATA SHEET

Version 5.6
Revision Date 08/10/2016
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benzene

Product Number : 443603
Brand : Sigma-Aldrich
Index-No. : 601-020-00-8

CAS-No. : 71-43-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure (Category 1), H372
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.

H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
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 measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C6H6
Molecular weight	:	78.11 g/mol
CAS-No.	:	71-43-2
EC-No.	:	200-753-7
Index-No.	:	601-020-00-8
Registration number	:	01-2119447106-44-XXXX

Hazardous components

Component	Classification	Concentration
Benzene		
	Flam. Liq. 2; Skin Irrit. 2; Eye Irrit. 2A; Muta. 1B; Carc. 1A; STOT RE 1; Asp. Tox. 1; Aquatic Acute 3; Aquatic Chronic 3; H225, H304, H315, H319, H340, H350, H372, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. 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
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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
Flash back possible over considerable distance., Container explosion may occur under fire conditions.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

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
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

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 inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Benzene	71-43-2	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		STEL	2.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.		
		TWA	0.1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		ST	1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benzene	71-43-2	S-	0.0300	In urine	ACGIH - Biological

		Phenylmercapturic acid	mg/g		Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			
		t,t-Muconic acid	0.5000 mg/g	In urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

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.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, 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 and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., 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 respirator with multi-purpose 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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: clear, colourless
b)	Odour	No data available

c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 5.5 °C (41.9 °F)
f)	Initial boiling point and boiling range	80.0 - 80.2 °C (176.0 - 176.4 °F)
g)	Flash point	-11.0 °C (12.2 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 8 %(V) Lower explosion limit: 1.3 %(V)
k)	Vapour pressure	221.3 hPa (166.0 mmHg) at 37.7 °C (99.9 °F) 99.5 hPa (74.6 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.88 g/cm3
n)	Water solubility	ca.1.88 g/l at 23.5 °C (74.3 °F) - soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.13 at 25 °C (77 °F)
p)	Auto-ignition temperature	562.0 °C (1,043.6 °F)
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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
acids, Bases, Halogens, Strong oxidizing agents, Metallic salts

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - > 5,960 mg/kg
(OECD Test Guideline 401)

LC50 Inhalation - Rat - female - 4 h - 43.7 mg/l
(OECD Test Guideline 403)

LD50 Dermal - Rabbit - 8,263 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation

Respiratory or skin sensitisation
Maximisation Test - Guinea pig
Result: Does not cause skin sensitisation.

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vivo tests showed mutagenic effects

Chinese hamster lung cells
Result: positive

OECD Test Guideline 475
Mouse - male
Result: positive

Carcinogenicity

Carcinogenicity - Human - male - Inhalation
Tumorigenic:Carcinogenic by RTECS criteria. Leukaemia Blood:Thrombocytopenia.

Carcinogenicity - Rat - Oral
Tumorigenic:Carcinogenic by RTECS criteria. Endocrine:Tumors. Leukaemia

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Human carcinogen.

IARC:	1 - Group 1: Carcinogenic to humans (Benzene)
NTP:	Known to be human carcinogen (Benzene)
OSHA:	OSHA specifically regulated carcinogen (Benzene)

Reproductive toxicity

Reproductive toxicity - Mouse - Intraperitoneal
Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Embryo or Fetus: Fetal death.

Developmental Toxicity - Rat - Inhalation
Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Developmental Toxicity - Mouse - Inhalation
Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material). Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Additional Information

Repeated dose toxicity: Rat - male and female - Oral - NOAEL : 100 mg/kg - OECD Test Guideline 408
RTECS: CY1400000

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

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 15.00 - 32.00 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Ceriodaphnia dubia (water flea) - 17.2 mg/l - 48 h
Toxicity to algae	Growth inhibition EC50 - Pseudokirchneriella subcapitata (green algae) - 100 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 96 % - Readily biodegradable (OECD Test Guideline 301F)

12.3 Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d - 0.05 mg/l Bioconcentration factor (BCF): 10

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1114 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: BENZENE

IATA
UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benzene	71-43-2	2009-02-01
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Benzene	71-43-2	2009-02-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Asp. Tox.	Aspiration hazard
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6 Revision Date: 08/10/2016 Print Date: 11/10/2018

TED PELLA, INC.
Microscopy Products for Science and Industry

Safety Data Sheet

Product No. 1655, 1655-B, 1656, Beryllium
Beryllium Products
Issue Date (05-28-15)
Review Date (08-31-17)

Section 1: Product and Company Identification

Product Name: Beryllium Products
Synonym: Be, Glucinium
Company Name
Ted Pella, Inc., P.O. Box 492477, Redding, CA 96049-2477
Inside USA and Canada 1-800-237-3526 (Mon-Thu. 6:00AM to 4:30PM PST; Fri 6:00AM to 4:00PM PST)
Outside USA and Canada 1-530-243-2200 (Mon-Thu. 6:00AM to 4:30PM PST; Fri 6:00AM to 4:00PM PST)
CHEMTREC USA and Canada Emergency Contact Number 1-800-424-9300 24 hours a day
CHEMTREC Outside USA and Canada Emergency Contact Number +1-703-741-5970 24 hours a day

Section 2: Hazard Identification

GHS Pictograms:


Health hazard Irritant

GHS Categories:

GHS08 Health Hazard

Sensitization, respiratory	Category 1
Sensitization, skin	Category 1
Carcinogenicity	Category 1
Specific target organ toxicity, Repeated exposure	Category 1

GHS07 Irritant

Signal Word: Danger

Hazard statements:

H350 May cause cancer by inhalation.
H317 May cause an allergic skin reaction.
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H373 May cause damage to organs (respiratory system) through prolonged or repeated exposure.

Precautionary statements:

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/fume.
P264	Wash thoroughly after handling.
P270	Do not eat, drink or smoke while using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

P285	In case of inadequate ventilation, wear respiratory protection.
P303+P332	IF ON SKIN: Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention.
P304+308+342	IF INHALED: Remove person to fresh air and keep comfortable for breathing. If exposed or concerned: Get medical advice/attention. If experiencing respiratory symptoms: Call a poison center/doctor.
P405	Store locked up.
P501	Dispose of contents/container in accordance with local/regional/national/international regulations.

Health Effects:
NFPA Hazard Rating: Health: 2; Fire: 0; Reactivity: 0
HMIS® Hazard Rating: Health: 2; Fire: 0; Reactivity: 0
(0=least, 1=Slight, 2=Moderate, 3=High, 4=Extreme)

Results of PBT and vPvB assessment: A chemical safety assessment has not been carried out.
PBT: ND
vPvB: ND

Emergency overview:
Appearance: Metallic solid
Immediate effects: ND

Potential health effects
Beryllium metal, in solid form and as contained in finished products presents no special health risks. Exposure to the elements listed by inhalation, ingestion, and skin contact can occur when melting, casting, dross handling, pickling, chemical cleaning, heat treating, abrasive cutting, welding, grinding, sanding, polishing, milling, crushing, or otherwise heating or abrading the surface of this material in a manner which generates particulate. Exposure may also occur during repair or maintenance activities on contaminated equipment such as: furnace rebuilding, maintenance or repair of air cleaning equipment, structural renovation, welding, etc. Particulate depositing on hands, gloves, and clothing, can be transferred to the breathing zone and inhaled during normal hand to face motions such as rubbing of the nose or eyes, sneezing, coughing, etc.
Primary Routes of entry: Inhalation, eye and skin contact.
Signs and Symptoms of Overexposure:
Eyes: Exposure may result from direct contact with airborne particulate or contact to the eye with contaminated hands or clothing. Damage can result from irritation or mechanical injury to the eyes by particulate.
Skin: Beryllium: Particulate that becomes lodged under the skin has the potential to induce sensitization and skin lesions.
Ingestion: Ingestion can occur from hand, clothing, food and drink contact with particulate during hand to mouth activities such as eating, drinking, smoking, nail biting, etc. Beryllium: The health effect of ingestion of beryllium in the form found in this product is unknown.
Inhalation: Can cause irritation to the nose, throat, lungs and mucous membranes. Beryllium: The beryllium in this product is not known to cause acute health effects. Inhaling particulate containing beryllium may cause a serious, chronic lung disease called Chronic Beryllium Disease (CBD) in some individuals.
Chronic Exposure: Beryllium: Inhaling particulate containing beryllium may cause a serious, chronic lung disease called chronic beryllium disease (CBD) in some individuals. Over time, lung disease can be fatal. Chronic beryllium disease is a hypersensitivity or allergic condition in which the tissues of the lungs become inflamed. This inflammation, sometimes with accompanying fibrosis (scarring), may restrict the exchange of

oxygen between the lungs and the bloodstream. Medical science suggests that CBD may be related to genetic factors.
Chemical Listed As Carcinogen Or Potential Carcinogen: Beryllium: The International Agency for Research on Cancer (IARC) lists beryllium as a Group 1 – Known Human Carcinogen. The National Toxicology Program (NTP) lists beryllium as known to be human carcinogens. IARC lists beryllium as a known human carcinogen (Group 1) and notes that the work environment of workers involved in refining, machining and producing beryllium metal was associated with an increased risk of lung cancer, "the greater excess was in workers hired before 1950 when exposures to beryllium in the work place were relatively uncontrolled and much higher than in subsequent decades"; and "the highest risk for lung cancer being observed among individuals diagnosed with acute beryllium-induced pneumonitis, who represent a group that had the most intense exposure to beryllium." IARC further noted that "Prior to 1950, exposure to beryllium in working environments was usually very high, and concentrations exceeding 1 mg/m3 [1000 micrograms per cubic meter] were not unusual."
See Toxicological Information (Section11)

Potential environmental effects
See Ecological Information (Section 12)

Section 3: Composition / Information on Ingredients

Principle Hazardous Component(s) **(chemical and common name(s))** **(Cas. No)**	**%**	**OSHA PEL mg/m3**	**ACGIH TLV mg/m3**	**NTP** Carcinogen	**IARC** Carcinogen	**OSHA regulated** Carcinogen
Beryllium (7440-41-7) EC-No: 231-150-7	~100	PEL 0.002 CEILING 0.005 PEAK 0.025	TLV 0.00005 TLV-STEL NA	Known	Group 1	Known

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Section 4: First Aid Measures
If accidental overexposure is suspected
Eye(s) Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.
Skin Contact: Take off all contaminated clothing and wash before reuse. Thoroughly wash skin cuts or wounds to remove all particulate debris from the wound. Seek medical attention for wounds that cannot be thoroughly cleansed. Treat skin cuts and wounds with standard first aid practices such as cleansing, disinfecting and covering to prevent wound infection and contamination before continuing work. Obtain medical help for persistent irritation. Material accidentally implanted or lodged under the skin must be removed.
Inhalation: Breathing difficulty caused by inhalation of particulate requires immediate removal to fresh air. For breathing difficulties, oxygen may be necessary. If breathing has stopped, perform artificial respiration and obtain medical help.
Ingestion: If swallowed, seek medical advice and show this container or label. Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Most important symptoms/effects, acute and delayed: May cause allergic skin reaction. May cause allergic respiratory reaction. Prolonged exposure may cause chronic effects.
Note to physician
Treatment: Treatment of Chronic Beryllium Disease: There is no known treatment which will cure chronic beryllium disease. Prednisone or other corticosteroids are the most specific treatment currently available. They

are directed at suppressing the immunological reaction and can be effective in diminishing signs and symptoms of chronic beryllium disease. In cases where steroid therapy has had only partial or minimal effectiveness, other immunosuppressive agents, such as cyclophosphamide, cyclosporine, or methotrexate, have been used. These latter agents remain investigational. Further, in view of the potential side effects of all the immunosuppressive medications, including steroids such as prednisone, they should be used only under the direct care of a physician. In general, these medications should be reserved for cases with significant symptoms and/or significant loss of lung function. Other symptomatic treatment, such as oxygen, inhaled steroids or bronchodilators, may be prescribed by some physicians and can be effective in selected cases. The decision about when and with what medication to treat is a judgment situation for individual physicians. For the most part, treatment is reserved for those persons with symptoms and measurable loss of lung function. The value of starting oral steroid treatment, before signs or symptoms are evident, remains a medically unresolved issue. The effects of continued low exposure to beryllium are unknown for individuals who are sensitized to beryllium or who have a diagnosis of chronic beryllium disease. It is generally recommended that persons who are sensitized to beryllium or who have CBD terminate their occupational exposure to beryllium.
Medical Conditions generally Aggravated by Exposure: Persons with impaired pulmonary function, airway diseases, or conditions such as asthma, emphysema, chronic bronchitis, etc. may incur further impairment if particulate is inhaled. If prior damage or disease to the neurologic (nervous), circulatory, hematologic (blood), or urinary (kidney) systems has occurred, proper screening or examinations should be conducted on individuals who may be exposed to further risk where handling and use of this material may cause exposure. Beryllium: The effects of chronic beryllium disease on the lungs and heart are additive to the effects of other health conditions.

Section 5: Fire Fighting Measures
Flash Point: Not applicable to solids.
Flammable Limits: Not applicable to solids.
Auto-ignition point: Not applicable to solids.
Fire Extinguishing Media: Only in powder or other finely divided form does this material present a special fire problem. To extinguish a metal powder fire, use Class D fire extinguishing powder.
Special Fire Fighting Procedures: Pressure-demand self-contained breathing apparatus must be worn by firefighters or any other persons potentially exposed to the particulate released during or after a fire.
Unusual Fire and Explosion Hazards: Do not use water to extinguish fires around operations involving molten metal due to the potential for steam explosions. In addition, water may disassociate when in contact with burning metal particulate or chips releasing flammable hydrogen gas which could burn and result in an explosion.
Ventilation duct work which has accumulated a fine coating of this material as a particulate on its internal surface poses a potentially serious fire hazard. Extinguish using Class D fire extinguisher media and shut down or isolate the affected portion of the ventilation system. Because of this potential risk, sources of ignition such as flame, spark from machining of other materials, welding spark, etc. must not be allowed to enter the ventilation duct work. Also, duct work must be made of non-combustible material. See Section 8 for further information regarding personal protective measures.
Hazardous combustion products: None
DOT Class: Not regulated

Section 6: Accidental Release Measures
Steps to be Taken in Case Material is Released or Spilled: If this material is a particulate, establish a restricted entry zone based on the severity of the spill. Persons entering the restricted zone must wear adequate respiratory protection and protective clothing appropriate for the severity of the spill (see Section 8). Cleanup spills with a vacuum system utilizing a high efficiency particulate air (HEPA) filtration system followed by wet cleaning methods. Special precautions must be taken when changing filters on HEPA vacuum cleaners used to clean up hazardous materials. Be careful to minimize airborne generation of particulate and avoid contamination of air and water. Depending upon the quantity of material released into the environment, the incident may be required to be reported to the National Response Center, as well as the State Emergency Response Commission and

Local Emergency Planning Committee.
Waste Disposal Methods: Dispose of waste according to Federal, State and Local Regulations.

Section 7: Handling and Storage

Precautions to be taken in Handling and Storage: Particulate may enter the body through cuts, abrasions or other wounds on the surface of the skin. Wear gloves when handling parts with loose surface particulate or sharp edges.
Storage temperature: Store in a dry area.
Storage Pressure: ND

Section 8: Exposure Controls / Personal Protection

Occupational Exposure Limits

U.S. OSHA Table A-2 (29 CFR 1910.1000)			
Material	**Type**	**Value**	
Beryllium (CAS 7440-41-7)	Ceiling TWA	0.005 mg/m3 0.002 mg/m3	
U.S. ACGIH Threshold Limit Values			
Material	**Type**	**Value**	**Form**
Beryllium (CAS 7440-41-7)	TWA	0.00005 mg/m3	Inhalable fraction
U.S. NIOSH: Pocket Guide to Chemical Hazards			
Material	**Type**	**Value**	
Beryllium (CAS 7440-41-7)	Ceiling	0.0005 mg/m3	

Engineering Controls

Ventilation required: Whenever possible, the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne particulate. Where utilized, exhaust inlets to the ventilation system must be positioned as close as possible to the source of airborne generation. Avoid disruption of the airflow in the area of a local exhaust inlet by equipment such as a man-cooling fan. Check ventilation equipment regularly to ensure it is functioning properly. Provide training on the use and operation of ventilation to all users. Use qualified professionals to design and install ventilation systems.

Personal Protection Equipment

Develop work practices and procedures that prevent particulate from coming in contact with worker skin, hair, or personal clothing. If work practices and/or procedures are ineffective in controlling airborne exposure or visual particulate from deposition on skin, hair, or clothing, provide appropriate cleaning/washing facilities. Procedures should be written that clearly communicate the facility's requirements for protective clothing and personal hygiene. These clothing and personal hygiene requirements help keep particulate from being spread to non-production areas or from being taken home by the worker. Never use compressed air to clean work clothing or other surfaces.
Fabrication processes may leave a residue of particulate on the surface of parts, products or equipment that could result in employee exposure during subsequent material handling activities. As necessary, clean loose particulate from parts between processing steps. As a standard hygiene practice, wash hands before eating or smoking.
To prevent exposure, remove surface scale or oxidation formed on cast or heat treated products in an adequately ventilated process prior to working the surface.

Control parameters

Wet Methods: Machining operations conducted under a flood of liquid coolant require complete hooded containment and local exhaust ventilation. Openings into the hood must be baffled to prevent release of fast moving particulate. The cycling through a machine of liquid lubricant/coolant containing finely divided

beryllium particulate in suspension can result in the concentration building to a point where the particulate may become airborne during use. Prevent coolant from splashing onto floor areas, external structures or operators' clothing. Utilize a coolant filtering system to remove particulate from the coolant.
Housekeeping: Use vacuum and wet cleaning methods for particulate removal from surfaces. Be certain to de-energize electrical systems, as necessary, before beginning wet cleaning. Use vacuum cleaners with high efficiency particulate air (HEPA). Do not use compressed air, brooms, or conventional vacuum cleaners to remove particulate from surfaces as this activity can result in elevated exposures to airborne particulate. Follow the manufacturer's instructions when performing maintenance on HEPA filtered vacuums used to clean hazardous materials.
Maintenance: During repair or maintenance activities the potential exists for exposures to particulate in excess of the occupational standards. Under these circumstances, protecting workers can require the use of specific work practices or procedures involving the combined use of ventilation, wet and vacuum cleaning methods, respiratory protection, decontamination, special protective clothing, and when necessary, restricted work zones.
Welding: In accordance with OSHA regulation 29 CFR 1910.252 welding of materials containing beryllium is regulated as follows: Welding or cutting indoors, outdoors, or in confined spaces involving beryllium containing base or filler metals shall be done using local exhaust ventilation and pressure-demand airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations defined by 29 CFR 1910.1000. In all cases, workers in the immediate vicinity of the welding or cutting operations shall be protected as necessary by local exhaust ventilation or airline respirators.
Corrosion Protection: Beryllium is corrosion-resistant in air and water up to 600°C. This is attributed to the formation of an adherent oxide layer on the surface.
The presence of salts in water, particularly chloride, dramatically accelerates the corrosion of beryllium. This corrosion can be further accelerated (galvanic corrosion) if beryllium is in contact with a less reactive metal. Contrarily, beryllium can be protected from corrosion by contact with a more reactive metal (anodic protection). Generally, some corrosion protection should be applied to beryllium. Salts from handling beryllium without gloves along with humidity in the air are sufficient to cause "finger print" corrosion on a bare beryllium part. A chromate conversion coating is an effective protection for non-severe service. For applications where beryllium is exposed to salt spray or mist, an integral coating is needed to prevent corrosion. The conversion coating alone will not protect beryllium in salt spray applications. Conversion coating in combination with anodic protection with manganese or magnesium has been effective in protecting beryllium brake components on aircraft carrier based planes. Electroless nickel, epoxy paint and other integral coatings are effective corrosion barriers in salt spray applications.
Exposure Characterization: Determine exposure to airborne particulate by air sampling in the employee breathing zone, work area, and department. Utilize an Industrial Hygienist or other qualified professional to specify the frequency and type of air sampling. Develop and utilize a sampling strategy which identifies the extent of exposure variation and provides statistical confidence in the results. Conduct an exposure risk assessment of processes to determine if conditions or situations exist which dictate the need for additional controls or improved work practices. Make air sample results available to employees.

Individual protection measures, such as personal protective equipment
Respiratory protection: When airborne exposures exceed or have the potential to exceed the occupational limits shown in Section 8.15, approved respirators must be used as specified by an Industrial Hygienist or other qualified professional. Respirator users must be medically evaluated to determine if they are physically capable of wearing a respirator. Quantitative and/or qualitative fit testing and respirator training must be satisfactorily completed by all personnel prior to respirator use. Users of tight fitting respirators must be clean shaven on those areas of the face where the respirator seal contacts the face. Exposure to unknown concentrations of particulate requires the wearing of a pressure-demand airline respirator or pressure-demand self-contained breathing apparatus (SCBA). Use pressure-demand airline respirators when performing jobs with high potential exposures such as changing filters in a bag house air cleaning device.
Protective gloves: Wear gloves to prevent contact with particulate or solutions. Wear gloves to prevent metal cuts and skin abrasions during handling.

Eye protection: Wear safety glasses, goggles, face shield or welder's helmet when risk of eye injury is present, particularly during melting, casting, machining, grinding, welding, powder handling, etc.
Gloves: Wear gloves to prevent contact with particulate or solutions. Wear gloves to prevent metal cuts and skin abrasions during handling.
Skin protection: Protective overgarments or work clothing must be work by persons who may become contaminated with particulate during activities such as machining, furnace building, air cleaning, equipment filter changes, maintenance, furnace tending, etc. Skin contact with this material may cause, in some sensitive individuals, an allergic dermal response. Particulate that becomes lodged under the skin has the potential to induce sensitization and skin lesions.

Medical Surveillance: Beryllium: Medical surveillance for beryllium health effects includes (1) skin examination, (2) respiratory history, (3) examination of the lungs, (4) lung function tests (FVC and FEV1), and (5) periodic chest x-ray. In addition, a specialized, specific, immunological blood test, the beryllium blood lymphocyte proliferation test (BLPT), is available to assist in the diagnosis of beryllium related reactions. Individuals who have an abnormal BLPT are normally referred to a lung specialist for additional specific tests to determine if chronic beryllium disease is present. Note: Substantial inter- and intra-laboratory disagreement exists among the laboratories that conduct this test. The BLPT does not at this time meet the criteria for a screening test. Despite its limitations, however, the BLPT remains a useful disease surveillance tool.
Risk Factors: Specific genetic factors have been identified and have been shown to increase an individual's susceptibility to CBD. Medical testing is available to detect genetic factors in individuals.
Exposure Guidelines
See Composition/Information on Ingredients (Section 3)

Section 9 Physical and Chemical Properties
Appearance and Physical State: Grey metallic solid
Odor (threshold): NA
Specific Gravity (H_2O=1): 1.85 g/cc at 20°C
Vapor Pressure (mm Hg): 6.67 hPa estimated
Vapor Density (air=1): NA
Percent Volatile by volume: None
Evaporation Rate (butyl acetate=1): NA
Boiling Point: 5378°F
Freezing point / melting point: 1287°C
pH: NA
Solubility in Water: Insoluble
Molecular Weight: 9.01
Specific gravity: 1.85

Section 10: Stability and Reactivity
Stability: Stable
Conditions to Avoid: ND
Materials to Avoid (Incompatibility): Avoid contact with mineral acids and strong bases which generate hydrogen gas. Hydrogen gas can be an explosion hazard.
Hazardous Decomposition Products: None under normal conditions of use.
Hazardous Polymerization: Will not occur

Section 11: Toxicological Information
Results of component toxicity test performed: ND
Human experience: Likely Routes of Exposure: Inhalation, skin, eyes. Product as shipped does not present an inhalation hazard; however subsequent operations may create dusts or fumes which could be inhaled.
Symptoms of Exposure: Dust may cause irritation to upper respiratory tract, skin or eyes.

Acute and Chronic Effects: Some people inhaling low concentrations of beryllium develop chronic beryllium disease, a granulomatous lung disease characterized by dyspnea, cough, reduced pulmonary function, and a variety of other
symptoms including weight loss. The lack of a dose-response relationship between the extent of exposure and development of the disease, long latency period between exposure and onset, and the low incidence among beryllium exposed individuals suggests that the disease is immune mediated.
This product **does** contain Beryllium listed by NTP or IARC or regulated by OSHA as a carcinogen. Beryllium: The International Agency for Research on Cancer (IARC) lists beryllium as a Group 1 – Known Human Carcinogen.

Section 12: Ecological Information
Ecological Information: This material can be recycled.
Chemical Fate Information: ND

Section 13 Disposal Considerations
RCRA 40 CFR 261 Classification:
When spent products are declared solid wastes (no longer recyclable), they must be labeled, managed and disposed of, in accordance with federal, state and local requirements. This material is not classified a hazardous waste under federal law.
The U.S. Environmental Protection Agency has classified beryllium powder (P015) as a hazardous waste under the Resource Conservation and Recovery Act (RCRA). In Section 40 CFR 261.33(e) of RCRA, beryllium powder is considered hazardous when it is in the form of a "discarded commercial chemical product, off-specification species, container residue and spill residue, thereof." This designation only applies to commercially pure products or manufacturing intermediates in which beryllium is the "sole active ingredient." Due to the limited scope of this definition, the only form of beryllium to which it applies is waste commercially pure metallic beryllium powder.
Beryllium scrap, chips, and powder are normally recycled as by-products and are not classified a waste. In cases where this is not justified, seal any off-specification metallic beryllium powder in two plastic bags and then place in a DOT container approved for flammable solids. If being disposed, the outer container must be labeled with the appropriate EPA hazardous waste label and DOT hazard warning label(s) and shipped under a uniform hazardous waste manifest to an approved hazardous waste management facility. Dispose of dust collector filters contaminated with metallic beryllium powder following the above procedure, with the exception of the hazardous waste manifest and hazardous waste container label. Federal, State and local laws governing disposal of materials can differ. Ensure proper disposal compliance with proper authorities before disposal.

Section 14: Transportation Information
Beryllium Solid Form:
US DOT Information: Proper shipping name: Not regulated
IATA: Proper shipping name: Not regulated
Marine Pollutant: No
Canadian TDG: Not regulated

Section 15: Regulatory Information
United States Federal Regulations
SDS complies with OSHA's Hazard Communication Rule 29, CFR 1910.1200.
SARA: Substance is listed.
SARA Title III: Substance is listed.
RCRA: Beryllium powder is considered hazardous when it is in the form of a "discarded commercial chemical product, off-specification species, container residue and spill residue, thereof."
TSCA: All components are listed.
CERCLA: Beryllium Powder: RQ = 10 lb (4.54 Kg)
Other Federal Regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List
Beryllium (CAS 7440-41-7)
Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)
Not regulated
Clean Water Act (CWA) Section 112(r) (40 CFR 68.130)
Priority pollutant
Toxic pollutant
Safe Drinking Water Act (SDWA)
0.004 mg/l

State Regulations

California Proposition 65: Warning! This product contains a chemical known to the state of California to cause cancer.
Beryllium (7440-41-7)

California – Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))
Beryllium (7440-41-7)

New Jersey RTK – Substances: Listed Substance
Beryllium (CAS 7440-41-7)

New Jersey Worker and Community Right-to-Know Act
Beryllium (7440-41-7)

Pennsylvania RTK – Hazardous substances: All compounds of this substance are considered environmental hazards
Beryllium (CAS 7440-41-7)

Pennsylvania Worker and Community Right-to-Know Law
Beryllium (7440-41-7)

Massachusetts RTK – Substance List
Beryllium (7440-41-7)

Rhode Island RTK
Beryllium (7440-41-7)

International Regulations

Canada WHMIS: D2A, D2B
Europe EINECS Numbers: ND

Section 16: Other Information

Label Information:

Beryllium Solid
WARNING!

INHALING DUST OR FUMES MAY CAUSE CHRONIC BERYLLIUM DISEASE, A SERIOUS CHRONIC LUNG DISEASE, IN SOME INDIVIDUALS. CANCER HAZARD. OVER TIME, LUNG DISEASE AND CANCER CAN BE FATAL. TARGET ORGAN IS PRIMARILY THE LUNG.
READ THE MATERIAL SAFETY DATA SHEET (MSDS) ON FILE WITH YOUR EMPLOYER BEFORE WORKING WITH THIS MATERIAL.

Overexposure to beryllium by inhalation may cause chronic beryllium disease, a serious chronic lung disease.
• If processing or recycling produces airborne dust, fumes, or mists, use exhaust ventilation or other controls designed to prevent exposure to workers. Examples of such activities include melting, machining, welding, grinding, abrasive sawing, sanding and polishing. Any activity which abrades the surface of this material can generate airborne dust.
• The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational exposures.
• Beryllium metal, in solid form and as contained in finished products presents no special health risks.
• Sold for manufacturing purposes only. This product can be recycled; contact your sales representative.
The Occupational Safety and Health Administration requires employers to provide training in the proper use of this product.
We strongly caution against washing or cleaning Beryllium Products with acids or solvents due to the risk of forming Beryllium Salts which may be extremely toxic.

SOLD FOR LABORATORY USE ONLY

European Risk and Safety Phrases: ND
European symbols needed: ND
Canadian WHMIS Symbols: D2A, D2B

Abbreviations used in this document

NE= Not established
NA= Not applicable
NIF= No Information Found
ND= No Data

Disclaimer

Ted Pella, Inc. makes no warranty of any kind regarding the information furnished herein. Users should independently determine the suitability and completeness of information from all sources. While this data is presented in good faith and believed to be accurate, it should be considered only as a supplement to other information gathered by the user. It is the User's responsibility to assure the proper use and disposal of these materials as well as the safety and health of all personnel who may work with or otherwise come in contact with these materials.

SAFETY DATA SHEET

Revision Date 17-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Cadmium**

Cat No. : **C3-500**

CAS-No 7440-43-9
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

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)

Flammable solids	Category 2
Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 2
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	
Combustible dust	Yes

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
May form combustible dust concentrations in air
Fatal if inhaled

Harmful if swallowed
Harmful in contact with skin
May cause respiratory irritation
Suspected of causing genetic defects
May cause cancer
Suspected of damaging fertility. Suspected of damaging the unborn child
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Skin
IF ON SKIN: Wash with plenty of soap and water
Wash contaminated clothing before reuse
Call a POISON CENTER or doctor/physician if you feel unwell
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING. Cancer and Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Cadmium	7440-43-9	100

4. First-aid measures

General Advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation	Move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.
Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms and effects	None reasonably foreseeable. . Kidney disorders: May cause harm to the unborn child: Blood disorders
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Fine dust dispersed in air may ignite. Dust can form an explosive mixture in air. Pyrophoric properties of solids and liquids. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Highly toxic fumes
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	1	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.
Methods for Containment and Clean Up	Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Use only under a chemical fume hood. Do not breathe vapors/dust. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cadmium	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³	Ceiling: 0.3 mg/m³ Ceiling: 0.6 mg/m³ (Vacated) STEL: 0.3 ppm TWA: 0.1 mg/m³ TWA: 0.2 mg/m³ TWA: 5 µg/m³	IDLH: 9 mg/m³	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

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 Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. Physical and chemical properties

Physical State	Solid
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	321 °C / 609.8 °F
Boiling Point/Range	765 °C / 1409 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable

Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	8.64 @ 25°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cd
Molecular Weight	112.40

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under recommended storage conditions. Moisture sensitive. Air sensitive.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. Exposure to air or moisture over prolonged periods.

Incompatible Materials Strong oxidizing agents, Strong acids, Sulfur oxides

Hazardous Decomposition Products Highly toxic fumes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cadmium	LD50 = 2330 mg/kg (Rat)	Not listed	LC50 = 25 mg/m³ (Rat) 30 min

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Cadmium	7440-43-9	Group 1	Known	A2	X	A2

IARC: (International Agency for Research on Cancer)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial

A1 - Known Human Carcinogen

Hygienists)

A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects Possible risk of irreversible effects

Reproductive Effects Possible risk of impaired fertility. May cause harm to the unborn child.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure Kidney Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Kidney disorders: May cause harm to the unborn child: Blood disorders

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cadmium	Not listed	LC50: 0.0004 - 0.003 mg/L, 96h (Pimephales promelas) LC50: = 0.016 mg/L, 96h (Oryzias latipes) LC50: = 21.1 mg/L, 96h flow-through (Lepomis macrochirus) LC50: = 0.24 mg/L, 96h static (Cyprinus carpio) LC50: = 4.26 mg/L, 96h semi-static (Cyprinus carpio) LC50: = 0.002 mg/L, 96h (Cyprinus carpio) LC50: = 0.006 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 0.003 mg/L, 96h flow-through (Oncorhynchus mykiss)	Not listed	EC50: = 0.0244 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN2930
Proper Shipping Name	TOXIC SOLIDS, FLAMMABLE, ORGANIC, N.O.S.
Proper technical name	Cadmium
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

TDG

UN-No	UN2930
Proper Shipping Name	TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IATA

UN-No	UN2930
Proper Shipping Name	TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IMDG/IMO

UN-No	UN2930
Proper Shipping Name	TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Cadmium	X	X	-	231-152-8	-		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 %
Cadmium	7440-43-9	100	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Cadmium	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Cadmium	X		-

OSHA Occupational Safety and Health Administration
Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Cadmium	5 µg/m³ TWA 2.5 µg/m³ Action Level	-

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Cadmium	10 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Cadmium	7440-43-9	Carcinogen Developmental Male Reproductive	0.05 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Cadmium	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 17-Jan-2018

Print Date	17-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

Material Safety Data Sheet
Chromium (III) oxide

ACC# 05060

Section 1 - Chemical Product and Company Identification

MSDS Name: Chromium (III) oxide
Catalog Numbers: AC192080000, AC192085000, AC353580000, C333-3, C334-500, NC9526419, NC9527292, NC9609821, S79968, XXC33410KG
Synonyms: Chromic Sesquioxide; chrome green; chrome oxide; chromium sesquioxide; chromium (3+) trioxide; dichromium trioxide
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
1308-38-9	Chromium (III) oxide	99-100.0	215-160-9

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: light to dark green powder.
Warning! May cause allergic skin reaction. May cause eye, skin, and respiratory tract irritation. Hygroscopic (absorbs moisture from the air).
Target Organs: None.

Potential Health Effects

Eye: Dust may cause mechanical irritation.
Skin: May cause skin irritation. May cause an allergic reaction in certain individuals.
Ingestion: Ingestion of large amounts may cause gastrointestinal irritation.
Inhalation: May cause respiratory tract irritation. Chromium (III) oxide is poorly absorbed into the body and, therefore, exists mostly as a "nuisance" dust.
Chronic: Prolonged or repeated skin contact may cause sensitization dermatitis and possible destruction and/or ulceration. Repeated inhalation may cause chronic bronchitis. A review of studies conducted over 100 years showed no conclusive evidence for a cancer hazard among workers exposed to aerosols formed by chromium metal or Chromium (III) compounds. The International Agency for Research on Cancer (IARC) has concluded that there is inadequate evidence in humans or experimental animals for the carcinogenicity of Chromium (III) compounds. The overall evaluation concluded that Chromium (III) compounds are not classifiable as to their carcinogenicity to humans.

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.
Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
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.
Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.
Flash Point: Not available.
Autoignition Temperature: Noncombustible.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use only in a well-ventilated area. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation. Wash clothing before reuse.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Store protected from moisture.

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 ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chromium (III) oxide	none listed	none listed	none listed

OSHA Vacated PELs: Chromium (III) oxide: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: 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: 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: Powder
Appearance: light to dark green
Odor: odorless
pH: 7.5@ 0.5% soln.
Vapor Pressure: Not applicable.
Vapor Density: Not applicable.
Evaporation Rate: Not available.
Viscosity: Not applicable.
Boiling Point: 4000 deg C
Freezing/Melting Point:2435 deg C
Decomposition Temperature: Not available.
Solubility: insoluble in water.
Specific Gravity/Density:5.21 (water=1)
Molecular Formula: Cr2O3
Molecular Weight:151.9902

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions. Hygroscopic: absorbs moisture or water from the air.
Conditions to Avoid: Dust generation, exposure to moist air or water.
Incompatibilities with Other Materials: Alkaline earth metals, chlorine trifluoride, oxygen difluoride, lithium, rubidium, rubidium acetylide, glycerol.
Hazardous Decomposition Products: Not known.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 1308-38-9: GB6475000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 1308-38-9: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: A review of studies conducted over 100 years showed no conclusive evidence for a cancer hazard among workers exposed to aerosols formed by chromium metal or Chromium (III) compounds. The International Agency for Research on Cancer (IARC) has concluded that there is inadequate evidence in humans or experimental animals for the carcinogenicity of Chromium (III) compounds. The overall evaluation concluded that Chromium (III) compounds are not classifiable as to their carcinogenicity to humans.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Mutagenicity: No information available.

Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: No information found.
Physical: No information found.
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
Shipping Name:	Please contact Fisher Scientific for shipping information	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 1308-38-9 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 1308-38-9: immediate, delayed.
Section 313 No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 1308-38-9 can be found on the following state right to know lists: New Jersey, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28 After contact with skin, wash immediately with...

WGK (Water Danger/Protection)

CAS# 1308-38-9: 1

Canada - DSL/NDSL

CAS# 1308-38-9 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 1308-38-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 5/18/1999
Revision #7 Date: 3/16/2007

Section 1 - PRODUCT AND COMPANY IDENTIFICATION

Material Name
CRUDE COKE OVEN TAR, CRUDE COAL TAR

Synonyms
CENTRIFUGE TAR

Product Use
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.
Acute Toxicity - Dermal - Category 4
Acute Toxicity - Inhalation - Dust/Mist - Category 3
Skin Corrosion/Irritation - Category 2
Serious Eye Damage/Eye Irritation - Category 2A
Skin Sensitization - Category 1
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1A
Reproductive Toxicity - Category 1B
Specific target organ toxicity - Single exposure - Category 1 (blood , respiratory system , kidneys , nervous system , heart)
Specific target organ toxicity - Single exposure - Category 2 (eyes)
Specific Target Organ Toxicity - Repeated Exposure - Category 1 (blood , eyes , respiratory system , central nervous system)
Hazardous to the Aquatic Environment - Acute - Category 2
Hazardous to the Aquatic Environment - Chronic - Category 2

GHS Label Elements

Symbol(s)

Signal Word
Danger

Hazard Statement(s)

Toxic if inhaled.
Harmful in contact with skin.
Causes skin irritation.
Causes serious eye irritation.
May cause an allergic skin reaction.
May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
Causes damage to organs. (blood , respiratory system , kidneys , nervous system , heart)
May cause damage to organs. (eyes)
Causes damage to organs through prolonged or repeated exposure. (blood , eyes , respiratory system , central nervous system)
Toxic to aquatic life with long lasting effects.

Precautionary Statement(s)

Prevention

Do not breathe vapor or mist.
Wash thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Do not eat, drink or smoke when using this product.
Contaminated work clothing should not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid release to the environment.

Response

IF exposed or concerned: Get medical advice/attention.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
Call a POISON CENTER or doctor/physician.
IF ON SKIN: Wash with plenty of soap and water.
Call a POISON CENTER or doctor/physician if you feel unwell.
If skin irritation or rash occurs: Get medical advice/attention.
Take off contaminated clothing and wash 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/attention.
Collect spillage.

Storage

Store in a well-ventilated place.
Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

Statement(s) of Unknown Acute Toxicity

Dermal	72% of the mixture consists of ingredient(s) of unknown acute toxicity.
Inhalation	97% of the mixture consists of ingredient(s) of unknown acute toxicity.

Other Hazards

Heated material may cause thermal burns.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component Name	Percent
65996-89-6	Tar, coal, high-temperature	100
-	The above listed complex substance contains the following constituents	-
Not Available	POLYCYCLIC AROMATIC HYDROCARBONS	7.0-31.0
91-20-3	Naphthalene	3.0-12.0
85-01-8	Phenanthrene	2.5-7.5
206-44-0	Fluoranthene	1.5-5.0
120-12-7	Anthracene	0.7-4.0
83-32-9	Acenaphthene	0.10-3.0
205-99-2	Benzo(b)fluoranthene	0.4-2.5
132-64-9	Dibenzofuran	1.0-2.5
50-32-8	Benzo[a]pyrene	0.1-2.0
56-55-3	Benz[a]anthracene	0.5-1.6
207-08-9	Benzo(k)fluoranthene	0.1-1.5
218-01-9	Chrysene	0.1-1.5
193-39-5	Indeno(1,2,3-cd)pyrene	0.1-1.0
108-88-3	TOLUENE	0.1-1.0
71-43-2	Benzene	0.1-1.0
108-95-2	Phenol	0.1-1.0

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Aromatic hydrocarbons, polycyclic (130489-29-2).

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

Take off immediately all contaminated clothing. Wash all affected skin areas with warm soapy water. Skin contact causes photosensitization which can last for 36-72 hours after exposure. Keep out of direct sunlight for the next two

to three days to avoid sunburn to the photosensitized skin areas. Use a broad spectrum blockout cream to protect against UV alpha ray exposure. Get medical attention, if needed.

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. Rinse mouth. 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.

Most Important Symptoms/Effects

Acute
Harmful in contact with skin, toxic if inhaled, skin irritation, eye irritation, thermal burns from heated material, allergic reactions, blood damage, respiratory system damage, kidney damage, nervous system damage, heart damage, eye damage

Delayed
allergic reactions, mutagenic effects, Reproductive Effects, blood damage, eye damage, respiratory system damage, central nervous system damage, lung cancer, bladder cancer, skin cancer, scrotal cancer

Indication of any immediate medical attention and special treatment needed
Treat symptomatically and supportively.

Section 5 - FIRE FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media
regular dry chemical, carbon dioxide, regular foam, water spray, fog or mist

Unsuitable Extinguishing Media
Do not use high-pressure water streams.

Hazardous Combustion Products
oxides of carbon

Advice for firefighters
Contact with heat may generate toxic and/or flammable gases. Containers may rupture or explode if exposed to heat.

Fire Fighting Measures
Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Use extinguishing agents appropriate for surrounding fire. Flood with fine water spray. 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. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. 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 firefighting gear including self-contained breathing apparatus (SCBA) for protection against possible exposure.

Section 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures
Wear personal protective clothing and equipment, see Section 8. Avoid release to the environment.

Methods and Materials for Containment and Cleaning Up

Stop leak if possible without personal risk. To prevent liquid from flowing into drains, completely contain spilled material with dikes, sandbags, etc. Collect spilled material in appropriate container for disposal. In Canada, report releases to provincial authorities, municipal authorities, or both, as required. Due to the concentration of Benzo(b)fluoranthene and the CERCLA (40 CFR 302.4) reportable quantity of 1 pound, the release of 40 pounds (4 gallons) of this product requires National Response Center notification. See Section 13 for waste disposal information.

Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Do not breathe vapor or mist. Avoid breathing vapors of heated materials. Avoid contact with eyes, skin and clothing. Use only outdoors or in a well-ventilated area. When using, do not eat, drink or smoke. Wear protective gloves/clothing and eye/face protection. Wash exposed areas thoroughly with soap and water, or a waterless hand cleaner, after skin contact and before eating, drinking, using tobacco products, or restrooms. Use protective skin cream on exposed skin before and during work shift. To reduce sun sensitivity a sun-blocking lotion can also be applied prior to application of a protective cream. Contaminated clothing should be removed and laundered before reuse. Contaminated work clothing should not be allowed out of the workplace unless laundered or decontaminated. After working with the product use warm soapy water and a wash cloth to thoroughly wash all areas of skin that have been contacted with product. After washing, apply a broad spectrum UV blockout cream on exposed skin areas before going into sunlight. Keep out of strong sunlight for two to three days after being affected by the 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

Store in a well-ventilated place.
Keep container tightly closed.
Store locked up.
Store and handle in accordance with all current regulations and standards. Label all containers. Keep in a closed, properly labeled container in a cool (shaded), dry, well-ventilated area. Protect from physical damage. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355 Part B).

Incompatible Materials

oxidizing materials

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Component Exposure Limits

Tar, coal, high-temperature	**65996-89-6**
ACGIH:	0.2 mg/m3 TWA as benzene-soluble aerosol (related to Pitch, coal tar, high-temperature)
OSHA (US):	0.2 mg/m3 TWA (benzene soluble fraction) (related to Pitch, coal tar, high-temperature)
Naphthalene	**91-20-3**
ACGIH:	10 ppm TWA
	Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA (US):	10 ppm TWA ; 50 mg/m3 TWA

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 (US):	10 ppm TWA applies to industry segments exempt from the benzene standard at 29 CFR 1910.1028 ; 1 ppm TWA
	5 ppm STEL (See 29 CFR 1910.1028) 15 min ; 0.5 ppm Action Level ; 1 ppm TWA
	5 ppm STEL (see 29 CFR 1910.1028)
	25 ppm Ceiling
Phenol	**108-95-2**
ACGIH:	5 ppm TWA
	Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA (US):	5 ppm TWA ; 19 mg/m3 TWA
	prevent or reduce skin absorption

ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)

Tar, coal, high-temperature (65996-89-6)
Medium: urine Time: end of shift at end of workweek Parameter: 1-Hydroxypyrene with hydrolysis (nonquantitative) (related to Pitch, coal tar, high-temperature)
Naphthalene (91-20-3)
Time: end of shift Parameter: 1-Naphthol with hydrolysis plus 2-Naphthol with hydrolysis (nonquantitative, nonspecific)
Benzene (71-43-2)
25 µg/g creatinine Medium: urine Time: end of shift Parameter: S-Phenylmercapturic acid (background); 500 µg/g creatinine Medium: urine Time: end of shift Parameter: t,t-Muconic acid (background)
Phenol (108-95-2)
250 mg/g creatinine Medium: urine Time: end of shift Parameter: Phenol with hydrolysis (background, nonspecific)

Engineering Controls

Provide local exhaust or process enclosure ventilation system. 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. At elevated temperatures: A face shield is recommended.

Skin Protection

Wear protective clothing to prevent contact. Wear long sleeved shirt or overalls fastened at wrists and neck, with long legged trousers with trouser legs worn outside over boot tops, boots, socks, and safety hat plus gloves. Use protective skin cream on exposed skin before and during work shift. Protective clothing must be changed when it shows signs of contamination. Remove and launder contaminated clothing separately from other laundry before reuse. When material is at an elevated temperature, wear appropriate heat resistant clothing.

Respiratory Protection
If the applicable TLVs and/or PELs are exceeded, use NIOSH-approved multipurpose air-purifying cartridge respirators, for organic vapors and P-100 particulate.

Glove Recommendations
Wear appropriate chemical resistant gloves. When material is at an elevated temperature, wear appropriate heat resistant gloves.

Protective Materials
protective skin cream, chemical resistant material, heat resistant material

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	black viscous Liquid	**Physical State**	liquid
Odor	aromatic odor	**Color**	black
Odor Threshold	Not available	**pH**	Not applicable
Melting Point	16.6 °F	**Boiling Point**	410 °F
Boiling Point Range	Not available	**Freezing point**	Not available
Evaporation Rate	Not available	**Flammability (solid, gas)**	Not applicable
Autoignition Temperature	Not available	**Flash Point**	>205 °F
Lower Explosive Limit	Not available	**Decomposition temperature**	Not available
Upper Explosive Limit	Not available	**Vapor Pressure**	0.2 - 1 mmHg @ 68 °C
Vapor Density (air=1)	Not available	**Specific Gravity (water=1)**	1.16
Water Solubility	Not available	**Partition coefficient: n-octanol/water**	Not available
Viscosity	>20.5 mm2/s	**Kinematic viscosity**	Not available
Solubility (Other)	Not available	**Density**	Not available
Physical Form	viscous liquid	**Texture**	viscous
Molecular Weight	Not available	**OSHA Flammability Category**	4

Other Information
None known

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. Avoid contact with incompatible materials. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

Incompatible Materials
oxidizing materials

Hazardous decomposition products
oxides of carbon

Section 11 - TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure

Inhalation
respiratory system damage, central nervous system damage, eye damage, blood damage, kidney damage, lung cancer, bladder cancer

Skin Contact
irritation, sensitivity to sunlight, allergic reactions, thermal burns from heated material, eye damage, Reproductive Effects, central nervous system damage, blood damage, kidney damage, nervous system damage, skin cancer, scrotal cancer

Eye Contact
irritation, sensitivity to sunlight, thermal burns from heated material, eye damage

Ingestion
thermal burns from heated material, eye damage, central nervous system damage, blood damage, nervous system damage, kidney damage

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:

Tar, coal, high-temperature (65996-89-6)
Oral LD50 Rat 3300 mg/kg (related to Pitch, coal tar, high-temperature)
Dermal LD50 Rat >5000 mg/kg (no deaths occurred) (related to Pitch, coal tar, high-temperature)

Naphthalene (91-20-3)
Oral LD50 Rat 1110 mg/kg
Dermal LD50 Rabbit 1120 mg/kg
Inhalation LC50 Rat >340 mg/m3 1 h

Phenol (108-95-2)
Oral LD50 Rat 340 mg/kg
Dermal LD50 Rabbit 630 mg/kg

Product Toxicity Data

Acute Toxicity Estimate

Dermal	1174.01 mg/kg
Inhalation - Dust and Mist	2.72 mg/L
Oral	>2000 mg/kg

Immediate Effects

Harmful in contact with skin, toxic if inhaled, skin irritation, eye irritation, thermal burns from heated material, allergic reactions, blood damage, respiratory system damage, kidney damage, nervous system damage, heart damage, eye damage.

Delayed Effects
allergic reactions, mutagenic effects, Reproductive Effects, blood damage, eye damage, respiratory system damage, central nervous system damage, lung cancer, bladder cancer, skin cancer, scrotal cancer

Irritation/Corrosivity Data
Erythema/eschar score: very slight

Respiratory Sensitization
No evidence that the material can lead to respiratory hypersensitivity.

Dermal Sensitization
Component data indicate the substance is sensitizing.

Component Carcinogenicity

Tar, coal, high-temperature	**65996-89-6**
ACGIH:	A1 - Confirmed Human Carcinogen (related to Pitch, coal tar, high-temperature)
IARC:	Supplement 7 [1987] (Group 1 (carcinogenic to humans))
NTP:	Known Human Carcinogen (related to Pitch, coal tar, high-temperature)
NIOSH:	potential occupational carcinogen (related to Pitch, coal tar, high-temperature)

May cause cancer. NOAEL: 36 mg/kg bw/day - oral.

Germ Cell Mutagenicity
Bacterial Reverse Mutation Test – positive. May cause genetic defects.

Tumorigenic Data
No data available

Reproductive Toxicity
Available data characterizes this substance as a reproductive hazard. May damage fertility or the unborn child.

Specific Target Organ Toxicity - Single Exposure
blood, respiratory system, kidneys, nervous system, heart, eyes

Specific Target Organ Toxicity - Repeated Exposure
blood, eyes, respiratory system, central nervous system

Aspiration hazard
Not expected to be an aspiration hazard.

Medical Conditions Aggravated by Exposure
respiratory disorders, skin disorders and allergies, eye disorders, central nervous system disorders (i.e. headache, drowsiness, dizziness, loss of coordination) blood system disorders, metabolic disorders, immune system disorders or allergies

Additional Data
Coal tars are listed in the IARC monographs as carcinogenic to humans (Group 1). IARC's evaluation is based on evidence from the first half of the 20th century that occupational exposures to coal-tar derived products are associated with skin cancer in humans. There are also case reports and a few other studies on occupational exposures to coal-tars that are consistent with this evaluation. Epidemiological studies provide evidence that certain exposures

in the coke production industry are carcinogenic to humans, giving rise to lung cancer possibly from coal-tar fume. Also, there is evidence for the carcinogenicity in experimental animals of coal-tars. Today, with the use of engineering controls and personal protective equipment, occupational exposure to coal tar derived components is expected to be below permissible limits (measured as CTPVs). In addition to containing information about the product as a whole, this data sheet also contains information about individual components of the product. Information of this nature may not have been derived from studies or data relating to this product and/or may have been derived from studies or data that did not involve human exposure and involved animal exposure only. Some polycyclic aromatic hydrocarbons (PAHs), found in coal tar complex substances, have been reported to cause lung and skin cancer in humans under conditions of poor personal hygiene, prolonged/repeated contact, and exposure to sunlight. The National Toxicology Program (NTP) and IARC have independently classified various PAH compounds present in coal tar substances as reasonably anticipated to be human carcinogens (NTP), probably carcinogenic to humans (IARC Group 2A), possibly carcinogenic to humans (IARC Group 2B), and not classifiable as to carcinogenicity to humans (IARC Group 3). The cancers reported in the studies upon which IARC based its conclusions involved lung, skin, liver, stomach, kidney and blood cancers in animals. Based on the results of animal experiments PAHs may cause injury to the liver, kidneys, lungs, blood and lymph systems. Some PAH's have also been associated with impaired fertility, heritable genetic damage and birth defects in mice.

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity
Toxic to aquatic life with long lasting effects.

Component Analysis - Aquatic Toxicity

Tar, coal, high-temperature	**65996-89-6**
Fish:	LC50 96 h Oryzias latipes 7.33 - 235 mg/L [semi-static]
Algae:	EC50 72 h Pseudokirchneriella subcapitata 0.015 mg/L IUCLID
Invertebrate:	LC50 48 h Daphnia magna 4.44 - 11.2 mg/L IUCLID

Fish Toxicity
>250 mg/l 96 hour(s) LL50 Brachydanio rerio (Zebra fish)

Invertebrate Toxicity
2.8 mg/l 48 hour(s) EL50 Daphnia magna.

Algal Toxicity
29 mg/l 72 hour(s) EL50 Desmodesmus subspicatus. 5 mg/l 72 hour(s) NOELR.

Persistence and Degradability
Highly insoluble in water.

Bioaccumulative Potential
This material is believed not to bioaccumulate due to low water solubility. Highly insoluble in water.

Mobility
Highly insoluble in water.

Other Toxicity
No data available.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Methods

Dispose in accordance with all applicable regulations. Based on the results of the Toxicity Characteristic Leaching Procedure (TCLP): Benzene - D018 (toxicity >/= 0.5 ppm).

Component Waste Numbers

The U.S. EPA has not published waste numbers for this product's components.

Section 14 - TRANSPORT INFORMATION

US DOT Information:
Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. , (Contains: BENZO(A)PYRENE , BENZO(B)FLUORANTHENE , NAPHTHALENE) RQ
Hazard Class: 9
UN/NA #: UN3082
Packing Group: III
Required Label(s): 9
Marine pollutant
Further information: For International Shipments: RQ Environmentally hazardous substances, liquid, n.o.s. ID Number UN3082 This material contains reportable quantity (RQ) Hazardous Substances.

IATA Information:
Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. , (Contains: BENZO(A)PYRENE , BENZO(B)FLUORANTHENE , NAPHTHALENE) RQ
Hazard Class: 9
UN#: UN3082
Packing Group: III
Required Label(s): 9
Marine pollutant
Further information: Passenger & Cargo Aircraft - Ltd. Qty. - (Packing Instruction / Max. Net Qty. per Pkg.): Y964 / 30 kg GPassenger & Cargo Aircraft (Packing Instruction / Max. Net Qty. per Pkg.): 964 / 450 L ERG Code: 9L

TDG Information:
Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. , (Contains: BENZO(A)PYRENE , BENZO(B)FLUORANTHENE , NAPHTHALENE) RQ
Hazard Class: 9
UN#: UN3082
Packing Group: III
Required Label(s): 9
Marine pollutant

International Bulk Chemical Code

This material contains one or more of the following chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.

Tar, coal, high-temperature	**65996-89-6**
IBC Code:	Category X (molten) (related to Pitch, coal tar, high-temperature)

Further information

STCC Code: 2814137; HAZ STCC Code: 4966312, ERG: 171 US DOT Reportable Quantites BENZO(B)FLUORANTHENE (205-99-2) 1 lbs RQ; 0.454 kg RQ

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.

Tar, coal, high-temperature	**65996-89-6**
TSCA 12b:	Section 4 , 1 % de minimus concentration
Naphthalene	**91-20-3**
SARA 313:	0.1 % de minimis concentration
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Phenanthrene	**85-01-8**
SARA 313:	1 % de minimis concentration
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
Fluoranthene	**206-44-0**
SARA 313:	1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Anthracene	**120-12-7**
SARA 313:	1 % de minimis concentration
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
Acenaphthene	**83-32-9**
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Benzo(b)fluoranthene	**205-99-2**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	1 lb final RQ ; 0.454 kg final RQ
Dibenzofuran	**132-64-9**
SARA 313:	1 % de minimis concentration
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Benzo[a]pyrene	**50-32-8**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	1 lb final RQ ; 0.454 kg final RQ

Benz[a]anthracene	**56-55-3**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	10 lb final RQ ; 4.54 kg final RQ
Benzo(k)fluoranthene	**207-08-9**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	5000 lb final RQ ; 2270 kg final RQ
Chrysene	**218-01-9**
SARA 313:	1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
Indeno(1,2,3-cd)pyrene	**193-39-5**
SARA 313:	0.1 % Supplier notification limit
CERCLA:	100 lb final RQ ; 45.4 kg final RQ
TOLUENE	**108-88-3**
SARA 313:	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)
Phenol	**108-95-2**
SARA 302:	500 lb lower TPQ ; 10000 lb upper TPQ
SARA 313:	1 % de minimis concentration
CERCLA:	1000 lb final RQ ; 454 kg final RQ
SARA 304:	1000 lb EPCRA RQ

SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories

Carcinogenicity; Acute toxicity; Reproductive 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
Tar, coal, high-temperature	**65996-89-6**	Yes	Yes	Yes	Yes	Yes

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

WARNING

This product can expose you to chemicals including 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.

Canada Regulations

Canadian WHMIS Ingredient Disclosure List (IDL)

Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL

Tar, coal, high-temperature	**65996-89-6**
	0.1 % (related to Pitch, coal tar, high-temperature)
Naphthalene	**91-20-3**
	1 %
Phenanthrene	**85-01-8**
	1 %
Fluoranthene	**206-44-0**
	1 %
Anthracene	**120-12-7**
	1 %
Acenaphthene	**83-32-9**
	1 %
Benzo(b)fluoranthene	**205-99-2**
	0.1 %
Benzo[a]pyrene	**50-32-8**
	0.1 %

Benz[a]anthracene	**56-55-3**
	0.1 %
Chrysene	**218-01-9**
	0.1 %
Indeno(1,2,3-cd)pyrene	**193-39-5**
	0.1 %
TOLUENE	**108-88-3**
	1 %
Benzene	**71-43-2**
	0.1 %

WHMIS Classification
D2A , D2B

Component Analysis - Inventory
Tar, coal, high-temperature (65996-89-6)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	No	No	Yes

The above listed complex substance contains the following constituents (-)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

POLYCYCLIC AROMATIC HYDROCARBONS (Not Available)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Naphthalene (91-20-3)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Phenanthrene (85-01-8)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Fluoranthene (206-44-0)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	Yes	No	Yes	Yes	No	No	No	Yes	Yes	No	Yes	Yes

Anthracene (120-12-7)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Acenaphthene (83-32-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes

Benzo(b)fluoranthene (205-99-2)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	Yes	No	Yes	Yes

Dibenzofuran (132-64-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes

Benzo[a]pyrene (50-32-8)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	No	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes

Benz[a]anthracene (56-55-3)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	No	No	No	No	No	No	No	Yes	Yes	No	Yes	Yes

Benzo(k)fluoranthene (207-08-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	EIN	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

Chrysene (218-01-9)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	No	No	No	Yes	No	No	No	Yes	No	Yes	Yes

Indeno(1,2,3-cd)pyrene (193-39-5)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	NSL	EIN	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

TOLUENE (108-88-3)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes

Benzene (71-43-2)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes

Phenol (108-95-2)

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes

U.S. Inventory (TSCA)
Listed on inventory.

Section 16 - OTHER INFORMATION

NFPA Ratings
Health: 2 Fire: 1 Reactivity: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Summary of Changes
Updated: 7/20/2018; SDS SUMMARY OF CHANGES: SECTION 15 - CA Proposition 65

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 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; 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; 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

Version 4.12
Revision Date 09/28/2017
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Copper

Product Number : 203122
Brand : Aldrich

CAS-No. : 7440-50-8

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable solids (Category 1), H228
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H228	Flammable solid.
H400	Very toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.

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

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Cu
Molecular weight	:	63.55 g/mol
CAS-No.	:	7440-50-8
EC-No.	:	231-159-6

Hazardous components

Component	Classification	Concentration
Copper		
	Flam. Sol. 1; Aquatic Acute 1; Aquatic Chronic 3; H228, H400, H412	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. 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
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.
For personal protection see section 8.

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

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Copper	7440-50-8	TWA	1.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Irritation Gastrointestinal metal fume fever		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		

		TWA	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	1.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		
		TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		
		TWA	0.2 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection

Safety glasses with side-shields conforming to EN166 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.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, 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 and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Flame retardant antistatic protective clothing., 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 N100 (US) or type P3 (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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: light red
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 1,083.4 °C (1,982.1 °F) - lit.
f)	Initial boiling point and boiling range	2,567 °C (4,653 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	The substance or mixture is a flammable solid with the category 1.
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	8.94 g/mL at 25 °C (77 °F)

n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong acids, Strong oxidizing agents, Acid chlorides, Halogens

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Copper oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intraperitoneal - Mouse - 3.5 mg/kg

Skin corrosion/irritation
May irritate skin.

Serious eye damage/eye irritation
May irritate eyes.

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

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

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a

known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: GL5325000

Symptoms of systemic copper poisoning may include: capillary damage, headache, cold sweat, weak pulse, and kidney and liver damage, central nervous system excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure. Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with Wilson's disease. It has also been reported that copper poisoning has lead to hemolytic anemia and accelerates arteriosclerosis., Damage to the lungs., Vomiting, Diarrhoea, Abdominal pain, Blood disorders

Liver - Irregularities - Based on Human Evidence
Liver - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 0.022 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	mortality NOEC - Daphnia (water flea) - 0.004 mg/l - 24 h
	EC50 - Daphnia magna (Water flea) - 0.04 - 0.05 mg/l - 48 h

12.2 Persistence and degradability

Biodegradability	Result: - Readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 40 d - 200 mg/l
	Bioconcentration factor (BCF): 108

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powders, flammable, n.o.s.
Reportable Quantity (RQ): 5000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 3089 Class: 4.1 Packing group: II EMS-No: F-G, S-G
Proper shipping name: METAL POWDER, FLAMMABLE, N.O.S. (Copper)
Marine pollutant:yes

IATA
UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powder, flammable, n.o.s.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

	CAS-No.	Revision Date
Copper	7440-50-8	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Copper	7440-50-8	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Copper	7440-50-8	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Copper	7440-50-8	2007-07-01

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.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Sol.	Flammable solids
H228	Flammable solid.
H400	Very toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	3

NFPA Rating

Health hazard:	0
Fire Hazard:	3
Reactivity Hazard:	3

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.12 Revision Date: 09/28/2017 Print Date: 11/10/2018

SAFETY DATA SHEET

Version 5.12
Revision Date 04/20/2017
Print Date 10/19/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Ethylbenzene

Product Number : 296848
Brand : Sigma-Aldrich
Index-No. : 601-023-00-4

CAS-No. : 100-41-4

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure (Category 2), H373
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

Precautionary statement(s)

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 measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C_8H_{10}
Molecular weight	:	106.17 g/mol
CAS-No.	:	100-41-4
EC-No.	:	202-849-4
Index-No.	:	601-023-00-4

Hazardous components

Component	Classification	Concentration
Ethylbenzene		
	Flam. Liq. 2; Acute Tox. 4; Carc. 2; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H304, H332, H351, H373, H401	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. 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
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

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
Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).

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 inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

hygroscopic

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Ethylbenzene	100-41-4	TWA	20.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Cochlear impair Kidney damage (nephropathy) Upper Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	125.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	100.000000 ppm 435.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125.000000 ppm 545.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100.000000 ppm 435.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Cochlear impair Kidney damage (nephropathy) Upper Respiratory Tract irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	100 ppm 435 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125 ppm 545 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

		TWA	100 ppm 435 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	125 ppm 545 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		PEL	5 ppm 22 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	30 ppm 130 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	0.7g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Ethylbenzene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		Not critical			
		Sum of mandelic acid and phenyl glyoxylic acid	0.15g/g creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

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.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, 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 and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., 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 respirator with multi-purpose 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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -95 °C (-139 °F) - lit.
f)	Initial boiling point and boiling range	136 °C (277 °F) - lit.
g)	Flash point	15.0 °C (59.0 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 6.7 %(V) Lower explosion limit: 1 %(V)
k)	Vapour pressure	13.3 hPa (10.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.867 g/cm3 at 25 °C (77 °F)
n)	Water solubility	0.2 g/l at 25 °C (77 °F) - slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 3.6 at 20 °C (68 °F)
p)	Auto-ignition temperature	432.0 °C (809.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	0.773 mm2/s at 20 °C (68 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	71.2 mN/m at 23 °C (73 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male and female - 3,500 mg/kg

Inhalation: No data available

LD50 Dermal - Rabbit - 15,433 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Moderate skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Hamster
ovary
Result: negative

Mouse - male and female
Result: negative

Carcinogenicity

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Ethylbenzene)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

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
May be fatal if swallowed and enters airways.

Additional Information

Repeated dose toxicity	Rat - male and female - NOAEL : 75 mg/kg - OECD Test Guideline 407

RTECS: DA0700000

Central nervous system depression, Nausea, Headache, Vomiting, Ataxia., Tremors

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 4.2 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 1.8 - 2.4 mg/l - 48 h
Toxicity to algae	static test EC50 - Skeletonema costatum (marine diatom) - 4.9 mg/l - 72 h

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 70 - 80 % - Readily biodegradable.

12.3 Bioaccumulative potential

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1175 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYLBENZENE

IATA

UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Ethylbenzene	100-41-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Asp. Tox.	Aspiration hazard
Carc.	Carcinogenicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H332	Harmful if inhaled.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.12 Revision Date: 04/20/2017 Print Date: 10/19/2018

LEAD METAL
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Lead Metal

Trade Names and Synonyms: Lead; Pb; Plumbum; Metallic Lead; Inorganic Lead; ASTM B29; TADANAC Lead, Low-Alpha Lead.

Manufacturer:
Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:
In U.S.:
Teck American Metal Sales Incorporated
501 North Riverpoint Blvd, Suite 300
Spokane, WA
USA, 99202

Other than U.S.:
Teck Metals Ltd.
#1700 – 11 King Street West
Toronto, Ontario
M5H 4C7

Preparer:
Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Review: June 29, 2015.

Date of Last Edit: June 29, 2015.

Product Use: Used as a construction material for tank linings, piping, and equipment used in the manufacture of sulphuric acid and the refining and processing of petroleum; used in x-ray and atomic radiation shielding; used in the manufacture of paint pigments, organic and inorganic lead compounds, lead shot, lead wire for bullets, ballast, and lead solders; used as a bearing metal or alloy; used in the manufacture of storage batteries, ceramics, plastics, and electronic devices; used in the metallurgy of steel and other metals; and used in the form of lead oxide for batteries.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Oral, Inhalation)	– Does not meet criteria	Does not meet criteria for any Physical Hazard	**Aquatic Toxicity – Short Term (Acute) Category 3**
Skin Corrosion/Irritation	– Does not meet criteria		
Eye Damage/Eye Irritation	– Does not meet criteria		
Respiratory or Skin Sensitization	– Does not meet criteria		
Mutagenicity	– Does not meet criteria		
Carcinogenicity	**– Category 2**		
Reproductive Toxicity	**– Category 1A**		
Specific Target Organ Toxicity Chronic Exposure	**– Category 1**		

LABEL:

Symbols:

Signal Word:

DANGER

Hazard Statements	**Precautionary Statements:**
DANGER! Causes damage to kidneys, blood-forming systems, central nervous system and digestive tract through prolonged or repeated exposure. May damage the unborn child. May cause harm to breast-fed children. Suspected of damaging fertility. Suspected of causing cancer. Harmful to aquatic life.	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection. Do not breathe dust or fumes. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. If exposed or concerned or you feel unwell: Get medical advice/attention. Avoid release to the environment.

Emergency Overview: A bluish-white to silvery-grey, heavy, soft metal that does not burn in bulk. Finely-divided lead dust clouds are a moderate fire and explosion hazard, however. When heated strongly in air, highly toxic lead oxide fumes can be generated. Inhalation or ingestion of lead may produce both acute and chronic health effects. Possible cancer and reproductive hazard. SCBA and full protective clothing are required for fire emergency response personnel.

Potential Health Effects: Inhalation or ingestion of lead may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage, hypertension, gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure in order to prevent lead crossing the placental barrier and causing infant neurological disorders. Lead and inorganic lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU does not currently list lead as a human carcinogen (see Toxicological Information, Section 11).

Potential Environmental Effects: Lead metal has relatively low bioavailability; however, compounds which it forms with other elements can be toxic to both aquatic and terrestrial organisms at low concentrations. These compounds can be particularly toxic in the aquatic environment. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENT	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Lead	7439-92-1	99+%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Eye irritation, redness. Gently brush product off face if necessary. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not dislodge, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Symptoms:* Skin soiling, mild irritation. Gently brush away excess dust. Wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 5 minutes, or until product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: *Symptoms:* Respiratory irritation. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Stomach upset. If you feel unwell or are concerned, get medical advice/attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not flammable or combustible. Finely-divided lead dust or powder is a moderate fire hazard and moderate explosion hazard when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: Do not use direct water streams on fires where molten metal is present, due to the risk of a steam explosion that could potentially eject molten metal uncontrollably. Use a fine water mist on the front-running edge of the spill and on the top of the molten metal to cool and solidify it. If possible, move solid material from fire area or cool material exposed to flame to prevent melting of the metal ingots. Highly toxic lead oxide fumes may evolve in fires. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions outlined below. Molten metal should be allowed to solidify before cleanup. If solid metal, wear gloves, pick up and return to process. If dust, wear recommended personal protective equipment (see below) and use methods which will minimize dust generation (e.g., vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash as well as a respirator to protect against inhalation of lead fume. Workers should wash and change clothing following cleanup of a lead spill to prevent personal contamination with lead dust.

Environmental Precautions: Lead metal has low bioavailability; however, compounds which it forms with other elements can be toxic to aquatic and terrestrial organisms. Releases of the product to water and soil should be prevented.

SECTION 7. HANDLING AND STORAGE

Store in a DRY, covered area, separate from strong acids, other incompatible materials, active metals and food or feedstuffs. Solid metal suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath. No special packaging materials are required. Lead metal, in contact with wood or other surfaces, may leave traces of lead particulate that can accumulate over time. Cleaning or disposal of these surfaces requires review to ensure that any effluent or solid waste disposal meets the requirements of regulations in the applicable jurisdiction.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Lead	0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.
ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of lead fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is recommended for melting, casting, welding, grinding, flame cutting or burning, and use of lead powders.

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when lead is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from radiant heat and hot metal splash should be worn. Safety type boots are recommended.

Respirators: Where lead dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge). When exposure levels are obviously high but the actual concentration is unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask should be worn.

General Hygiene Considerations: Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas as well as at the end of the workday. A double locker-shower system with separate clean and dirty sides is usually required for lead handling operations to avoid cross-contamination of street clothes. Contaminated clothing should be changed frequently and laundered before each reuse. Inform laundry personnel of contaminants' hazards. Workers should not take dirty work clothes home and launder them with other personal clothing.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Malleable, bluish-white to silvery-grey solid metal	**Odour:** None	**Odour Threshold:** Not Applicable	**pH:** Not Applicable
Vapour Pressure: (negligible @ 20°C)	**Vapour Density:** Not Applicable	**Melting Point/Range:** 328°C	**Boiling Point/Range:** 1,740°C
Relative Density (Water = 1)**:** 11.34	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Solubility:** Insoluble in water
Flash Point: None	**Flammable Limits (LEL/UEL):** Not Flammable	**Auto-ignition Temperature:** None	**Decomposition Temperature:** None

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Freshly cut or cast lead surfaces tarnish rapidly due to the formation of an insoluble protective layer of basic lead carbonate.

Incompatibilities: Lead reacts vigorously with strong acids (e.g., hot concentrated nitric acid, boiling concentrated hydrochloric acid, etc.), strong oxidizers such as peroxides, chlorates, nitrates and halogen or interhalogen compounds such as chlorine trifluoride. Powdered lead metal in contact with disodium acetylide, chlorine trifluoride, sodium carbide or fused ammonium nitrate poses a risk of explosion. Solutions of sodium azide in contact with lead metal can form lead azide, which is a detonating compound. Vigorous reactions can also occur between molten lead and active metals, such as sodium, potassium, lithium and calcium. A lead-zirconium alloy (10-70% Zr) will ignite when struck with a hammer.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting or burning, electric arc welding or overheating a molten bath will generate highly toxic lead oxide fume. Lead oxide is highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Lead accumulates in bone and body organs once it enters the body. Elimination from the body is slow. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels at or above the exposure limits of lead dust or fumes. Once lead enters the body, it can affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal system. The primary routes of exposure to lead are inhalation or ingestion of dust and fumes.

Acute:
Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage.

Inhalation: Exposure to lead dust or fume may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An intense, short-term exposure to lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are unlikely in industry today. Kidney damage, as well as anemia, can occur from acute exposure.

Ingestion: Symptoms due to ingestion of lead dust or fume would be similar to those from inhalation. Other health effects such as metallic taste in the mouth and constipation or bloody diarrhea might also occur.

Chronic:
Prolonged exposure to lead dust and fume may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, and, rarely, wrist drop. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate lead exposure include fatigue, headaches, tremors and hypertension. Very high lead exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Lead	No Data	No Data	No Data

SECTION 12. ECOLOGICAL INFORMATION

While lead metal is relatively insoluble, its processing or extended exposure in aquatic and terrestrial environments may lead to the release of lead compounds in more bioavailable forms. While lead compounds are not particularly mobile in the aquatic environment, they can be toxic to aquatic organisms, especially fish, at low concentrations. Water hardness, pH and dissolved organic carbon content are three major factors which regulate the degree of lead toxicity. Lead in soil is generally neither very mobile nor bioavailable, as it can become strongly sorbed onto soil particles, increasingly so over time, to a degree related to physical properties of the soil. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME ..... Not a regulated product in ingot form.
TRANSPORT CANADA AND U.S. DOT CLASSIFICATION ..... Not Applicable

TRANSPORT CANADA AND U.S. DOT PIN ..... Not Applicable
MARINE POLLUTANT..... No
IMO CLASSIFICATION ..... Not Regulated

SECTION 15. REGULATORY INFORMATION

U.S.
Ingredient Listed on TSCA Inventory..... Yes

Hazardous Under Hazard Communication Standard ..... Yes

CERCLA Section 103 Hazardous Substances..... ..... Lead ..... RQ: 10 lbs. (4.54 kg.)*
*reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA Section 302 Extremely Hazardous Substance..... No

EPCRA Section 311/312 Hazard Categories ..... Delayed (chronic) health hazard - Carcinogen
Delayed (chronic) health hazard – Reproductive toxin

EPCRA Section 313 Toxic Release Inventory..... Lead CAS No. 7439-92-1
Percent by Weight - At least 99%

SECTION 16. OTHER INFORMATION

Date of Original Issue: July 23, 1997 **Version:** 01 *(First edition)*

Date of Latest Revision: June 29, 2015 **Version:** 13

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, Guide to Occupational Exposure Values – 2015.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed), 1995.
- Canadian Centre for Occupational Health and Safety, Hamilton, ON, CHEMINFO Record No. 608 - Lead (Rev. 2009-05).
- European Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 - Lead.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (online version).
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13th Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards, on-line edition.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead, September 2005.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader
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SAFETY DATA SHEET

Version 4.7
Revision Date 05/24/2016
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Manganese

Product Number : 463728
Brand : Aldrich

CAS-No. : 7439-96-5

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H260 In contact with water releases flammable gases which may ignite spontaneously.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
P223 Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231 + P232 Handle under inert gas. Protect from moisture.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P335 + P334 Brush off loose particles from skin. Immerse in cool water/ wrap in wet

	bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P402 + P404	Store in a dry place. Store in a closed container.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Mn
Molecular weight	:	54.94 g/mol
CAS-No.	:	7439-96-5
EC-No.	:	231-105-1

Hazardous components

Component	Classification	Concentration
Manganese		
	Water-react. 1; Aquatic Acute 3; Aquatic Chronic 3; H260, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder Carbon dioxide (CO2)

Unsuitable extinguishing media
Water

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. 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.Keep away from sources of ignition - No smoking.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage.

Moisture sensitive. Keep in a dry place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Manganese	7439-96-5	TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC)		
		C	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		C	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		

		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		C	5.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Ceiling limit is to be determined from breathing-zone air samples.		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) varies		
		TWA	0.100000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2015 Adoption varies		
		TWA	0.020000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment 2015 Adoption varies		
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	3 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Not classifiable as a human carcinogen varies		
		TWA	0.02 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Not classifiable as a human carcinogen varies		
		PEL	0.2 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	3 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 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.

Body Protection
Impervious clothing, Flame retardant protective clothing, 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 N100 (US) or type P3 (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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder 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: 1,244 °C (2,271 °F) - lit.
f)	Initial boiling point and boiling range	1,962 °C (3,564 °F) - 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	7.3 g/mL at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

10.5 Incompatible materials
acids, Halogens, Bases, Phosphorus, Sulphur oxides, Peroxides

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Manganese/manganese oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 9,000 mg/kg

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

Carcinogenicity - Rat - Intramuscular
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application.

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

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

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

May cause reproductive disorders.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: OO9275000

Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 40 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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)

Poison Inhalation Hazard: No

IMDG
UN number: 3208 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. (Manganese)

IATA
UN number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SARA 311/312 Hazards
Reactivity Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

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.
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H260	In contact with water releases flammable gases which may ignite spontaneously.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	2

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	2
Special hazard.I:	W

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7 Revision Date: 05/24/2016 Print Date: 11/10/2018

Safety Data Sheet
Mercury (Metallic)

SDS Revision Date: **05/01/2015**

1. Identification

1.1. Product identifier

Product Identity	Mercury (Metallic)
Alternate Names	Quicksilver; Hydrargyrum; Liquid Silver

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

Intended use	See Technical Data Sheet.
Application Method	See Technical Data Sheet.

1.3. Details of the supplier of the safety data sheet

Company Name	WM Mercury Waste Inc. 21211 Durand Avenue Union Grove, WI 53182
Emergency	
CHEMTREC (USA)	(800) 424-9300
Customer Service: WM Mercury Waste Inc.	(800) 741-3343

2. Hazard(s) identification

2.1. Classification of the substance or mixture

Acute Tox. 2;H330	Fatal if inhaled.
Repr. 1B;H360D	May damage the unborn child.
STOT RE 1;H372	Causes damage to organs through prolonged or repeated exposure. Specific Target Organs: (Central Nervous System)
Aquatic Chronic 1;H410	Very toxic to aquatic life with long lasting effects.

2.2. Label elements

Using the Toxicity Data listed in section 11 and 12 the product is labeled as follows.

Danger

H330 Fatal if inhaled.

H360D May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H410 Very toxic to aquatic life with long lasting effects.

SDS Revision Date: **05/01/2015**

[Prevention]:

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P260 Do not breathe mist / vapors / spray.

P264 Wash thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P271 Use only outdoors or in a well-ventilated area.

P273 Avoid release to the environment.

P281 Use personal protective equipment as required.

P284 Wear respiratory protection.

[Response]:

P304+340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P308+313 IF exposed or concerned: Get medical advice / attention.

P310 Immediately call a POISON CENTER or doctor / physician.

P314 Get Medical advice / attention if you feel unwell.

P320 Specific treatment is urgent (see information on this label).

P391 Collect spillage.

[Storage]:

P403+233 Store in a well ventilated place. Keep container tightly closed.

P405 Store locked up.

[Disposal]:

P501 Dispose of contents / container in accordance with local / national regulations.

3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the relevant State and Federal Hazardous Substances regulations.

Ingredient/Chemical Designations	Weight %	GHS Classification	Notes
Mercury **CAS Number: 0007439-97-6**	**100**	**Repr. 1B;H360D** **Acute tox. 2;H330** **STOT RE 1;H372** **Aquatic Acute 1;H400** **Aquatic Chronic 1;H410**	**[1][2]**

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

[1] Substance classified with a health or environmental hazard.

[2] Substance with a workplace exposure limit.

[3] PBT-substance or vPvB-substance.

*The full texts of the phrases are shown in Section 16.

4. First aid measures

4.1. Description of first aid measures

General In all cases of doubt, or when symptoms persist, seek medical attention.
Never give anything by mouth to an unconscious person.

Inhalation Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious place in the recovery position and obtain immediate medical attention. Give nothing by mouth.

Eyes Irrigate copiously with clean water for at least 15 minutes, holding the eyelids apart and seek medical attention.

Skin Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser.

Ingestion If swallowed, wash out mouth with water, obtain immediate medical attention. Keep at rest. Do NOT induce vomiting.

4.2. Most important symptoms and effects, both acute and delayed

Overview **Eye:** Contact with eyes may cause severe irritation, and possible eye burns. Vapors may cause eye irritation.
Skin: May cause skin irritation. May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure.
Inhalation: Causes respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. May cause severe respiratory tract irritation.
Chronic: Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.

Notes to Physician: Treat symptomatically and supportively.
Antidote: The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel. The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. See section 2 for further details.

Inhalation Fatal if inhaled.

5. Fire-fighting measures

5.1. Extinguishing media

Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition: Mercury/mercury oxides.

Do not breathe mist / vapors / spray.

5.3. Advice for fire-fighters

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.

ERG Guide No. 172

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Put on appropriate personal protective equipment (see section 8).

6.2. Environmental precautions

Do not allow spills to enter drains or waterways.

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

6.3. Methods and material for containment and cleaning up

Vacuum or sweep up material and place into a suitable disposal container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section).

7. Handling and storage

7.1. Precautions for safe handling

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

See section 2 for further details. - [Prevention]:

7.2. Conditions for safe storage, including any incompatibilities

Handle containers carefully to prevent damage and spillage.

Incompatible materials: Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Poison room locked.

See section 2 for further details. - [Storage]:

7.3. Specific end use(s)

No data available.

SDS Revision Date: **05/01/2015**

8. Exposure controls and personal protection

8.1. Control parameters

Exposure

CAS No.	Ingredient	Source	Value
0007439-97-6	Mercury	OSHA	TWA 0.1 mg/m3
		ACGIH	Alkyl compounds TWA: 0.01 mg/m3 STEL 0.03 mg/m3 Skin Aryl compounds TWA: 0.05 mg/m3 C 0.1 mg/m3 Skin Elemental/Inorganic 0.025mg/m3 Skin
		NIOSH	No Established Limit
		Supplier	No Established Limit

Carcinogen Data

CAS No.	Ingredient	Source	Value
0007439-97-6	Mercury	OSHA	Select Carcinogen: No
		NTP	Known: No; Suspected: No
		IARC	Group 1: No; Group 2a: No; Group 2b: No; Group 3: Yes; Group 4: No;

8.2. Exposure controls

Respiratory Follow the OSHA respirator regulations found in 29CFR §1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Eyes Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin Wear appropriate protective clothing to prevent skin exposure. Wear appropriate gloves to prevent skin exposure.

Engineering Controls Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and any vapor below occupational exposure limits suitable respiratory protection must be worn.

Other Work Practices Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details. - [Prevention]:

9. Physical and chemical properties

Appearance	Silver Liquid
Odor	Odorless
Odor threshold	Not Measured
pH	Not Applicable
Melting point / freezing point	-38.87 deg C

SDS Revision Date: **05/01/2015**

Initial boiling point and boiling range	356.5 deg C @ 760.00mmHg
Flash Point	Not Measured
Evaporation rate (Ether = 1)	Not Available
Flammability (solid, gas)	Not Applicable
Upper/lower flammability or explosive limits	**Lower Explosive Limit:** Not Measured **Upper Explosive Limit:** Not Measured
Vapor pressure (Pa)	0.002 mmHg @ 25C
Vapor Density	7 (Air=1)
Specific Gravity	13.5400g/cm3 (Water=1)
Solubility in Water	Insoluble
Partition coefficient n-octanol/water (Log Kow)	Not Measured
Auto-ignition temperature	Not Measured
Decomposition temperature	Not Available
Viscosity (cSt)	1.554 cP 20.00
Molecular Formula	Hg
Molecular Weight	200.59

9.2. Other information

No other relevant information.

10. Stability and reactivity

10.1. Reactivity

Hazardous Polymerization will not occur.

10.2. Chemical stability

Stable under normal circumstances.

10.3. Possibility of hazardous reactions

No data available.

10.4. Conditions to avoid

High temperatures, incompatible materials, metals.

10.5. Incompatible materials

Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

10.6. Hazardous decomposition products

Mercury/mercury oxides.

11. Toxicological information

Acute toxicity

Ingredient	Oral LD50, mg/kg	Skin LD50, mg/kg	Inhalation Vapor LC50, mg/L/4hr	Inhalation Dust/Mist LC50, mg/L/4hr	Inhalation Gas LC50, ppm

SDS Revision Date: **05/01/2015**

Mercury - (7439-97-6)	37.00, Rat - Category: 2	No data available	No data available	No data available	No data available

Note: When no route specific LD50 data is available for an acute toxin, the converted acute toxicity point estimate was used in the calculation of the product's ATE (Acute Toxicity Estimate).

Classification	Category	Hazard Description
Acute toxicity (oral)	2	Fatal if swallowed.
Acute toxicity (dermal)	---	Not Applicable
Acute toxicity (inhalation)	2	Fatal if inhaled.
Skin corrosion/irritation	---	Not Applicable
Serious eye damage/irritation	---	Not Applicable
Respiratory sensitization	---	Not Applicable
Skin sensitization	---	Not Applicable
Germ cell mutagenicity	---	Not Applicable
Carcinogenicity	---	Not Applicable
Reproductive toxicity	1B	May damage the unborn child.
STOT-single exposure	---	Not Applicable
STOT-repeated exposure	1	Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard	---	Not Applicable

12. Ecological information

12.1. Toxicity

Very toxic to aquatic life with long lasting effects.

No additional information provided for this product. See Section 3 for chemical specific data.

Aquatic Ecotoxicity

Ingredient	96 hr LC50 fish, mg/l	48 hr EC50 crustacea, mg/l	ErC50 algae, mg/l
Mercury - (7439-97-6)	Not Available	0.0052, Daphnia magna	Not Available

12.2. Persistence and degradability

There is no data available on the preparation itself.

12.3. Bioaccumulative potential

Not Measured

12.4. Mobility in soil

No data available.

12.5. Results of PBT and vPvB assessment

SDS Revision Date: **05/01/2015**

This product contains no PBT/vPvB chemicals.

12.6. Other adverse effects

No data available.

13. Disposal considerations

13.1. Waste treatment methods

Observe all federal, state and local regulations when disposing of this substance.

14. Transport information

	DOT (Domestic Surface Transportation)	IMO / IMDG (Ocean Transportation)	ICAO/IATA
14.1. UN number	UN2809	UN2809	UN2809
14.2. UN proper shipping name	UN2809, Mercury, 8, III	Mercury	Mercury
14.3. Transport hazard class(es)	**DOT Hazard Class:** 8 (6.1)	**IMDG:** 8 **Sub Class:** 6.1	**Air Class:** 8
14.4. Packing group	III	III	III

14.5. Environmental hazards

IMDG Marine Pollutant: Yes (Mercury)

14.6. Special precautions for user

No further information

15. Regulatory information

Regulatory Overview The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented.

Toxic Substance Control Act (TSCA) All components of this material are either listed or exempt from listing on the TSCA Inventory.

WHMIS Classification D1A

US EPA Tier II Hazards

Fire: No
Sudden Release of Pressure: No
Reactive: No
Immediate (Acute): Yes
Delayed (Chronic): Yes

EPCRA 311/312 Chemicals and RQs (lbs):

Mercury (1.00)

EPCRA 302 Extremely Hazardous:

To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

SDS Revision Date: **05/01/2015**

EPCRA 313 Toxic Chemicals:

Mercury

Proposition 65 - Carcinogens (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

Proposition 65 - Developmental Toxins (>0.0%):
Mercury

Proposition 65 - Female Repro Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

Proposition 65 - Male Repro Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

New Jersey RTK Substances (>1%):

Mercury

Pennsylvania RTK Substances (>1%):

Mercury

16. Other information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:

H330 Fatal if inhaled.

H360D May damage the unborn child.

H372 Causes damage to organs through prolonged or repeated exposure.

H400 Very toxic to aquatic life.

H410 Very toxic to aquatic life with long lasting effects.

This is the first version in the GHS SDS format. Listings of changes from previous versions in other formats are not applicable.

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 way shall WM Mercury Waste Inc. 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.

End of Document

SAFETY DATA SHEET

Version 4.11
Revision Date 04/24/2018
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Nickel

Product Number : 203904
Brand : Aldrich
Index-No. : 028-002-01-4

CAS-No. : 7440-02-0

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.

P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P363	Wash contaminated clothing before reuse.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Ni
Molecular weight	:	58.69 g/mol
CAS-No.	:	7440-02-0
EC-No.	:	231-111-4
Index-No.	:	028-002-01-4

Hazardous components

Component	Classification	Concentration
Nickel, powder [particle diameter < 1 mm]		
	Skin Sens. 1; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; H317, H351, H372, H412	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
For personal protection see section 8.

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.Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place. Handle and store under inert gas. Keep in a dry place.
Storage class (TRGS 510): 4.1B: Flammable solid hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Nickel, powder [particle diameter < 1 mm]	7440-02-0	TWA	1.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Dermatitis Pneumoconiosis Not suspected as a human carcinogen		

		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.015 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

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.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, 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 and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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 N100 (US) or type P3 (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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder 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: 1,455 °C (2,651 °F)
f)	Initial boiling point and boiling range	2,730 °C (4,946 °F)
g)	Flash point	Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	The substance or mixture is a flammable solid with the category 2.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	1 hPa (1 mmHg) at 1,810 °C (3,290 °F)
l)	Vapour density	No data available
m)	Relative density	8.9 g/mL at 25 °C (77 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
acids, Oxidizing agents, Sulphur compounds, Hydrogen gas, Oxygen, Methanol, organic solvents, Aluminium, Fluorine, Ammonia

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Nickel/nickel oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male and female - > 9,000 mg/kg
(OECD Test Guideline 401)

Dermal: No data available

No data available

Skin corrosion/irritation

Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation

Germ cell mutagenicity

No data available

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC:	1 - Group 1: Carcinogenic to humans (Nickel, powder [particle diameter < 1 mm])
	2B - Group 2B: Possibly carcinogenic to humans (Nickel, powder [particle diameter < 1 mm])
IARC:	1 - Group 1: Carcinogenic to humans (Nickel, powder [particle diameter < 1 mm])
	2B - Group 2B: Possibly carcinogenic to humans (Nickel, powder [particle diameter < 1 mm])
NTP:	RAHC - Reasonably anticipated to be a human carcinogen (Nickel, powder [particle diameter < 1 mm])
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Inhalation - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard

No data available

Additional Information

Repeated dose toxicity	Rat - male and female - Inhalation - LOAEL : 0.0001 mg/l - OECD Test Guideline 451

RTECS: Not available

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

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - 15.3 mg/l - 96 h

12.2 Persistence and degradability

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

12.3 Bioaccumulative potential

12.4 Mobility in soil

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powders, flammable, n.o.s.
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG

IATA

UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powder, flammable, n.o.s.

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Nickel, powder [particle diameter < 1 mm]	7440-02-0	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Nickel, powder [particle diameter < 1 mm]	7440-02-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Nickel, powder [particle diameter < 1 mm]	7440-02-0	2007-07-01

California Prop. 65 Components

, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov. Nickel, powder [particle diameter < 1 mm]	CAS-No. 7440-02-0	Revision Date 2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H402	Harmful to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	1
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	1
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.11 Revision Date: 04/24/2018 Print Date: 11/10/2018

SAFETY DATA SHEET

Version 5.8
Revision Date 10/20/2017
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : PCBs in Transformer Oil

Product Number : QC1275
Brand : Sigma-Aldrich

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Eye irritation (Category 2A), H319
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H319	Causes serious eye irritation.
H411	Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264	Wash skin thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P391	Collect spillage.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Hazardous components

Component		Classification	Concentration
Paraffin oils			
CAS-No. EC-No.	8012-95-1 232-384-2	Asp. Tox. 1; H304	90 - 100 %
Aroclor 1254			
CAS-No. Index-No.	11097-69-1 602-039-00-4	Acute Tox. 4; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H302, H373, H410	< 0.1 %
Aroclor 1016			
CAS-No. Index-No.	12674-11-2 602-039-00-4	STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H373, H410	< 0.1 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

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

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

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
Soak up with inert absorbent material and dispose of as hazardous waste. 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 inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store at Room Temperature.
Storage class (TRGS 510): 12: Non Combustible Liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Paraffin oils	8012-95-1	TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		As sampled by method that does not collect vapor.		
Aroclor 1254	11097-69-1	TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		

		TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Liver damage Chloracne Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Liver damage Chloracne Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		TWA	0.001000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
Aroclor 1016	12674-11-2	TWA	0.001000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 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.

Body Protection
Impervious clothing, 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 respirator with multi-purpose 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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance Form: liquid

b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available
g)	Flash point	No data available
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	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
Hazardous decomposition products formed under fire conditions. - Carbon oxides
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

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

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available
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

Additional Information

RTECS: Not available

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

Nerves. - (Aroclor 1260)
Stomach - Irregularities - Based on Human Evidence (Aroclor 1254)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

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

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3082 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Aroclor 1016, Aroclor 1254)
Marine pollutant:yes

IATA
UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Aroclor 1016, Aroclor 1254)

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

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Paraffin oils	8012-95-1	2007-03-01
Aroclor 1254	11097-69-1	1993-04-24
Aroclor 1242	53469-21-9	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Paraffin oils	8012-95-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Paraffin oils	8012-95-1	2007-03-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Aroclor 1260	11096-82-5	2008-08-01
Aroclor 1254	11097-69-1	1990-06-30

Aroclor 1016	12674-11-2	2008-08-01
Aroclor 1242	53469-21-9	2008-08-01

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No.	Revision Date
	11096-82-5	2008-08-01
Aroclor 1260		
Aroclor 1254	11097-69-1	1990-06-30
Aroclor 1016	12674-11-2	2008-08-01
Aroclor 1242	53469-21-9	2008-08-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Asp. Tox.	Aspiration hazard
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H319	Causes serious eye irritation.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.
STOT RE	Specific target organ toxicity - repeated exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.8 Revision Date: 10/20/2017 Print Date: 11/10/2018

SAFETY DATA SHEET

Revision Date 24-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Selenium**

Cat No. : **AC419270000; AC419271000; AC419275000**

Synonyms None

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 3
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Specific target organ toxicity - (repeated exposure)	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
Toxic if swallowed
Toxic if inhaled
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
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)
May cause long lasting harmful effects to aquatic life

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Selenium	7782-49-2	> 99.5

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes.

Inhalation Remove from exposure, lie down. Move to fresh air. If not breathing, give artificial respiration. Immediate medical attention is required.

Ingestion Do not induce vomiting. Never give anything by mouth to an unconscious person. Drink plenty of water. Call a physician immediately. If possible drink milk afterwards.

Most important symptoms and effects No information available.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Water spray. Carbon dioxide (CO_2). Dry chemical. Chemical foam.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature Not applicable

Explosion Limits
Upper No data available
Lower No data available

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Vapors may form explosive mixtures with air.

Hazardous Combustion Products
None known
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal.

7. Handling and storage

Handling Avoid contact with skin and eyes. Do not breathe dust. Use only in area provided with appropriate exhaust ventilation.

Storage Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep under nitrogen.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Selenium	TWA: 0.2 mg/m³	(Vacated) TWA: 0.2 mg/m³	IDLH: 1 mg/m³ TWA: 0.2 mg/m³	TWA: 0.2 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures 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 A NIOSH/MSHA approved air purifying dust or mist respirator or European Standard EN 149.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Grey
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	217 - 222 °C / 422.6 - 431.6 °F
Boiling Point/Range	685 °C / 1265 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mmHg @ 345 °C
Vapor Density	Not applicable
Specific Gravity	4.810
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	Not applicable
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Se
Molecular Weight	78.96

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Acids, Strong oxidizing agents, Fluorine, oxygen, Metals

Hazardous Decomposition Products None under normal use conditions

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Selenium	LD50 = 6700 mg/kg (Rat)	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 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
Selenium	7782-49-2	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

.

Persistence and Degradability Insoluble in water

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT
- **UN-No** UN3283
- **Hazard Class** 6.1
- **Packing Group** III

TDG
- **UN-No** UN3283
- **Hazard Class** 6.1
- **Packing Group** III

IATA
- **UN-No** UN3283
- **Proper Shipping Name** SELENIUM COMPOUND, SOLID, N.O.S.
- **Hazard Class** 6.1
- **Packing Group** III

IMDG/IMO
- **UN-No** UN3283
- **Proper Shipping Name** SELENIUM COMPOUND, SOLID, N.O.S.
- **Hazard Class** 6.1
- **Packing Group** III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Selenium	X	X	-	231-957-4	-		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 %
Selenium	7782-49-2	> 99.5	1.0

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
Selenium	-	-	X	X

Clean Air Act Not applicable

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Selenium	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
Selenium	100 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
Selenium	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 24-Jan-2018
Print Date 24-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

Version 6.0
Revision Date 09/21/2017
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Toluene

Product Number : 244511
Brand : Sigma-Aldrich
Index-No. : 601-021-00-3

CAS-No. : 108-88-3

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Specific target organ toxicity - repeated exposure (Category 2), H373
Aspiration hazard (Category 1), H304
Acute aquatic toxicity (Category 2), H401

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.

Precautionary statement(s)	
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 measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C_7H_8
Molecular weight	:	92.14 g/mol
CAS-No.	:	108-88-3
EC-No.	:	203-625-9
Index-No.	:	601-021-00-3
Registration number	:	01-2119471310-51-XXXX

Hazardous components

Component	Classification	Concentration
Toluene		
	Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; H225, H304, H315, H336, H361, H373, H401	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. 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
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

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
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

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 inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Handle and store under inert gas.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Toluene	108-88-3	TWA	100 ppm 375 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
	Remarks	Z37.12-1967		
		CEIL	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		Peak	500 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.12-1967		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Visual impairment Female reproductive Pregnancy loss 2015 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	100 ppm 375 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	150 ppm 560 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Toluene	108-88-3	Toluene	0.0200 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Toluene	0.0300 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3000 mg/g	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		Toluene	0.02 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to last shift of workweek			

		Toluene	0.03 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			
		o-Cresol	0.3mg/g Creatinine	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift (As soon as possible after exposure ceases)			

Derived No Effect Level (DNEL)

Application Area	Exposure routes	Health effect	Value
Workers	Inhalation	Acute systemic effects	384 mg/m3
Workers	Inhalation	Acute local effects	384 mg/m3
Workers	Skin contact	Long-term systemic effects	384mg/kg BW/d
Workers	Inhalation	Long-term systemic effects	192 mg/m3
Workers	Inhalation	Long-term local effects	192 mg/m3
Consumers	Inhalation	Acute systemic effects	226 mg/m3
Consumers	Inhalation	Acute local effects	226 mg/m3
Consumers	Skin contact	Long-term systemic effects	226mg/kg BW/d
Consumers	Inhalation	Long-term systemic effects	56.5 mg/m3
Consumers	Ingestion	Long-term systemic effects	8.13mg/kg BW/d

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	2.89 mg/kg
Marine water	0.68 mg/l
Fresh water	0.68 mg/l
Marine sediment	16.39 mg/kg
Fresh water sediment	16.39 mg/kg
Sewage treatment plant	13.61 mg/l
Aquatic intermittent release	0.68 mg/l

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

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.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, 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 and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., 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 respirator with multi-purpose 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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	aromatic
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -93 °C (-135 °F)
f)	Initial boiling point and boiling range	110 - 111 °C (230 - 232 °F)
g)	Flash point	4.0 °C (39.2 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 7 %(V) Lower explosion limit: 1.2 %(V)
k)	Vapour pressure	29.1 hPa (21.8 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.865 g/mL at 25 °C (77 °F)
n)	Water solubility	0.5 g/l at 15 °C (59 °F)
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	535.0 °C (995.0 °F)
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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 5,580 mg/kg

LC50 Inhalation - Rat - 4 h - 12,500 - 28,800 mg/m3

LD50 Dermal - Rabbit - 12,196 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Rat
Liver
DNA damage

Carcinogenicity

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

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
Damage to fetus possible
Suspected human reproductive toxicant

Reproductive toxicity - Rat - Inhalation
Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count).

Experiments have shown reproductive toxicity effects in male and female laboratory animals.

Developmental Toxicity - Rat - Oral
Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: XS5250000

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

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 7.63 mg/l - 96 h
	NOEC - Pimephales promelas (fathead minnow) - 5.44 mg/l - 7 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 8.00 mg/l - 24 h
	Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h
Toxicity to algae	EC50 - Chlorella vulgaris (Fresh water algae) - 245.00 mg/l - 24 h
	EC50 - Pseudokirchneriella subcapitata (green algae) - 10.00 mg/l - 24 h

12.2 Persistence and degradability

Biodegradability	Result: - Readily biodegradable.

12.3 Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d - 0.05 mg/l
	Bioconcentration factor (BCF): 90

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TOLUENE

IATA
UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene	108-88-3	2009-02-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Asp. Tox.	Aspiration hazard
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H336	May cause drowsiness or dizziness.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.
Repr.	Reproductive toxicity
Skin Irrit.	Skin irritation

HMIS Rating
Health hazard: 2

Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 6.0 Revision Date: 09/21/2017 Print Date: 11/10/2018

SAFETY DATA SHEET

Version 5.9
Revision Date 01/04/2018
Print Date 11/09/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Trichloroethylene

Product Number : 133124
Brand : Aldrich
Index-No. : 602-027-00-9

CAS-No. : 79-01-6

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

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

Precautionary statement(s)	
P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves.
P281	Use personal protective equipment as required.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	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.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	TCE Trichloroethene
Formula	:	C_2HCl_3
Molecular weight	:	131.39 g/mol
CAS-No.	:	79-01-6
EC-No.	:	201-167-4
Index-No.	:	602-027-00-9

Hazardous components

Component	Classification	Concentration
Trichloroethylene		
	Skin Irrit. 2; Eye Irrit. 2A; Muta. 2; Carc. 1B; STOT SE 3; Aquatic Acute 3; Aquatic Chronic 3; H315, H319, H336, H341, H350, H412	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

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
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

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
Soak up with inert absorbent material and dispose of as hazardous waste. 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 inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Light sensitive. Handle and store under inert gas.
Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Trichloroethylene	79-01-6	TWA	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		STEL	25.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		Potential Occupational Carcinogen See Appendix C See Appendix A		
		See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		

		STEL	100 ppm 537 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	25 ppm 135 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
	-	Trichloroacetic acid	15.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		Trichloroethanol	0.5000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 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.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, 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 and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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 respirator with multi-purpose 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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -84.8 °C (-120.6 °F) - lit.
f)	Initial boiling point and boiling range	86.7 °C (188.1 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 10.5 %(V) Lower explosion limit: 8 %(V)
k)	Vapour pressure	81.3 hPa (61.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.463 g/mL at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 2.29log Pow: 5
p)	Auto-ignition temperature	410.0 °C (770.0 °F)
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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Oxidizing agents, Strong bases, Magnesium

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 4,920 mg/kg

LC50 Inhalation - Mouse - 4 h - 8450 ppm

LD50 Dermal - Rabbit - > 20,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Severe skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	1 - Group 1: Carcinogenic to humans (Trichloroethylene)
NTP:	RAHC - Reasonably anticipated to be a human carcinogen (Trichloroethylene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

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

Additional Information
RTECS: Not available

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 41 mg/l - 96.0 h
	LOEC - other fish - 11 mg/l - 10.0 d
	NOEC - Oryzias latipes - 40 mg/l - 10.0 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 18.00 mg/l - 48 h
Toxicity to algae	IC50 - Pseudokirchneriella subcapitata (green algae) - 175.00 mg/l - 96 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
Does not bioaccumulate.

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

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

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1710 Class: 6.1 Packing group: III
Proper shipping name: Trichloroethylene
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1710 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TRICHLOROETHYLENE

IATA
UN number: 1710 Class: 6.1 Packing group: III

Proper shipping name: Trichloroethylene

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

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

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Trichloroethylene	79-01-6	2011-09-01
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Trichloroethylene	79-01-6	2011-09-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H402	Harmful to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.9 Revision Date: 01/04/2018 Print Date: 11/09/2018

SAFETY DATA SHEET

Version 3.16
Revision Date 03/05/2018
Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Vinyl chloride

Product Number : 387622
Brand : Aldrich
Index-No. : 602-023-00-7

CAS-No. : 75-01-4

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Carcinogenicity (Category 1A), H350
Simple Asphyxiant,

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H350	May cause cancer. May displace oxygen and cause rapid suffocation.

Precautionary statement(s)

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.
P280	Wear protective gloves/ protective clothing/ eye protection/ face

	protection.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Chloroethylene
Formula	:	C_2H_3Cl
Molecular weight	:	62.50 g/mol
CAS-No.	:	75-01-4
EC-No.	:	200-831-0
Index-No.	:	602-023-00-7

Hazardous components

Component	Classification	Concentration
Vinyl chloride		
	Flam. Gas 1; Press. Gas Liquefied gas; Carc. 1A; SA ; H220, H280, H350,	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

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.Move out of dangerous area.

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. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. 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

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Contents under pressure. Light sensitive.
Storage class (TRGS 510): 2A: Gases

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Vinyl chloride	75-01-4	TWA	1 ppm	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Lung cancer Confirmed human carcinogen		
		STEL	5 ppm	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		STEL	5 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		See 1910.1017		

		Potential Occupational Carcinogen See Appendix A

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

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.

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 120 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, 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 and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., 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 respirator with multi-purpose combination (US) or type AXBEK (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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Liquefied gas
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -153.8 °C (-244.8 °F) - lit.
f)	Initial boiling point and boiling range	-13.4 °C (7.9 °F) - lit.
g)	Flash point	-61.0 °C (-77.8 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available

j)	Upper/lower flammability or explosive limits	Upper explosion limit: 33 %(V) Lower explosion limit: 3.6 %(V)
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	0.911 g/cm3 at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition 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

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabiliser(s):
Hydroquinone (>=0 - <=0.0001 %)
Phenol (>=0 - <=0.01 %)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Chemically active metals, Copper

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

LC50 Inhalation - Rat - 0.3 h - 180000 ppm
Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
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.

Human carcinogen.

IARC:	1 - Group 1: Carcinogenic to humans (Vinyl chloride)
NTP:	Known - Known to be human carcinogen (Vinyl chloride)
OSHA:	OSHA specifically regulated carcinogen (Vinyl chloride)

Reproductive toxicity
No data available

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KU9625000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -
Stomach - Irregularities - Based on Human Evidence (Phenol)
Liver - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1086 Class: 2.1
Proper shipping name: Vinyl chloride, stabilized
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1086 Class: 2.1 EMS-No: F-D, S-U
Proper shipping name: VINYL CHLORIDE, STABILIZED

IATA
UN number: 1086 Class: 2.1
Proper shipping name: Vinyl chloride, stabilized
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01
Hydroquinone	123-31-9	2007-03-01

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

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Sudden Release of Pressure Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01
Phenol	108-95-2	2007-07-01
Hydroquinone	123-31-9	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01
Phenol	108-95-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

	May displace oxygen and cause rapid suffocation.
Carc.	Carcinogenicity
Flam. Gas	Flammable gases
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H350	May cause cancer.
Press. Gas	Gases under pressure
SA	Simple Asphyxiant

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	3

NFPA Rating

Health hazard:	2
Fire Hazard:	4
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.16 Revision Date: 03/05/2018 Print Date: 11/10/2018

Section 1: IDENTIFICATION OF SUBSTANCE AND SUPPLIER

PRODUCT NAME: Xylenes, High Purity Chemicals

SYNONYMS: Dimethylbenzene; xylol, methyltoluene; Xylene mixture of isomers

PRODUCT CODES: ES609, ES609-5G

MANUFACTURER: Azer Scientific, Inc.
ADDRESS: 701 Hemlock Rd, Morgantown, PA 19543

CHEMTREC PHONE: 800-424-9300 (USA)
+1.703.527.3887 (International)

SUPPORT: 610-524-5810

FAX: 610-901-3046

PRODUCT USE: This product is recommended for laboratory and manufacturing use only. It is NOT recommended for drug, food or household use.

PREPARED BY: CB

Section 2: HAZARDS IDENTIFICATION

Emergency Overview:

WARNING! HIGHLY FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO EYES, SKIN, AND RESPIRATORY TRACT. ASPIRATION HAZARD IF SWALLOWED. MAY BE HARMFUL IF ABSORBED THROUGH THE SKIN OR IF INHALED. MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION.

GHS Classification(s):
Acute Toxicity, Dermal (Category 4)
Acute Toxicity, Inhalation (Category 4)
Aspiration Hazard (Category 1)
Chronic aquatic toxicity (Category 3)
Eye irritation (Category 2A)
Flammable Liquids (Category 3)
Skin irritation (Category 2)
Specific Target Organ Toxicity – single exposure (Category 3)

Target Organs: Central nervous system, Eyes, Respiratory system, Skin

GHS label elements (including precautionary statements)

Signal Word: DANGER!

.

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
H319	Causes serious eye irritation.
H332	Harmful if inhaled
H335	May cause respiratory irritation
H412	Harmful to aquatic life with long lasting effects

Precautionary Phrases	
P261	Avoid breathing dust/fumes/gas/mist/vapors
P501	Dispose of contents and container to an approved waste disposal plant.
P331	Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water.
P310+P310	IF SWALLOWED: Immediately call a POISON CENTER or a doctor/physician.
P210	Keep away from heat, sparks, open flames and hot surfaces. No smoking.
P280	Wear protective gloves and eye and face protection

Other hazards which do not result in classification:

Potential Health Effects:

Organ	Description
Eyes	Contact with eyes generally causes transient superficial injury. Based on animal studies with mixed xylene isomers, it is probably a mild irritant.
Ingestion	Aspiration hazard. May cause irritation of the digestive tract. May cause central nervous system depression characterized by excitement followed by nausea, headache, and unconsciousness. Advanced stages may cause collapse, loss of consciousness, coma, and death from respiratory failure. May cause affects similar to acute inhalation.
Inhalation	High concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma. Prolonged exposures may result in dizziness and general weakness. Irritation may lead to pneumonitis and pulmonary edema. May cause liver and kidney damage. Causes irritation of the mucous membranes. Odor is not an adequate warning of exposure to xylene. Reversible liver and kidney damage has been reported in cases of extreme overexposure. Industrial fatalities due to severe overexposure have been described.
Skin	May be harmful if absorbed through the skin. Causes skin irritation, defatting, cracking, and dryness. Blistering may occur, particularly if exposure is concentrated and the exposed area is covered. Liquid and vapor and be absorbed through the skin, but not as easily as inhalation or ingestion. Absorption is reported to be slow and significant health effects are not expected by this route of exposure.
Chronic	Prolonged or repeated exposure to xylene may cause defatting and dermatitis., reversible eye damage, labored breathing, confusion, dizziness, apprehension, memory loss, headache, tremors, weakness, anorexia, nausea, ringing in the ears, irritability, thirst, mild changes in liver function, kidney impairment, anemia, and hyperplasia (but not destruction) of bone marrow.

Section 3: COMPOSITION AND INFORMATION ON INGREDIENTS

Chemical Identity: Xylene
Common name / Synonym: Dimethylbenzene, xylol, methyltoluene
CAS #: 1330-20-7; 100-41-4
EINECS #: 215-535-7; 202-849-4
ICSC #: 0268 (Ethyl Benzene)
RTECS #: DA0700000 (Ethyl Benzene)
UN #: 1307
EC #: 601-023-00-4 (Ethyl Benzene)

% Weight	Material	CAS
15-25	Ethyl Benzene	100-41-4
75-85	Xylenes	1330-20-7

Section 4: FIRST AID MEASURES

General Advice
Take proper precautions to ensure your own health and safety before attempting rescue and providing first aid. Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

Skin
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing/shoes. Get medical aid if irritation persists. Wash clothing before reuse. Thoroughly clean shoes before reuse.

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

Eyes
Check for and remove contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Ingestion
Aspiration hazard if swallowed. Get medical attention immediately. DO NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person.

Note to Physician
Treat symptomatically and supportively.

Section 5: FIRE FIGHTING MEASURES

Suitable (and unsuitable) extinguishing media:
Water streams may be ineffective and spread the fire. Use water spray, dry chemical, carbon dioxide or appropriate foam.

Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products):
No data available.

Special protective equipment and precautions for fire fighters:
Wear self-contained breathing apparatus in pressure-demand (MSA/NIOSH approved or equivalent), and full protective gear. Use water spray to keep fire exposed containers cool. Approach fire upwind to avoid hazardous vapors and toxic decomposition products. 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. Liquid is lighter than water and may travel to a source of ignition and spread fire. May accumulate static electricity.

Flammable Properties
Classification OSHA/NFPA Class IC Flammable Liquid
Flash Point 25-32° C (77-90°F) – closed cup
Autoignition temperature 527° C (982°F)

Section 6: ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:
Wear respiratory protection. Do not inhale vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.
Environmental precautions:
Stop leak. Contain spill if possible and safe to do so. Prevent product from entering drains.
Methods and materials for containment and clean up:
Use water spray to dilute into a non-flammable mixture. Avoid runoff into storm sewers and ditches which lead to waterways. Provide ventilation to the affected area and remove all ignition sources. Vapor suppressing foam may be used. Water spray may be reduce vapors but may not prevent ignition in closed spaces. Absorb spilled liquid with sorbent pads, socks, or other inert material such as vermiculite, sand or earth. Approach the spill from upwind and pick up absorbed material and place it in a suitable container. Always use proper personal protective equipment as described in section 8.

Section 7: HANDLING AND STORAGE

Precautions for safe handling:
Always use proper personal protective equipment as described in section 8. Wash thoroughly after handling. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Remove contaminated clothing and wash before reuse. Empty containers contain product residue (liquid and vapor) and can be dangerous. Keep container tightly closed and away from heat, spark, and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use with adequate ventilation. Avoid breathing vapor or mist.

Conditions for safe storage, including any incompatibilities:
Keep away from heat, sparks, and flame in a flammables area. Keep container closed when no in use. Keep from contact with oxidizing materials and strong acids. Store in a cool, dry, well-ventilated space and avoid contact with incompatible materials.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters, e.g., occupational exposure limit values or biological limit values:
Occupational Exposure Limits

Component	Source	Type	Value	Note
Ethyl Benzene	US (NIOSH)	TWA	100 ppm /435 mg/m^3	NIOSH Recommended exposure limit
Ethyl Benzene	US (ACGIH)	TWA	100 ppm	ACGIH Threshold Limit Value
Ethyl Benzene	US (OSHA)	TWA	100 ppm / 435 mg/m^3	29 CFR 1910.1000 Table Z-1 Limits for Air Contaminants
Xylene	US (OSHA)	TWA	100 ppm / 435 mg/m^3	29 CFR 1910.1000 Table Z-1 Limits for Air Contaminants
Xylene	US (ACGIH)	TWA	100 ppm / 34 mg/m^3	ACGIH Threshold Limit Value

Appropriate engineering controls:
Use explosion-proof ventilation equipment. Facilities storing or using the material should be equipped with eyewash station and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Individual protection measures, such as personal protective equipment:
Respiratory Protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as 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).
Hand 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.
Eye protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Use equipment approved by appropriate government standards, such as NIOSH (US) or EN166 (EU). Maintain eye wash fountain and quick-drench facilities in work area.
Skin and body protection:
Wear impervious, flame retardant, antistatic protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance *(physical state, color, etc.)*	Liquid. Colorless. Clear
Odor	Aromatic odor
Odor threshold	1 ppm
pH	Not available
Freezing point	-34° C (-29.2° F)
Initial boiling point and boiling range	137-140°C (279-284°F)
Flash point	22.8°C (73°F) – Closed cup
Evaporation rate	(Butyl acetate = 1): 0.7
Flammability (solid, gas)	Flammable
Upper / Lower flammability or explosive limits	Lower Limit – 1.1 vol %, Upper Limit – 7.0 vol %
Vapor pressure	8.29 mmHg at 25°C (77°F)
Vapor density	3.66
Relative density	0.865 g/cm^3
Solubility(ies)	Insoluble
Partition coefficient n-octanol/water(ies)	Not Available
Auto-ignition temperature	527°C (982°F)
Decomposition temperature	Not Available
Formula	$C_6H_4(CH_3)_2$
Molecular weight (Xylene Mixtures)	106.17 g/mol

Section 10: STABILITY AND REACTIVITY

Chemical Stability	Stable under recommended storage conditions
Possibility of hazardous reactions	Hazardous Polymerization: Will not occur
Conditions to avoid (e.g., static discharge, shock or vibration)	Ignition sources and excess heat.
Incompatible materials	Strong oxidizing agents, , strong acids, acetic acid, and nitric acid
Hazardous decomposition products	Carbon monoxide and carbon dioxide

Section 11: TOXICOLOGICAL INFORMATION

Xylenes: Ethyl benzene 1330-20-7: 100-41-4

Product Summary: Epidemiology: 175 workers were exposed to 21 ppm of xylene for 7 years. Subjective symptoms, such as anxiety, forgetfulness, inability to concentrate, and dizziness were reported. Xylenes accounted for 70%of the total exposure. Liver and kidney effects were reported. Teratogenicity: No increased evidence of birth defects was reported in a study of lab workers exposed to xylene during early pregnancy. Exposure to other solvents and chemicals also occurred. An increased incidence of spontaneous abortions was reported. Animal information suggests that xylene is not teratogenic or embryotoxic at levels that are not harmful to the mother. Reproductive Effects: an increase in menstrual disorders has been reported in women exposed to organic solvents such as benzene, toluene, and xylenes. It is not possible to attribute these effects to xylene in particular. Mutagenicity: Xylene does not appear to be a mutagen. Neurotoxicity: Xylene may damage hearing or enhance sensitivity to noise in chronic occupational exposures, probably from a neurotoxic mechanism.

Acute Toxicity:

Animal Toxicity (Ethylbenzene)

LC50 Inhalation	Rat	55,000 mg/m^3	2 hours
LD50 Oral	Rat	3500 mg/kg	
LD50 Dermal	Rabbit	17,800 uL/kg	
LC50 Oral	Mouse	35,000 mg/m^3	2 hours
Draize test	Rabbit eye	500 mg	Severe

Animal Toxicity (Xylenes)

LC50 Inhalation	Rat	5,000 mg/m^3	4 hours
LD50 Oral	Rat	4300 mg/kg	
LD50 Dermal	Rabbit	>1700 mg/kg	

LD50 Oral	Mouse	2,119 mg/kg	
Draize test	Rabbit eye	87mg	Mild
Draize test	Rabbit eye	5 mg/24H	Severe
Draize test	Rabbit skin	100%	moderate
Draize test	Rabbit skin	500 mg/24H	Moderate

Irritation:
Routes of Entry:
Inhalation, skin absorption, skin contact

Carcinogenicity
IARC: Group 3: Not classifiable as to its carcinogenicity to humans (Xylene): Group 2B: Possibly carcinogenic to humans (Ethylbenzene)

ACGIH: Carcinogenicity (Xylenes): ACGIH: A4, not classifiable as a human carcinogen IARC: Group 3 – not classifiable. Carcinogenicity (Ethylbenzene):ACGIH: A3, confirmed animal carcinogen with unknown relevance to humans California: carcinogen, initial date 6/11/04 NTP: Not listed IARC: Group 2B carcinogen

NTP: No data is available

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Other Hazards

Organ	Description
Eyes	Contact with eyes generally causes transient, superficial injury. Based on animal studies with mixed Xylene isomers, it is probably a mild irritant.
Ingestion	Aspiration hazard. May cause irritation of the digestive tract. May cause central nervous system depression characterized by excitement followed by nausea, headache, dizziness, and unconsciousness. Advanced stages may cause collapse, loss of consciousness, coma, and death from respiratory failure. May cause affects similar to acute inhalation.
Inhalation	High concentrations may cause central nervous systems effects characterized by nausea, headache, dizziness, unconsciousness, and coma. Prolonged exposures may result in dizziness and general weakness. Irritation may lead to pneumonitis and pulmonary edema. May cause liver and kidney damage. Causes irritation of the mucous membranes. Odor is not an adequate warning of exposure to xylene. Industrial fatalities due to severe overexposure have been described
Skin	May be harmful if absorbed through the skin. Causes skin irritation, defatting, cracking, and dryness. Blistering may occur, particularly if exposure is concentrated and the exposed area is covered. Liquid and vapor and be absorbed through the skin, but not as easily as inhalation or ingestion. Absorption is reported to be slow and significant health effects are not expected by this route of exposure.
Chronic	Prolonged or repeated exposure to xylene may cause defatting and dermatitis., reversible eye damage, labored breathing, confusion, dizziness, apprehension, memory loss, headache, tremors, weakness, anorexia, nausea, ringing in the ears, irritability, thirst, mild changes in liver function, kidney impairment, anemia, and hyperplasia (but not destruction) of bone marrow.

Section 12: ECOLOGICAL INFORMATION

Xylenes: Ethyl benzene 1330-20-7: 100-41-4

Ecotoxicity (aquatic and terrestrial, where available):
Fish: rainbow trout: LC50 = 13.5 mg/L; 96 Hr; unspecified
Fish: rainbow trout: LC50 = 8.5 mg/L; 96 Hr; static conditions
Fish: goldfish: LD50 = 13 mg/L; 24 Hr; unspecified
Fish: fathead minnow: LC50 = 46 mg/L; 1 Hr; Static bioassay
Fish: fathead minnow: LC50 = 16.1mg/L; 96 Hr; flow-through conditions
Fish: bluegill: EC50 = 16.1mg/L; 48 Hr; flow-through conditions
Water flea: EC50 = 3.82 mg/L; 24 Hr; flow-through conditions
Photobacterium phosphoreum: EC50 = 0.0084 mg/L; 24Hr; microtox test

Persistence and degradability:
No data available

Bioaccumulative potential:
No data available

Other adverse effects:
Environmental Fate: (Atmosphere): According to a model of gas/particulate partitioning of semi volatile organic compounds in the atmosphere, xylene, which has an experimental vapor pressure of 7.99 mm Hg at 25° C, will exist solely as a vapor in the ambient atmosphere by reaction with photochemically-produced hydroxyl radicals. The atmospheric lifetime of xylene is about 14-26 hours. Ambient levels of xylene are detected in the atmosphere due to large emissions of this compound. Soil: In soil, it will volatilize and leach into groundwater. Little bioconcentration is expected.

Section 13: DISPOSAL CONSIDERATIONS

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging:
Material that cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Processing, use or contamination of this product may change the waste management options. Waste generators must decide if discarded acetonitrile is a hazardous waste. State and local disposal regulations may differ from federal disposal definitions found in 40 CFR 261.3. Dispose of container and unused contents in accordance with federal, state, and local requirements. This material is not a “P” listed waste under 40 CFR 261.33. It is not a “U” listed waste.

Section 14: TRANSPORT INFORMATION

Description of waste residues and information on their safe handling and methods of disposal:

UN number	UN1307
UN proper shipping name	Xylenes
Transport hazard class(es)	3
Packing group *(if applicable)*	III

Reportable Quantity
454 kg

IMDG
UN-Number: 1307 Class: 3 Packing Group: III
EMS-No: F-E, S-D
Proper shipping name: XYLENES
Marine pollutant: No
IATA
UN-Number: UN1307 Class: 3 (6.1) Packing Group: III
Proper shipping name: Xylenes

Section 15: REGULATORY INFORMATION

Safety, health and environmental regulations specific for the product in question:
OSHA Hazards
Flammable liquid, Harmful by skin absorption, Irritant

All ingredients are on the following inventories or are exempted from listing

Country	Notification
Australia	AICS
Canada	DSL
China	IECS
European Union	EINECS
Japan	ENCS/ISHL
Korea	ECL
New Zealand	NZIoC

Philippines	PICCS
United States of America	TSCA

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302. Does not have a TPQ.

SARA 313 Components
Xylenes (CAS# 1330-20-7) and ethylbenzene (CAS# 100-41-4) are reportable under section 313 and 40 CFR373.

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

CERCLA
CERCLA Hazardous Substances: CAS# 1330-20-7: 1000 lb final RQ; 454 kg final RQ: CAS# 100-41-4: 1000 lb final RQ; 454 kg final RQ

Massachusetts Right to Know Components

Ethylbenzene CAS-No. 100-41-4 Revision date 2007-07-01; Xylene CAS-No. 1330-20-7 Revision date 1989-08-11

Pennsylvania Right to Know Components
Ethylbenzene CAS-No. 100-41-4 Revision date 2007-07-01; Xylene CAS-No. 1330-20-7 Revision date 1989-08-11

New Jersey Right to Know Components
Ethylbenzene CAS-No. 100-41-4 Revision date 2007-07-01; Xylene CAS-No. 1330-20-7 Revision date 1989-08-11

California Prop 65 Components
WARNING! This product contains a chemical known to the State of California to cause cancer. Ethylbenzene CAS-No. 100-41-4 Revision date 2007-09-08

Section 16: OTHER INFORMATION: INCLUDING INFORMATION ON PREPARATION AND REVISION OF THE SDS

NFPA:

Disclaimer
Azer Scientific believes that the information on this MSDS was obtained from reliable sources. However, the information is provided without any warranty, expressed or implied, regarding its correctness. Some information presented and conclusions drawn herein are from sources other than direct test data on the substance itself. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, Azer Scientific does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with handling, storage, use, or disposal of this product. If the product is used as a component in another product, this MSDS information may not be applicable. Information is correct to the best of our knowledge at the date of the MSDS publication.

Safety Data Sheet

Zinc, Metal

CAROLINA®
www.carolina.com

Section 1 Product Description

Product Name:	Zinc, Metal
Recommended Use:	Science education applications
Synonyms:	Spelter
Distributor:	Carolina Biological Supply Company 2700 York Road, Burlington, NC 27215 1-800-227-1150
Chemical Information:	800-227-1150 (8am-5pm (ET) M-F)
Chemtrec:	800-424-9300 (Transportation Spill Response 24 hours)

Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200;

DANGER

Self-heating: may catch fire. In contact with water releases flammable gases. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.

GHS Classification:
Self-heating substance or mixture Category 1, Hazardous to the aquatic environment - Acute Category 1, Hazardous to the aquatic environment - Chronic Category 1, Substance or mixture which in contact with water emits flammable gas Category 2

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%
Zinc, Metal	7440-66-6	100

Section 4 First Aid Measures

Emergency and First Aid Procedures

Inhalation:	In case of accident by inhalation: remove casualty to fresh air and keep at rest.
Eyes:	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact:	After contact with skin, wash immediately with plenty of water.
Ingestion:	If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Section 5 Firefighting Procedures

Extinguishing Media:	Dry lithium chloride, graphite powder, Pyrene G-1, dry sodium chloride, dry (anhydrous) calcium oxide.
Fire Fighting Methods and Protection:	Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Fire and/or Explosion Hazards:	Fire or excessive heat may produce hazardous decomposition products.
Hazardous Combustion Products:	Zinc Oxides

Section 6 Spill or Leak Procedures

Steps to Take in Case Material Is Released or Spilled:	No health affects expected from the clean-up of this material if contact can be avoided. Follow personal protective equipment recommendations found in Section 8 of this (M)SDS

Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation. Collect spillage.

Section 7 Handling and Storage

Handling: Keep away from any possible contact with water, because of violent reaction and possible flash fire. Handle under inert gas. Protect from moisture. Keep cool. Protect from sunlight. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. Use only in well-ventilated areas. Do not breathe dust.

Storage: Keep cool. Protect from sunlight. Store in a dry place. Store in a closed container. Maintain air gap between stacks/pallets. Store bulk masses greater than … kg/… lbs at temperatures not exceeding …°C/…°F. Store away from other materials. Keep container tightly closed in a cool, well-ventilated place.

Storage Code: Green - general chemical storage

Section 8 Protection Information

	ACGIH		OSHA PEL	
Chemical Name	**(TWA)**	**(STEL)**	**(TWA)**	**(STEL)**
Zinc	N/A	N/A	N/A	N/A

Control Parameters

Engineering Measures: No exposure limits exist for the constituents of this product. General room ventilation might be required to maintain operator comfort under normal conditions of use.

Personal Protective Equipment (PPE): Lab coat, apron, eye wash, safety shower.

Respiratory Protection: No respiratory protection required under normal conditions of use.

Respirator Type(s): None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.

Eye Protection: Wear chemical splash goggles when handling this product. Have an eye wash station available.

Skin Protection: Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

Gloves: Nitrile

Section 9 Physical Data

Formula: Zn
Molecular Weight: 65.38
Appearance: Grey Metallic Solid
Odor: None
Odor Threshold: No data available
pH: No data available
Melting Point: 419 C
Boiling Point: 907 C
Flash Point: No data available
Flammable Limits in Air: No data available

Vapor Pressure: 1.33 hPa at 487 °C
Evaporation Rate (BuAc=1): No data available
Vapor Density (Air=1): No data available
Specific Gravity: 7.12
Solubility in Water: Practically Insoluble
Log Pow (calculated): No data available
Autoignition Temperature: No data available
Decomposition Temperature: No data available
Viscosity: No data available
Percent Volatile by Volume: No data available

Section 10 Reactivity Data

Reactivity: Not generally reactive under normal conditions.
Chemical Stability: Stable under normal conditions.
Conditions to Avoid: No data available.
Incompatible Materials: Strong oxidizing agents, Strong acids, hydrogen chloride
Hazardous Decomposition Products: Zinc Oxides
Hazardous Polymerization: Will not occur

Section 11 Toxicity Data

Routes of Entry Inhalation and ingestion.

Symptoms (Acute): Muscle Weakness, Vomiting, Nausea, Anemia
Delayed Effects: No data available

Acute Toxicity:

Chemical Name	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
Zinc	7440-66-6	Not determined	Not determined	Not determined

Carcinogenicity:

Chemical Name	CAS Number	IARC	NTP	OSHA
Zinc	7440-66-6	Not listed	Not listed	Not listed

Chronic Effects:
Mutagenicity: No evidence of a mutagenic effect.
Teratogenicity: No evidence of a teratogenic effect (birth defect).
Sensitization: No evidence of a sensitization effect.
Reproductive: No evidence of negative reproductive effects.
Target Organ Effects:
Acute: No data available
Chronic: No data available

Section 12 Ecological Data

Overview: Severe ecological hazard. This product may be toxic to plants and/or wildlife.
Mobility: No data
Persistence: No data
Bioaccumulation: No data
Degradability: No data
Other Adverse Effects: No data

Chemical Name	CAS Number	Eco Toxicity
Zinc, Metal	7440-66-6	96 HR LC50 PIMEPHALES PROMELAS 2.66 MG/L [STATIC] 96 HR LC50 CYPRINUS CARPIO 30 MG/L 96 HR LC50 CYPRINUS CARPIO 7.8 MG/L [STATIC] 96 HR LC50 LEPOMIS MACROCHIRUS 3.5 MG/L [STATIC] 96 HR LC50 ONCORHYNCHUS MYKISS 0.41 MG/L [STATIC]

Section 13 Disposal Information

Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.
Waste Disposal Code(s): Not Determined

Section 14 Transport Information

Ground - DOT Proper Shipping Name:
Not regulated for transport by US DOT.

Air - IATA Proper Shipping Name:
Not regulated for air transport by IATA.

Section 15 Regulatory Information

TSCA Status: All components in this product are on the TSCA Inventory.

Chemical Name	CAS Number	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ

Zinc, Metal	7440-66-6	Zinc	No	454 kg final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm); 1000 lb final RQ (no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm)	No	No

Section 16 Additional Information

Revised: 10/13/2015 **Replaces: 10/13/2015** **Printed: 10-29-2015**

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
CAS	Chemical Abstract Service Number	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
DOT	U.S. Department of Transportation	ppm	Parts per million
IARC	International Agency for Research on Cancer	RCRA	Resource Conservation and Recovery Act
N/A	Not Available	SARA	Superfund Amendments and Reauthorization Act
		TLV	Threshold Limit Value
		TSCA	Toxic Substances Control Act
		IDLH	Immediately dangerous to life and health

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950
US GHS

Synonyms: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquid - Category 2
Skin Corrosion/Irritation - Category 2
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1B
Toxic to Reproduction - Category 1A
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Specific Target Organ Toxicity (Repeat Exposure) - Category 1 (liver, kidneys, bladder, blood, bone marrow, nervous system)
Aspiration Hazard - Category 1
Hazardous to the Aquatic Environment – Acute Hazard - Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Highly flammable liquid and vapour.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
Causes damage to organs (liver, kidneys, bladder, blood, bone marrow, nervous system) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe mist/vapours/spray.
Use only outdoors or in well-ventilated area.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

Response

In case of fire: Use water spray, fog, dry chemical fire extinguishers or hand held fire extinguisher.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash before reuse. If skin irritation occurs, get medical advice/attention.
IF exposed or concerned: Get medical advice/attention.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.
Get medical advice/attention if you feel unwell.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting.

Storage

Store in a well-ventilated place.
Keep cool. Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
86290-81-5	Gasoline, motor fuel	100
108-88-3	Toluene	1-25
106-97-8	Butane	<10
1330-20-7	Xylenes (o-, m-, p- isomers)	1-15
95-63-6	Benzene, 1,2,4-trimethyl-	<6
64-17-5	Ethyl alcohol	0-10
100-41-4	Ethylbenzene	<3
71-43-2	Benzene	0.1-4.9

110-54-3	Hexane	0.5-4

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

USE ONLY AS A MOTOR FUEL.
DO NOT SIPHON BY MOUTH

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Gasoline, motor fuel (86290-81-5)

ACGIH: 300 ppm TWA
500 ppm STEL

Toluene (108-88-3)

ACGIH: 20 ppm TWA
OSHA: 200 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL
NIOSH: 100 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL

Butane (106-97-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)
OSHA: 800 ppm TWA; 1900 mg/m3 TWA
NIOSH: 800 ppm TWA; 1900 mg/m3 TWA

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: 100 ppm TWA
150 ppm STEL
OSHA: 100 ppm TWA; 435 mg/m3 TWA
150 ppm STEL; 655 mg/m3 STEL

Benzene, 1,2,4-trimethyl- (95-63-6)

NIOSH: 25 ppm TWA; 125 mg/m3 TWA

Ethyl alcohol (64-17-5)

ACGIH: 1000 ppm STEL
OSHA: 1000 ppm TWA; 1900 mg/m3 TWA
NIOSH: 1000 ppm TWA; 1900 mg/m3 TWA

Ethylbenzene (100-41-4)

ACGIH: 20 ppm TWA
OSHA: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL
NIOSH: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL

Benzene (71-43-2)

ACGIH: 0.5 ppm TWA
2.5 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: 0.1 ppm TWA
1 ppm STEL

Hexane (110-54-3)

ACGIH: 50 ppm TWA
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 500 ppm TWA; 1800 mg/m3 TWA
NIOSH: 50 ppm TWA; 180 mg/m3 TWA

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Translucent, straw-colored or light yellow	**Odor:**	Strong, characteristic aromatic hydrocarbon odor. Sweet-ether like
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)	**Vapor Density:**	AP 3-4
Boiling Point:	85-437 °F (39-200 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible to Slight	**Specific Gravity:**	0.70-0.78
Evaporation Rate:	10-11	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	-45 °F (-43 °C)	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.6%	**Lower Flammability Limit (LFL):**	1.4%
Burning Rate:	ND	**Auto Ignition:**	>530°F (>280°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Gasoline, motor fuel (86290-81-5)

Inhalation LC50 Rat >5.2 mg/L 4 h; Oral LD50 Rat 14000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

Toluene (108-88-3)

Inhalation LC50 Rat 12.5 mg/L 4 h; Inhalation LC50 Rat >26700 ppm 1 h; Oral LD50 Rat 636 mg/kg; Dermal LD50 Rabbit 8390 mg/kg; Dermal LD50 Rat 12124 mg/kg

Butane (106-97-8)

Inhalation LC50 Rat 658 mg/L 4 h

Xylenes (o-, m-, p- isomers) (1330-20-7)
Inhalation LC50 Rat 5000 ppm 4 h; Inhalation LC50 Rat 47635 mg/L 4 h; Oral LD50 Rat 4300 mg/kg; Dermal LD50 Rabbit >1700 mg/kg

Benzene, 1,2,4-trimethyl- (95-63-6)
Inhalation LC50 Rat 18 g/m3 4 h; Oral LD50 Rat 3400 mg/kg; Dermal LD50 Rabbit >3160 mg/kg

Ethyl alcohol (64-17-5)
Oral LD50 Rat 7060 mg/kg; Inhalation LC50 Rat 124.7 mg/L 4 h

Ethylbenzene (100-41-4)
Inhalation LC50 Rat 17.2 mg/L 4 h; Oral LD50 Rat 3500 mg/kg; Dermal LD50 Rabbit 15354 mg/kg

Benzene (71-43-2)
Inhalation LC50 Rat 13050-14380 ppm 4 h; Oral LD50 Rat 1800 mg/kg

Hexane (110-54-3)
Inhalation LC50 Rat 48000 ppm 4 h; Oral LD50 Rat 25 g/kg; Dermal LD50 Rabbit 3000 mg/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Moderate irritant. Contact with liquid or vapor may cause irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product may cause genetic defects.

Carcinogenicity

A: General Product Information

May cause cancer.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

B: Component Carcinogenicity

Gasoline, motor fuel (86290-81-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

Toluene (108-88-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Ethyl alcohol (64-17-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 100E [in preparation] (in alcoholic beverages); Monograph 96 [2010] (in alcoholic beverages) (Group 1 (carcinogenic to humans))

Ethylbenzene (100-41-4)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 77 [2000] (Group 2B (possibly carcinogenic to humans))

Benzene (71-43-2)

ACGIH: A1 - Confirmed Human Carcinogen
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: potential occupational carcinogen
NTP: Known Human Carcinogen (Select Carcinogen)
IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is suspected of damaging fertility or the unborn child.

Specified Target Organ General Toxicity: Single Exposure

This product may cause drowsiness or dizziness.

Specified Target Organ General Toxicity: Repeated Exposure

This product causes damage to organs through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Very toxic to aquatic life with long lasting effects. Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Gasoline, motor fuel (86290-81-5)

Test & Species		Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]	
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]	
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L	
24 Hr EC50 Daphnia magna	170 mg/L	

Toluene (108-88-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	15.22-19.05 mg/L [flow-through]	1 day old
96 Hr LC50 Pimephales promelas	12.6 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.89-7.81 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	14.1-17.16 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.8 mg/L [semi-static]	
96 Hr LC50 Lepomis macrochirus	11.0-15.0 mg/L [static]	
96 Hr LC50 Oryzias latipes	54 mg/L [static]	
96 Hr LC50 Poecilia reticulata	28.2 mg/L [semi-static]	
96 Hr LC50 Poecilia reticulata	50.87-70.34 mg/L [static]	
96 Hr EC50 Pseudokirchneriella subcapitata	>433 mg/L	
72 Hr EC50 Pseudokirchneriella subcapitata	12.5 mg/L [static]	
48 Hr EC50 Daphnia magna	5.46 - 9.83 mg/L [Static]	
48 Hr EC50 Daphnia magna	11.5 mg/L	

Xylenes (o-, m-, p- isomers) (1330-20-7)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	13.4 mg/L [flow-through]	

96 Hr LC50 Oncorhynchus mykiss	2.661-4.093 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	13.5-17.3 mg/L
96 Hr LC50 Lepomis macrochirus	13.1-16.5 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	19 mg/L
96 Hr LC50 Lepomis macrochirus	7.711-9.591 mg/L [static]
96 Hr LC50 Pimephales promelas	23.53-29.97 mg/L [static]
96 Hr LC50 Cyprinus carpio	780 mg/L [semi-static]
96 Hr LC50 Cyprinus carpio	>780 mg/L
96 Hr LC50 Poecilia reticulata	30.26-40.75 mg/L [static]
48 Hr EC50 water flea	3.82 mg/L
48 Hr LC50 Gammarus lacustris	0.6 mg/L

Benzene, 1,2,4-trimethyl- (95-63-6)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	7.19-8.28 mg/L [flow-through]
48 Hr EC50 Daphnia magna	6.14 mg/L

Ethyl alcohol (64-17-5)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	12.0 - 16.0 mL/L [static]
96 Hr LC50 Pimephales promelas	>100 mg/L [static]
96 Hr LC50 Pimephales promelas	13400 - 15100 mg/L [flow-through]
48 Hr LC50 Daphnia magna	9268 - 14221 mg/L
24 Hr EC50 Daphnia magna	10800 mg/L
48 Hr EC50 Daphnia magna	2 mg/L [Static]

Ethylbenzene (100-41-4)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	11.0-18.0 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	4.2 mg/L [semi-static]
96 Hr LC50 Pimephales promelas	7.55-11 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	32 mg/L [static]
96 Hr LC50 Pimephales promelas	9.1-15.6 mg/L [static]
96 Hr LC50 Poecilia reticulata	9.6 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	4.6 mg/L
96 Hr EC50 Pseudokirchneriella subcapitata	>438 mg/L
72 Hr EC50 Pseudokirchneriella subcapitata	2.6 - 11.3 mg/L [static]

96 Hr EC50 Pseudokirchneriella subcapitata	1.7 - 7.6 mg/L [static]
48 Hr EC50 Daphnia magna	1.8 - 2.4 mg/L

Benzene (71-43-2)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [Static]
48 Hr EC50 Daphnia magna	10 mg/L

Hexane (110-54-3)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	2.1-2.98 mg/L [flow-through]
24 Hr EC50 Daphnia magna	>1000 mg/L

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

DOT Information

Shipping Name: Gasoline
UN #: 1203 **Hazard Class:** 3 **Packing Group:** II
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

A: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Toluene (108-88-3)
SARA 313: 1.0 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Xylenes (o-, m-, p- isomers) (1330-20-7)
SARA 313: 1.0 % de minimis concentration
CERCLA: 100 lb final RQ; 45.4 kg final RQ

Benzene, 1,2,4-trimethyl- (95-63-6)
SARA 313: 1.0 % de minimis concentration

Ethylbenzene (100-41-4)
SARA 313: 0.1 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Benzene (71-43-2)
SARA 313: 0.1 % de minimis concentration
CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

Hexane (110-54-3)

SARA 313: 1.0 % de minimis concentration
CERCLA: 5000 lb final RQ; 2270 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	**CAS**	**CA**	**MA**	**MN**	**NJ**	**PA**	**RI**
Gasoline, motor fuel	86290-81-5	No	No	No	No	Yes	No
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	No
Butane	106-97-8	Yes	Yes	Yes	Yes	Yes	No
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	Yes	Yes	Yes	Yes	No
Benzene, 1,2,4-trimethyl-	95-63-6	No	Yes	Yes	Yes	Yes	No
Ethyl alcohol	64-17-5	Yes	Yes	Yes	Yes	Yes	No
Ethylbenzene	100-41-4	Yes	Yes	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	No
Hexane	110-54-3	No	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.
WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Toluene	108-88-3	1 %
Butane	106-97-8	1 %
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 %
Ethyl alcohol	64-17-5	0.1 %
Ethylbenzene	100-41-4	0.1 %
Benzene	71-43-2	0.1 %
Hexane	110-54-3	1 %

Additional Regulatory Information

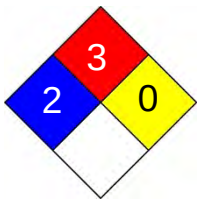
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Gasoline, motor fuel	86290-81-5	No	DSL	EINECS
Toluene	108-88-3	Yes	DSL	EINECS
Butane	106-97-8	Yes	DSL	EINECS
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	DSL	EINECS
Benzene, 1,2,4-trimethyl-	95-63-6	Yes	DSL	EINECS
Ethyl alcohol	64-17-5	Yes	DSL	EINECS
Ethylbenzene	100-41-4	Yes	DSL	EINECS
Benzene	71-43-2	Yes	DSL	EINECS
Hexane	110-54-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	2
Fire	3
Reactivity	0



HMIS® Hazard Rating

Health	2	Moderate
Fire	3	Serious
Physical	0	Minimal
		*Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

SDS # : 001031

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers

CAS number : 115-11-7

Product code : 001031

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

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

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

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

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If 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. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. 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). Eliminate all ignition sources. 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
Isobutylene	**ACGIH TLV (United States, 3/2015).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : 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.

Molecular weight : 56.12 g/mole

Molecular formula : C4-H8

Boiling/condensation point : -6.9°C (19.6°F)

Melting/freezing point : -140.7°C (-221.3°F)

Critical temperature : 144.75°C (292.6°F)

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -76.1°C (-105°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft^3/lb) : 6.6845

Gas Density (lb/ft^3) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.263 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

SADT : Not available.

Section 9. Physical and chemical properties

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Section 11. Toxicological information

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Isobutylene	2.34	-	low

Section 12. Ecological information

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

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

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 29	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 150 kg

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

Section 14. Transport information

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 Air Act (CAA) 112 regulated flammable substances: isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Isobutylene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

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 : Not determined.

Section 15. Regulatory information

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.

Canada

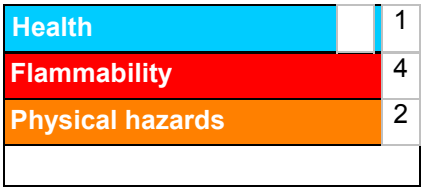
WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

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 B-1: Flammable gas.

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



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Flam. Gas 1, H220 Press. Gas Liq. Gas, H280	Expert judgment Expert judgment

History

Date of printing : 7/11/2016

Date of issue/Date of revision : 7/11/2016

Date of previous issue : No previous validation

Section 16. Other information

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.

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**ALCONOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

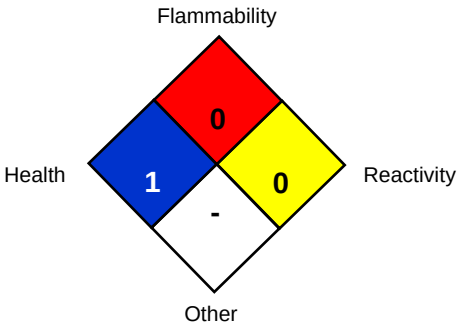
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Safety Data Sheet: **Simple Green® All-Purpose Cleaner** ★

Version No. 13000-14B Issue Date: September 13, 2014 Supersedes Date: January 7, 2014 *OSHA HCS-2012 / GHS*

Section 1: IDENTIFICATION

Product Name: Simple Green® All-Purpose Cleaner
Additional Names:

Manufacturer's Part Number: **Please refer to Section 16*

Recommended Use: Cleaner & Degreaser for water tolerant surfaces.
Restrictions on Use: Do not use on non-rinsable surfaces.

Company: Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA

Telephone: 800-228-0709 ● 562-795-6000 *Mon – Fri, 8am – 5pm PST*
Fax: 562-592-3830
Email: info@simplegreen.com

Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

This product is not classified as hazardous under 2012 OSHA Hazard Communication Standards (29 CFR 1910.1200).

OSHA HCS 2012
Label Elements
Signal Word: None **Hazard Symbol(s)/Pictogram(s):** None required

Hazard Statements: None
Precautionary Statements: None
Hazards Not Otherwise Classified (HNOC): None
Other Information: None Known

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Percent Range
Water	7732-18-5	> 84.8%*
Ethoxylated Alcohol	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Tetrasodium *N,N*-bis(carboxymethyl)-L-glutamate	51981-21-6	< 1%*
Sodium Carbonate	497-19-8	< 1%*
Citric Acid	77-92-9	< 1%*
Isothiazolinone mixture	55965-84-9	< 0.2%*
Fragrance	Proprietary Mixture	< 1%*
Colorant	Proprietary Mixture	< 1%*

**specific percentages of composition are being withheld as a trade secret*

Section 4: FIRST-AID MEASURES

Inhalation: Not expected to cause respiratory irritation. If adverse effect occurs, move to fresh air.
Skin Contact: Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.
Eye Contact: Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.
Ingestion: May cause upset stomach. Drink plenty of water to dilute. See section 11.

Most Important Symptoms/Effects, Acute and Delayed: None known.

Indication of Immediate Medical Attention and Special Treatment Needed, if necessary: Treat symptomatically

Section 5: FIRE-FIGHTING MEASURES

Suitable & Unsuitable Extinguishing Media: Use Dry chemical, CO2, water spray or "alcohol" foam. Avoid high volume jet water.
Specific Hazards Arising from Chemical: In event of fire, fire created carbon oxides may be formed.
Special Protective Actions for Fire-Fighters: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

This product is non-flammable. See Section 9 for Physical Properties.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: *For non-emergency and emergency personnel:* See section 8 – personal protection. Avoid eye contact. Safety goggles suggested.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Methods and Materials for Containment and Clean Up: Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling: Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

Conditions for Safe Storage including Incompatibilities: Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values: No components listed with TWA or STEL values under OSHA or ACGIH.

Appropriate Engineering Controls: Showers, eyewash stations, ventilation systems

Individual Protection Measures / Personal Protective Equipment (PPE)
Eye Contact: Use protective glasses or safety goggles if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.
Skin Contact: Use protective gloves (any material) when used for prolonged periods or dermally sensitive.
General Hygiene Considerations: Wash thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Green Liquid
Odor: Added sassafras odor
Odor Threshold: Not determined
pH ASTM D-1293**:** 8.5 – 9.5
Freezing Point ASTM D-1177**:** 0-3.33°C (32-38°F)
Boiling Point & Range ASTM D-1120**:** 101°C (213.8°F)
Flash Point ASTM D-93**:** > 212°F
Evaporation Rate ASTM D-1901**:** ½ Butyl Acetate @ 25°C
Flammability (solid, gas): Not applicable
Upper/Lower Flammability or Explosive Limits: Not applicable
Vapor Pressure ASTM D-323**:** 0.60 PSI @77°F, 2.05 PSI @100°F
Vapor Density: Not determined

Partition Coefficient: n-octanol/water: Not determined
Autoignition Temperature: Non-flammable
Decomposition Temperature: 109°F
Viscosity: Like water
Specific Gravity ASTM D-891**:** 1.01 – 1.03
VOCs: ***Water & fragrance exemption in calculation*

SCAQMD 304-91 / EPA 24:	0 g/L	0 lb/gal	0%
CARB Method 310**:	2.5 g/L	0.021 lb/gal	0.25%
SCAQMD Method 313:	Not tested		

VOC Composite Partial Pressure: Not determined
Relative Density ASTM D-4017**:** 8.34 – 8.42 lb/gal
Solubility: 100% in water

Section 10: STABILITY AND REACTIVITY

Reactivity: Non-reactive.
Chemical Stability: Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).
Possibility of Hazardous Reactions: None known.
Conditions to Avoid: Excessive heat or cold.
Incompatible Materials: Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
Hazardous Decomposition Products: Normal products of combustion - CO, CO2.

Section 11: TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:
Inhalation - Overexposure may cause headache.
Skin Contact - Not expected to cause irritation, repeated contact may cause dry skin.
Eye Contact - Not expected to cause irritation.
Ingestion - May cause upset stomach.

Symptoms related to the physical, chemical and toxicological characteristics: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from short term exposure: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from long term exposure: headache, dry skin, or skin irritation may occur.
Interactive effects: Not known.

Numerical Measures of Toxicity

Acute Toxicity:
Oral LD_{50} (rat) > 5 g/kg body weight
Dermal LD_{50} (rabbit) > 5 g/kg body weight
Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals

Skin Corrosion/Irritation: Non-irritant per Dermal Irritection® assay modeling. No animal testing performed.
Eye Damage/Irritation: Minimal irritant per Ocular Irritection® assay modeling. No animal testing performed.
Germ Cell Mutagenicity: Mixture does not classify under this category.
Carcinogenicity: Mixture does not classify under this category.
Reproductive Toxicity: Mixture does not classify under this category.
STOT-Single Exposure: Mixture does not classify under this category.
STOT-Repeated Exposure: Mixture does not classify under this category.
Aspiration Hazard: Mixture does not classify under this category.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Aquatic: Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC_{50} & IC_{50} ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Terrestrial: Not tested on finished formulation.

Persistence and Degradability: Readily Biodegradable per OCED 301D, Closed Bottle Test
Bioaccumulative Potential: No data available.
Mobility in Soil: No data available.
Other Adverse Effects: No data available.

Section 13: DISPOSAL CONSIDERATIONS

Unused or Used Liquid: May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

Empty Containers: May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.N. Number: Not applicable
U.N. Proper Shipping Name: Cleaning Compound, Liquid NOI
Transport Hazard Class(es): Not applicable
NMFC Number: 48580-3
Packing Group: Not applicable
Class: 55
Environmental Hazards: Marine Pollutant - NO
Transport in Bulk (according to Annex II of MARPOL 73/78 and IBC Code): Unknown.
Special precautions which user needs to be aware of/comply with, in connection with transport or conveyance either within or outside their premises: None known.

U.S. (DOT) / Canadian TDG: Not Regulated for shipping.
ICAO/ IATA: Not classified as Hazardous
IMO / IDMG: Not classified as Hazardous
ADR/RID: Not classified as Hazardous

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA and DSL Inventory.

SARA Title III: Sections 311/312 Hazard Categories – Not applicable.
Sections 313 Superfunds Amendments and Reauthorizations Act of 1986 – Not applicable.
Sections 302 – Not applicable.

Clean Air Act (CAA): Not applicable
Clean Water Act (CWA): Not applicable

State Right To Know Lists: No ingredients listed
California Proposition 65: No ingredients listed
Texas ESL:

Ethoxylated Alcohol	68439-46-3	60 µg/m³ long term	600 µg/m³ short term
Sodium Citrate	68-04-2	5 µg/m³ long term	50 µg/m³ short term
Sodium Carbonate	497-19-8	5 µg/m³ long term	50 µg/m³ short term
Citric Acid	77-92-9	10 µg/m³ long term	100 µg/m³ short term

Section 16: OTHER INFORMATION

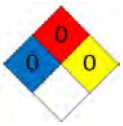
Size	UPC	Size	UPC
2 oz. Pump	043318130366	1 Gallon w/ Dilution Bottle	043318000669
2 oz. Pump	043318131035	1 Gallon	043318000799
4 oz. Pump	043318130014	1 Gallon w/ Dilution Bottle	043318001383
16 oz. Trigger	043318130021	1 Gallon w/ Dilution Bottle	043318002021
22 oz. Trigger	043318130229	1 Gallon	043318130052
24 oz. Trigger, 12 per case	043318000034	1 Gallon w/ Dilution Bottle, 112 per case	043318480140
24 oz. Trigger	043318000300	1 Gallon w/ Dilution Bottle, 4 per case	043318480416
24 oz. Trigger	043318130137	1 Gallon w/ Dilution Bottle, 24 per case	043318480492
32 oz. Trigger	043318000652	1 Gallon w/ laundry	043318002052
32 oz. Trigger	043318130335	1 Gallon w/ towel	043318001222
67.6 oz	043318000393	140 oz.	043318001390
67.6 oz.	043318130144	140 oz., 168 per case	043318561405
1 Gallon w/ Dilution Bottle	043318000539	140 oz. w/ Dilution Bottle	043318001468
1 Gallon w/ Dilution Bottle	043318000645		

USA items listed only. Not all items listed. USA items may not be valid for international sale.

Section 16: OTHER INFORMATION - continued

NFPA:

Health – None
Flammability – Non-flammable
Stability – Stable
Special - None



Acronyms

NTP	National Toxicology Program	IARC	International Agency for Research on Cancer
OSHA	Occupational Safety and Health Administration	CPSC	Consumer Product Safety Commission
TSCA	Toxic Substances Control Act	DSL	Domestic Substances List

Prepared / Revised By: Sunshine Makers, Inc., Regulatory Department.
This SDS has been revised in the following sections: Revised SDS layout

DISCLAIMER: The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

Hydrogen Chloride

Section 1. Identification

GHS product identifier : Hydrogen Chloride

Chemical name : Hydrogen chloride

Other means of identification :

Product use : Synthetic/Analytical chemistry.

Synonym :

SDS # : 001028

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : GASES UNDER PRESSURE - Compressed gas
ACUTE TOXICITY (inhalation) - Category 3
SKIN CORROSION/IRRITATION - Category 1
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Contains gas under pressure; may explode if heated.
Toxic if inhaled.
Causes severe skin burns and eye damage.
Causes serious eye damage.
May cause respiratory irritation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid breathing gas. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Hydrogen chloride

Other means of identification :

CAS number/other identifiers

CAS number : 7647-01-0

Product code : 001028

Ingredient name	%	CAS number
hydrogen chloride	100	7647-01-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Section 4. First aid measures

Eye contact : Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic if inhaled. May cause respiratory irritation.

Skin contact : Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.

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

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

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

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
halogenated compounds

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Section 6. Accidental release measures

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
hydrogen chloride	**ACGIH TLV (United States, 3/2015).** C: 2 ppm **NIOSH REL (United States, 10/2013).** CEIL: 7 mg/m³ CEIL: 5 ppm **OSHA PEL (United States, 2/2013).** CEIL: 7 mg/m³ CEIL: 5 ppm **OSHA PEL 1989 (United States, 3/1989).** CEIL: 7 mg/m³ CEIL: 5 ppm

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Section 8. Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless. Yellowish.

Molecular weight : 36.46 g/mole

Molecular formula : Cl-H

Boiling/condensation point : -85°C (-121°F)

Melting/freezing point : -114°C (-173.2°F)

Critical temperature : 51.45°C (124.6°F)

Odor : Pungent.

Odor threshold : Not available.

pH : Not available.

Flash point : [Product does not sustain combustion.]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

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

Section 9. Physical and chemical properties

Vapor pressure : 613 (psig)

Vapor density : 1.3 (Air = 1)

Specific Volume (ft ^{3}/lb) : 10.5263

Gas Density (lb/ft ^{3}) : 0.095

Relative density : Not applicable.

Solubility : Soluble in the following materials: cold water.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.25

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : No specific data.

Incompatible materials : No specific data.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
hydrogen chloride	LC50 Inhalation Gas. LC50 Inhalation Gas.	Rat Rat	3124 ppm 1562 ppm	1 hours 4 hours

IDLH : 50 ppm

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
hydrogen chloride	Eyes - Mild irritant Skin - Mild irritant	Rabbit Human	- -	0.5 minutes 5 milligrams 24 hours 4 Percent	- -

Sensitization

Not available.

Mutagenicity

Not available.

Section 11. Toxicological information

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
hydrogen chloride	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
hydrogen chloride	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic if inhaled. May cause respiratory irritation.

Skin contact : Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
hydrogen chloride	Acute LC50 240000 µg/l Marine water Acute LC50 282 ppm Fresh water	Crustaceans - Carcinus maenas - Adult Fish - Gambusia affinis - Adult	48 hours 96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
hydrogen chloride	0.25	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

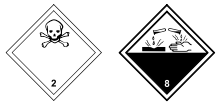
Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1050	UN1050	UN1050	UN1050	UN1050
UN proper shipping name	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS
Transport hazard class(es)	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	Inhalation hazard zone C **Reportable quantity** 5000 lbs / 2270 kg Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: Forbidden. **Special provisions** 3	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.40-2.42 (Class 8). **Explosive Limit and Limited Quantity Index** 0 **ERAP Index** 25 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 38	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 0 Forbidden

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

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Water Act (CWA) 311: Hydrogen chloride

Clean Air Act (CAA) 112 regulated toxic substances: Hydrogen chloride

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

Section 15. Regulatory information

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
hydrogen chloride	100	Yes.	500	-	5000	-

SARA 304 RQ : 5000 lbs / 2270 kg

SARA 311/312

Classification : Sudden release of pressure
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
hydrogen chloride	100	No.	Yes.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Hydrogen chloride	7647-01-0	100
Supplier notification	Hydrogen chloride	7647-01-0	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Section 15. Regulatory information

Canada

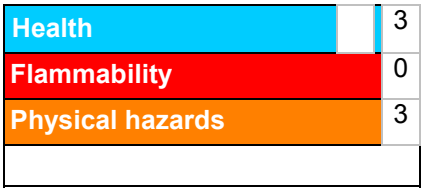
WHMIS (Canada) : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

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

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



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
Press. Gas Comp. Gas, H280	According to package
Acute Tox. 3, H331	On basis of test data
Skin Corr. 1, H314	Expert judgment
Eye Dam. 1, H318	Expert judgment
STOT SE 3, H335	Expert judgment

History

Date of printing : 6/24/2016

Date of issue/Date of revision : 6/24/2016

Section 16. Other information

Date of previous issue : No previous validation

Version : 0.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Hydrochloric Acid, 31 – 36%

Product Name: Hydrochloric Acid, 31 – 36.7%

Identified Uses: acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

Company Information:
ASHTA Chemicals Inc.
P.O. Box 858
Ashtabula Ohio 44005
Phone: (440) 997-5221
Fax: (440) 998-0286
24-hour Emergency Phone: CHEMTREC: (800) 424-9300

SECTION 2: HAZARDS IDENTIFICATION

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

GHS label elements, including precautionary statements:

Signal Word: **Danger**

Pictogram(s):

Hazard Statements	
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

Precautionary Statements	
P234	Keep only in original container.
P261	Avoid breathing dust/ fume/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.

P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container with a resistant inner liner.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms:

CHEMICAL NAME:	Hydrochloric acid
TRADE NAME:	Hydrochloric acid, 31 – 36%
SYNONYMS:	Muriatic acid, Chlorohydric acid, Hydrogen Chloride
C.A.S:	7647-01-0
EC:	231-595-7
WHMIS:	D2A, E
CHEMICAL FORMULA:	HCl (in aqueous solution)
CHEMICAL FAMILY:	Inorganic Acid

SECTION 4 FIRST AID MEASURES

Description of first aid measures:
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

In case of skin contact
Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point (Method):	Non-combustible.
Extinguishing Media:	Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.
Auto Ignition Temp:	Non-combustible.
Special Fire Fighting Procedures:	Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials.
Unusual Fire/Explosion Hazards:	Releases flammable hydrogen gas when reacting with metals.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Environmental Precautions:
Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

Containment and Cleaning:
Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill:	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.
Large Spill:	Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

SECTION 7: HANDLING AND STORAGE

Precautions to be taken for handling and storage:
Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well ventilated area. Keep out of sun.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Principal Component: Hydrochloric Acid
Occupational Exposure Limits:
Regulatory Limits:

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrochloric Acid Mixture	---	---	5 ppm 7.59 mg/m^3

ACGIH TLV = 5 ppm (7.59 mg/m^3) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

Exposure Controls:

Eye Protection: Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection: Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended: Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended: Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

Appearance	Colorless to light yellow liquid
Odor	Pungent (irritating/strong)
Odor Threshold	0.3ppm (can cause olfactory fatigue)
pH	<1 (in aqueous solution)
Melting point/freezing point	-30°C (-22°F)
Initial boiling point	>100°C (>212°F)
Flash point	Not applicable
Auto-ignition Temp	Not applicable
Evaporation rate	No data available

Decomposition temperature	No data available
Flammability (solid, gas)	Not combustible
Upper/lower flammability or explosive limits	Not combustible
Water solubility	100%
Molecular Weight	36.46
Relative Density (Specific Gravity)	1.16 (32% HCl solution) 1.19 (36.5% HCl solution)
Bulk Density	8.75 lbs/gal (32% HCl solution) 9.83 lbs/gal (36.5% HCl solution)
Vapor Density (air = 1)	1.267 at 20 °C
Vapor Pressure	84 mm Hg @ 20°C
Partition Coefficient: n-octanol/water	No data available

SECTION 10: STABILITY AND REACTIVITY

Stability: Hydrochloric acid is stable under normal conditions and pressures.

Conditions to avoid: Incompatible materials, metals, excess heat, bases.

Incompatibility: Bases, amines, metals, permanganates, (e.g. potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.

Hazardous decomposition products: Hydrogen chloride, chlorine, hydrogen gas.

Polymerization: Hazardous polymerization WILL NOT occur.

SECTION 11: TOXICOGICAL INFORMATION

Information on likely routes of exposure:

Inhalation: Vapors and mist will irritate throat and respiratory system and cause coughing.

Skin contact: Causes skin burns.

Eye contact: Causes eye burns.

Ingestion: Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Symptoms related to the physical, chemical and toxicological characteristics:

Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

Information on toxicological effects:

Acute toxicity: Harmful if swallowed.

Skin corrosion/irritation: Causes severe skin burns and eye damage.

Serious eye damage/eye Irritation: Causes serious eye damage.

Respiratory sensitization: Not available.

Skin sensitization:	No data available.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure:	No data available.
Aspiration hazard:	Not available.
Chronic effects:	Prolonged inhalation may be harmful.

Components Species Test Results:
Hydrochloric acid (CAS# 7647-01-0)

Rat - Inhalation LC_{50}:	3124 ppm, (1 hour)
Rabbit - Dermal LD_{50}:	5010 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:	Because of the low pH of this product, it would be expected produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity:	This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity:	Fish LC_{50} Mosquito fish: 282 mg/l, 96 hours Fish LC_{50} Bluegill: 3.6 mg/l, 48 hours
Persistence and degradability:	Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment..
Bioaccumulative Potential:	No data available.
Mobility in soil:	Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other adverse effects:	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation

SECTION 13: DISPOSAL CONSIDERATIONS

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material , if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.

SECTION 14: TRANSPORT INFORMATION

Shipping:

Usual Shipping Containers:	Tank cars, bulk tankers.
Usual Shelf Life:	Indefinite (life of containers).
Storage/Transport Temperatures:	Ambient.

Suitable Storage:

Materials/Coatings:	Teflon, Tygon, Rubber, PVC and polypropylene materials.

D.O.T. Information:

Labeling:	Corrosive
D.O.T. Identification Number	UN 1789
D.O.T. Shipping Name:	Hydrochloric Acid
Hazard Class:	8
Packing Group:	II
Hazard Guide:	157
Placard:	UN 1789

SECTION 15 REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:
Hydrochloric Acid CAS#: 7647-01-0

SARA 311/312 Hazards
Acute health hazard, reactive hazard.

Massachusetts Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
Pennsylvania Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
New Jersey Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

OSHA PSM/RMP Threshold for Accidental Release:
CAS# 7647-01-0 is regulated under OSHA PSM ***only*** if anhydrous HCl.
CAS# 7647-01-0 is regulated under EPA RMP ***only*** if $\geq$ 37% HCl.

Toxic Substances Control Act (TSCA):
Hydrochloric Acid CAS#: 7647-01-0

Comprehensive Environmental Response Compensation Liability Act: (CERCLA)
Hydrochloric Acid CAS#: 7647-01-0

SECTION 16 OTHER INFORMATION

NFPA Rating:
Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. Makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations, and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A regulations apply to the above.

Version 1.0	For the new GHS SDS Standard	Revision Date: 12/31/2014
Version 1.1	Graphics updated	Revision Date: 3/9/2015
Version 1.2	Title updated	Revision Date: 6/2/2015
Version 1.3	Section 9 changes	Revision Date: 7/30/2015
Version 1.4	Section 1, 15 changes	Revision Date: 4/15/2016

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 12-Mar-2009 **Revision Date** 28-Nov-2016 **Revision Number** 5

1. Identification

Product Name **Nitric acid (65 - 70%)**

Cat No. : **A198C-212, A200-212, A200-212LC, A200-500, A200-500LC, A200-612GAL, A200C-212, A200S-212, A200S-212LC, A200S-500, A200SI-212, A467-1, A467-2, A467-250, A467-500, A483-212; S719721**

Synonyms Azotic acid; Engraver's acid; Aqua fortis

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

4. First-aid measures

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.
Inhalation	If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Remove from exposure, lie down. Call a physician immediately.
Ingestion	Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.
Most important symptoms/effects	Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO_2, dry chemical, dry sand, alcohol-resistant foam.
Unsuitable Extinguishing Media	No information available
Flash Point	Not applicable
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Oxidizing Properties	Oxidizer
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products
Nitrogen oxides (NOx) Thermal decomposition can lead to release of irritating gases and vapors
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	OX

6. Accidental release measures

Personal Precautions	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.
Environmental Precautions	Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from clothing and other combustible materials.

Storage Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m³ TWA: 2 ppm TWA: 5 mg/m³	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm STEL: 4 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Tightly fitting safety goggles. Face-shield.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear Colorless, Light yellow
Odor	Strong Acrid
Odor Threshold	No information available
pH	< 1.0 (0.1M)
Melting Point/Range	-41 °C / -41.8 °F
Boiling Point/Range	Not applicable
Flash Point	Not applicable

Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available
Specific Gravity	1.40
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	HNO3
Molecular Weight	63.02

10. Stability and reactivity

Reactive Hazard Yes

Stability Oxidizer: Contact with combustible/organic material may cause fire.

Conditions to Avoid Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.

Incompatible Materials Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents

Hazardous Decomposition Products Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed

Persistence and Degradability Miscible with water Persistence is unlikely based on information available.
Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Nitric acid	-2.3

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

TDG

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IATA

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IMDG/IMO

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	65 - 70	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitric acid	X	X	X	X	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
C Oxidizing materials
E Corrosive material
D2B Toxic materials

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 12-Mar-2009
Revision Date 28-Nov-2016
Print Date 28-Nov-2016
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Attachment E

Site Orientation

Attachment E. Site Orientation

URS 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 URS 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 URS 4-Sight program;
- Stop Work authority;
- The JSAs/ Pre-JHAs (Attachment F) for the tasks that will be performed on a given job;
- Completion of a THA each day (Attachment F);
- 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

Project/Task-Specific Job Safety Analysis or Pre-Job Hazard Assessments

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: 26-28 Whitesboro Street, Utica, New York **Date:** 12/3/2018

Prepared By: Kevin J. McGovern, PG, CHMM **Approved By:** Stacy Wells, CSP, CHST, MPH

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify elimination, substitution, engineering & administrative controls & any specific required PPE	
ACTIVITY 1 – Driving between Buffalo office and site.	Long Distance Driving Fatigue	6	Complete and follow a Journey Management Plan, and implement fatigue management	3
	Vehicle crash	8	Wear seat belt Wear corrective eye ware (i.e., prescription glasses, sunglasses, etc.)	4
ACTIVITY 2 – Water level gauging, groundwater monitoring.	Repetitive Strain/ Motion Injuries	6	Participate in a "Stretch and Flex" program as part of morning tailgate meetings.	2
	Vehicular/ Pedestrian traffic	8	Reflective vests required Use cones, caution tape, or other barricades as necessary Wear appropriate PPE	4
	Chemical exposure (dermal and inhalation)	6	Wear nitrile gloves and other PPE as necessary. Monitor work zones/breathing zones with PID and Single gas detector monitoring for VC and benzene, as necessary. Adhere to action limits as specified in HASP	4
	Hot/Cold Weather Exposure	6	Wear appropriate clothing. Take frequent warming breaks. Drink cool/hot liquids	3
	Potential Electrical Hazards	8	If using extension cords and powered sampling equipment, check cords and equipment before use.	3
	Injury during lifting	8	Lift with knees Ask for assistance with heavy objects Keep back straight and do not twist	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Manage contaminated purge water and materials	5	Keep generation of excess contaminated purge water and materials to a minimum and manage according to work plan.	4
ACTIVITY 3 – Landscaping/ Mowing	Repetitive Strain/ Motion Injuries	6	Participate in a "Stretch and Flex" program as part of morning tailgate meetings.	2
	Vehicular/ Pedestrian traffic	8	Reflective vests required Use cones, caution tape, or other barricades as necessary Wear appropriate PPE	4
	Noise (>85 dB)	5	Hearing protection required. Monitor with sound level meter.	4
	Hot Weather Exposure	6	Wear appropriate clothing. Drink cool liquids	3
ACTIVITY 4 – Oversight of monitoring well decommissioning.	Repetitive Strain/ Motion Injuries	6	Participate in a "Stretch and Flex" program as part of morning tailgate meetings.	2
	Vehicular/ Pedestrian traffic	8	Reflective vests required Use cones, caution tape, or other barricades as necessary Wear appropriate PPE	4
	Potential explosive/flammable or ignitable conditions	8	Monitor with O2/LEL meter; adhere to action limits as specified in the HASP. Use non-sparking equipment.	4
	Overhead Power Lines	9	Keep at safe minimum distance. Issue permits and adhere to procedure 322 when necessary.	4
	Chemical exposure (dermal and inhalation)	6	Wear nitrile gloves and other PPE as necessary. Monitor work zones/breathing zones with PID and Single gas detector monitoring for VC and benzene, as necessary. Adhere to action limits as specified in HASP	4
	Noise (>85 dB)	5	Hearing protection required. Monitor with sound level meter.	4
	Heavy Equipment	5	Avoid blind spots designated by operator. Check back-up alarms Reflective vests required while working near rigs. Wear appropriate PPE (hard hat safety glasses, steel-toed boots)	4
	Hot/Cold Weather Exposure	6	Wear appropriate clothing. Take frequent warming breaks.	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			Drink cool/hot liquids	
ACTIVITY 5 – Excavation – oversight of contractor.	Vehicular/ Pedestrian traffic	8	Reflective vests required. Use cones or other barricades as necessary. Be aware of site traffic patterns. Try and place borings away from heavy traffic routes.	4
	Potential explosive/flammable or ignitable conditions	8	Monitor with O2/LEL meter; adhere to action limits as specified in the HASP. Use non-sparking equipment.	4
	Overhead Power Lines	9	Keep at safe minimum distance. Issue permits and adhere to procedure 322 when necessary.	4
	Nitric oxide (NO) exposure	6	Monitor with NO meter; adhere to action limits as specified in the HASP.	4
	Chemical exposure (dermal and inhalation)	6	Wear nitrile gloves and other PPE as necessary. Monitor work zones/breathing zones with PID and Single gas detector monitoring for VC and benzene, as necessary. Adhere to action limits as specified in HASP	4
	Noise (>85 dB)	5	Hearing protection required. Monitor with sound level meter.	4
	Heavy Equipment	5	Avoid blind spots designated by operator. Check back-up alarms Reflective vests required while working near rigs. Wear appropriate PPE (hard hat safety glasses, steel-toed boots)	4
	Hot/Cold Weather Exposure	6	Wear appropriate clothing. Take frequent warming breaks. Drink cool/hot liquids	3

SPECIAL REQUIREMENTS

Activity #	Equipment to be Used	Inspection requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Personal or Rental Vehicle.	NYS Inspection	Basic driver's education. Company driver safety course.
2.	Proper PPE (i.e., hi-vis vest, ear plugs, etc.). PID, water sampling tools, water quality meter, tool box.	Daily visual Calibrate PID per manufacturer's instructions	OSHA 40-HAZWOPER, OSHA HAZWOPER Supervisor, DOT and RCRA Training for tasks that involve IDW disposal/manifest signing.
3.	Proper PPE (i.e., hi-vis vest, ear plugs, etc.)	Daily equipment inspection.	Mower operator safety
4.	Proper PPE (i.e., hi-vis vest, ear plugs, etc.). PID, Single Gas Detectors, Sound Level Meter	Daily visual Calibrate PID per manufacturer's instructions	OSHA 40-HAZWOPER, OSHA HAZWOPER Supervisor, DOT and RCRA Training for tasks that involve IDW disposal/manifest signing.
5.	Proper PPE (i.e., hi-vis vest, ear plugs, etc.). PID, Single Gas Detectors, Sound Level Meter, Multi-gas Meter		

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

High ← → Low

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

High ↕ Low

10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk

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

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 & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

AECOM

Americas

Daily Tailgate Meeting

S3AM-209-FM5

Instructions: Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics**. This meeting is a daily refresher, not a full orientation**. Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.

AECOM Supervisor Name: **Phone Number:**	
AECOM SH&E Rep. Name: **Phone Number:**	
Meeting Leader:	

Date:	**Project Name/Location:** 26-28 Whitesboro Street Utica, New York	**Project Number:** 60592094

Today's Scope of Work:

Muster Point Location:	**First Aid Kit Location:**	**Fire Extinguisher Location:**	**Spill Kit Location:**

1. Required Topics

- ☐ Fitness for Duty requirements, all sign in / sign out
- ☐ Required training (incl. task specific) completed and current
- ☐ SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, hazards, controls, procedures, requirements, etc.)
- ☐ Pre-Job Hazard Assessments (JHA/JSAs) available and understood
- ☐ Task Hazard Assessments (THAs) are to be 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/ Neighbouring Operations
- ☐ ☐ Slip/ Trip/ Fall Hazards
- ☐ ☐ Specialized PPE Needs
- ☐ ☐ Traffic Control
- ☐ ☐ Waste Management/ Decontamination
- ☐ ☐ Weather Hazards / Heat Stress / Cold Stress
- ☐ ☐ Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.)
- ☐ ☐ Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach):
- ☐ ☐ Other Topics (describe/attach):
- ☐ ☐ Client specific requirements (describe):

3. Daily Check Out by Site Supervisor

Describe incidents, near misses, observations or Stop Work interventions from today:	Describe Lessons Learned/ Improvement Areas from today:

The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.

Site Supervisor Name	**Signature**	**Date** **Time** **(at end of day / shift)**

Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

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

AECOM

Americas

Task Hazard Assessment

S3AM-209-FM6

Date:	**Project Name / Location:** 26-28 Whitesboro Street Utica, New York
Permit / Job Number:	**Project Number:** 60592094
Description of Task:	

Do you have a pre-job hazard assessment (JHA) specific to this task in your hands?

- **Yes** – review the steps, hazards, and precautions. Attach and reference JHA in the form below. Add any additional steps, hazards, and precautions to this form otherwise unidentified on JHA.
- **No** – list all steps, hazards, and precautions associated with the task in the form below.

Basic Task Steps (explain in order how the task will be carried out)	**Hazards** (identify all hazards & potential hazards of each step)	**Risk** (before)	**Control Measures / Precautions** (describe how that hazard will be controlled)	**Risk** (after)	**Revised?** (yes – record time)
			Highest Risk Index		

The Task Hazard Assessment is to be completed at the worksite by the individual(s) who is intended to conduct the task immediately prior to initiating the associated task. Number and attach additional pages if necessary.

Worker/Visitor acknowledgement and review of this content on back of this document. Originator to also sign Worker acknowledgement section.

Originator _____ (Print Name) _____ (Signature)

Supervisor _____ (Print Name) _____ (Signature)

Risk Matrix on Reverse

THIS FORM IS TO BE KEPT ON JOB SITE.

AECOM

WORKER SIGN ON

NAME (Please Print) TIME SIGNATURE

I participated in the development and understand the content of this Task Hazard Assessment.

Task Hazard Assessment Follow-Up/Review

Initials/Time	Initials/Time	Initials/Time

Instructions:
Identify basic steps of the task and associated hazards. Calculate the initial risk rating. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Employees shall monitor the activities for compliance with this document. Workers should **STOP WORK** on a task if conditions change from the planned and agreed approach to the work.

This document should be updated to reflect new conditions or changes in task methods.

VISITOR SIGN ON

I have read and understand the content of this Task Hazard Assessment.

Emergency Meeting / Assembly Area

Emergency Contact #

Method of Communication

Risk Rating Matrix

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 & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	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

Attachment 1
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. APeriodic@monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

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

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

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

DEC Permits Subject to Exemption

In accordance with section 1.10, exemptions from the following permit programs may be granted to the person responsible for conducting the remedial programs undertaken pursuant to section 1.2:

Air - Title 5 permits
Air - State permits
Air - Registrations
Ballast Discharge
Chemical Control
Coastal Erosion Hazard Areas
Construction of Hazardous Waste Management Facilities
Construction of Solid Waste Management Facilities
Dams
Excavation and Fill in Navigatable Waters (Article 15)
Flood Hazard Area Development
Freshwater Wetland
Hazardous Waste
Long Island Wells
Mined Land Reclamation
Navigation Law - Docks
Navigation Law - Floating Objects
Navigation Law - Marinas
Non-Industrial Waste Transport
Operation of Solid Waste Management Facilities
Operation of Hazardous Waste Management Facilities
State Pollution Discharge Elimination Systems (SPDES)
Stream Disturbance
Tidal Wetlands
Water Quality Certification
Water Supply
Wild, Scenic and Recreational Rivers

APPENDIX F

QUALITY ASSURANCE PROJECT PLAN

APPENDIX F

QUALITY ASSURANCE PROJECT PLAN

26-28 WHITESBORO STREET SITE
SITE # B00063
UTICA, NEW YORK

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY
ALBANY, NEW YORK 12233-7011

Prepared by:

URS Corporation
257 West Genesee Street
Suite 400
Buffalo, New York 14202

December 2018

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

TABLE OF CONTENTS

QUALITY ASSURANCE PROJECT PLAN

Page No.

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

TABLES

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is designed to provide an overview of quality assurance/quality control (QA/QC) procedures and programs which will be adhered to during the site monitoring activities, as described in the Site Management Plan (SMP). The QAPP will identify specific methods and QA/QC procedures for chemically testing environmental samples collected from the 26-28 Whitesboro Street Site, located in The City of Utica, Oneida County, New York (NYSDEC Site Number: B00063).

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

2.0 PROJECT/SITE DESCRIPTION

A complete project description of the 26-26 Whitesboro Street Site is provided in Section 2.0 of the 26-26 Whitesboro Street Site Management Plan.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The Project QA Officer is responsible for verifying that corporate QA procedures are followed and will ensure that all project deliverables undergo a thorough QA review by senior staff members who are qualified and experienced in appropriate disciplines.

The Project Manager will be responsible for technical and financial management of the project, and for overall coordination and review of component work activities. The Project Manager will serve as the initial and primary contact with the client throughout the project and will be responsible for successful implementation of the field QA/QC activities. The Project Manager may delegate a portion of the tasks required for successful implementation of the work plans to a qualified individual who will be on site during the investigation (e.g., the onsite Environmental Scientist). This person will work under the direction of the Project Manager and will be responsible for implementing applicable QC procedures in the field and verifying that all other field personnel adhere to these procedures and perform all activities as described in the project work plans.

The onsite Environmental Scientist is responsible for verifying that QA procedures are followed in the field so that valid, representative samples are collected. The onsite Environmental Scientist also will be responsible for coordinating the activities of all personnel involved with implementing the project in the field, and will be in daily communication with the Project Manager. This person will verify that all field work is carried out in accordance with the approved project plans.

The Project Chemist is responsible for verifying that the analytical laboratory adheres to the QA/QC requirements specified in this QAPP. The Project Chemist will be the point-of-contact for the Laboratory Project Manager and will be in continual contact to verify that all efforts are being made to perform sample analyses in a manner such that the resulting data will be of sufficient quality for its intended purpose.

The analytical laboratory to be used for the analysis of groundwater shall hold applicable New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certifications for the analyses to be performed. The QA Manager of the laboratory will be responsible for performing project-specific audits and for overseeing the quality control data generated. Also, the Laboratory Project Manager will be in daily communication with the Project Chemist.

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

4.0 DATA QUALITY OBJECTIVES

4.1 Background

Data quality objectives (DQOs) are qualitative and quantitative statements, which specify the quality of data required to support the post-remediation groundwater monitoring activities at the 26-26 Whitesboro Street Site. The project DQOs focus on the identification of the end use of the data to be collected. The project DQOs will be achieved utilizing definitive data categories, as outlined in *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, EPA/240/B-06/001, USEPA (February 2006). The definitive data are generated using rigorous analytical methods, such as approved United States Environmental Protection Agency (USEPA) reference methods. The analytical methods to be used are presented in Table 4-1.

The project DQOs for data collected during the Site management of 26-28 Whitesboro Street activities are to:

- Evaluate the effectiveness of the post-remediation activities for contaminated groundwater at the Site.
- Perform annual sampling and analysis of groundwater samples.
- Sample quantitation limits for groundwater must not exceed NYSDEC, Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*, June 1998 (including April 2000 and June 2004 addenda), as listed on Table 4-2.

4.2 QA Objectives For Chemical Data Measurement

For the definitive data category described above, the data quality indicators of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) will be measured during offsite chemical analysis.

4.1.1 Precision

Precision examines the distribution of the reported values about their mean. The distribution of reported values refers to how different the individual reported values are from the average reported value. Precision may be affected by the natural variation of the matrix or contamination within that matrix, as well as by errors made in the field and/or laboratory handling procedures. Precision is evaluated using analyses of a laboratory matrix spike/matrix spike

duplicate (MS/MSD) and field duplicate samples, which not only provide a measure of sampling and analytical precision, but also indicate analytical precision through the reproducibility of the analytical results. Relative percent difference (RPD) is used to evaluate precision. RPD criteria for all analyses being performed as part of this work assignment shall meet method-specific QC requirements.

4.1.2 Accuracy

Accuracy measures the analytical bias in a measurement system. Sources of error are the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques. Sampling accuracy may be assessed by evaluating the results of rinse, field, and trip blanks. These data help to assess the potential contamination contribution from various outside sources. The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical methods on samples of the same matrix. The percent recovery criterion is used to estimate accuracy based on recovery in the MS/MSD and laboratory control sample (LCS)/matrix spike blank (MSB). The MS/MSD analyses, which will give an indication of matrix effects that may be affecting target compounds, are also a good gauge of method efficiency. Surrogate recovery results will also be measured. Acceptable criteria for all analyses being performed as part of this work assignment shall meet method-specific QC requirements.

4.1.3 Representativeness

Representativeness expresses the degree to which the sample data accurately and precisely represent the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter, which is most concerned with the proper design of the sampling program or subsampling of a given sample. Objectives for representativeness are defined for sampling and analysis tasks and are a function of the investigative objectives. The sampling procedures, as described in Sections 2.0, 3.0, and 4.0 of the 26-26 Whitesboro Street Field Sampling and Analysis Plan (FSAP) have been selected with the goal of obtaining representative samples for the media of concern.

4.1.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. An objective for this program is to produce data with the greatest possible degree of comparability. This goal is achieved through using standard

techniques to collect and analyze representative samples, and reporting analytical results in appropriate units. Complete field documentation using standardized data collection forms will support the assessment of comparability. Comparability is limited by the other parameters (e.g., precision, accuracy, representativeness, and completeness), because only when precision and accuracy are known can data sets be compared with confidence. For data sets to be comparable, it is imperative that the analytical methods and procedures be explicitly followed.

4.1.5 Completeness

Completeness is defined as a measure of the amount of valid data obtainable from a measurement system compared to the amount that was expected to be obtained under normal conditions. To meet project needs, it is important that appropriate QC procedures be maintained to verify that valid data are obtained. For the data generated, a goal of 90% is required for completeness (or usability) of the analytical data. If this goal is not met, then NYSDEC and contractor project personnel will determine whether the deviations may cause the data to be rejected, and what further actions, if any, need to be taken.

4.1.6 Sensitivity

Sensitivity, as it pertains to analytical methods/instrumentation, is defined as the lowest concentration that can be distinguished from background noise. Sensitivity is measured by method detection limit (MDL) determinations, which are performed by laboratories for each analyte and matrix following procedures specified in 40 CFR Part 136, Appendix B, Revision 2. The MDL is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDLs are determined by the laboratory on an annual basis.

Analytical results are typically reported down to the quantitation limit (QL), which represents the lowest point of the calibration curve, and are typically 3-10 times higher than MDLs. Analytical results reported above the MDL but below the QL are considered estimated values (qualified "J"). QLs for the parameters to be analyzed as part of this work assignment, where applicable, are presented in Table 4-2.

Table 4-1

Summary of Samples and Analytical Parameters
26-28 Whitesboro Street Site
Utica, NY

MATRIX/ANALYSIS	Analytical Method	Field Samples [1]	Matrix Spike (MS)	MS Duplicate or Matrix Duplicate	Field Duplicate	Equipment Blank [2]	Trip or Field Blank [3]	Total Analyses
Aqueous Groundwater Samples								
TCL Volatile Organics	SW 846 8260C	4	1	1	1	1	1	9
1,4-Dioxane [4]	SW 846 8270D SIM	4	1	1	1	1	-	8
PFAS (21 compound list[4, 5])	EPA 537 (modified)	4	1	1	1	1	1	9

PFAS - Per- and Polyfluoroalkyl Substances
SIM - Selected Ion Monitoring
TCL - Target Compound List

Notes

(1) Sample locations: B–2, B-4, B-5, MW-1
(2) Equipment rinsate blank quantity will vary depending on sampling equipment used; quantity may be greater or less than that shown. Equipment blank
(3) One trip blank or field blank per sample shipment or one per day, whichever is less.
(4) Samples for 1,4-Dioxane and PFAS will be collected during first sampling event. Results from first sampling event shall determine whether analyses for these parameters is required in subsequent sampling events.
(5) Based on NYSDEC's *Groundwater Sampling for Emerging Contaminants* , April 2018. Should the NYSDEC update this list prior to sampling, the compound list analyzed by the laboratory should reflect the update.

TABLE 4-2
GROUNDWATER QUANTITATION LIMITS AND NYSDEC WATER QUALITY STANDARDS AND GUIDANCE VALUES
26-28 WHITESBORO STREET SITE

Matrix: Groundwater			
Analytical Method [1]	**Parameter**	**PQL (ug/L)**	**GW Class GA Criteria [3] (ug/L)**
SW8260C - VOCs	1,1,1-Trichloroethane	1	5
	1,1,2,2-Tetrachloroethane	1	5
	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5
	1,1,2-Trichloroethane	1	1
	1,1-Dichloroethane	1	5
	1,1-Dichloroethene	1	5
	1,2,3-Trichorobenzene	1	5
	1,2,4-Trichlorobenzene	1	5
	1,2-Dibromo-3-chloropropane	1	0.04
	1,2-Dibromoethane	1	0.006
	1,2-Dichlorobenzene	1	3
	1,2-Dichloroethane	1	0.6
	1,2-Dichloropropane	1	1
	1,3-Dichlorobenzene	1	3
	1,4-Dichlorobenzene	1	3
	1,4-Dioxane	100	NS
	2-Butanone (Methyl ethyl ketone)	5	50
	2-Hexanone	5	50
	4-Methyl-2-pentanone	5	NS
	Acetone	5	50
	Benzene	1	1
	Bromochloromethane	1	5
	Bromodichloromethane	1	50
	Bromoform	1	50
	Bromomethane	1	5
	Carbon disulfide	1	60
	Carbon tetrachloride	1	5
	Chlorobenzene	1	5
	Chloroethane	1	5
	Chloroform	1	7
	Chloromethane	1	5
	cis-1,2-Dichloroethene	1	5
	cis-1,3-Dichloropropene	1	0.4
	Cyclohexane	1	NS
	Dibromochloromethane	1	50
	Dichlorodifluoromethane	1	5
	Ethylbenzene	1	5
	Isopropylbenzene	1	5
	Methyl acetate	1	NS
	Methyl tert-butyl ether	1	10
	Methylcyclohexane	1	NS
	Methylene chloride	1	5
	Styrene	1	5
	Tetrachloroethene	1	5
	Toluene	1	5
	trans-1,2-Dichloroethene	1	5
	trans-1,3-Dichloropropene	1	0.4
	Trichloroethene	1	5
	Trichlorofluoromethane	1	5
	Vinyl chloride	1	2
	Xylene (Total)	2	5
SW8270D SIM [4]	1,4-Dioxane	0.20	NS

TABLE 4-2
GROUNDWATER QUANTITATION LIMITS AND NYSDEC WATER QUALITY STANDARDS AND GUIDANCE VALUES
26-28 WHITESBORO STREET SITE

Matrix: Groundwater				
Analytical Method [2]	**Parameter**		**PQL (ng/L)**	**USEPA Advisory [5] (ng/L)**
EPA 537 (modified) [4]	Perfluorobutanesulfonic acid	(PFBS)	2.0	NS
	Perfluorohexanesulfonic acid	(PFHxS)	2.0	NS
	Perfluoroheptanesulfonic acid	(PFHpS)	2.0	NS
	Perfluorooctanessulfonic acid	(PFOS)	2.0	70
	Perfluorodecanesulfonic acid	(PFDS)	2.0	NS
	Perfluorobutanoic acid	(PFBA)	2.0	NS
	Perfluoropentanoic acid	(PFPeA)	2.0	NS
	Perfluorohexanoic acid	(PFHxA)	2.0	NS
	Perfluoroheptanoic acid	(PFHpA)	2.0	NS
	Perfluorooctanoic acid	(PFOA)	2.0	70
	Perfluorononanoic acid	(PFNA)	2.0	NS
	Perfluorodecanoic acid	(PFDA)	2.0	NS
	Perfluoroundecanoic acid	(PFUA/PFUdA)	2.0	NS
	Perfluorododecanoic acid	(PFDoA)	2.0	NS
	Perfluorotridecanoic acid	(PFTriA/PFTrDA)	2.0	NS
	Perfluorotetradecanoic acid	(PFTA/PFTeDA)	2.0	NS
	Perfluroroctanesulfonamide	(FOSA)	2.0	NS
	6:2 Fluorotelomer sulfonate	(6:2 FTS)	20	NS
	8:2 Fluorotelomer sulfonate	(8:2 FTS)	20	NS
	N-methyl perfluorooctanesulfonamidoacetic acid	(N-MeFOSAA)	20	NS
	N-ethyl perfluorooctanesulfonamidoacetic acid	(N-EtFOSAA)	20	NS

Notes:

1. NYSDEC Analytical Services Protocol (ASP), July 2005 Edition.
2. EPA Method 537. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) EPA/600/R-08/092.
3. NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* , June 1998, January 1999 Errata, April 2000 and June 2004 Addenda.
4. Samples for 1,4-Dioxane and PFAS will be collected during first sampling event. Results from first sampling event shall determine whether analyses for these parameters is required in subsequent sampling events.
5. USEPA, *Drinking Water Health Advisory* for PFOA and PFOS, May 2016.

ng/L - nanograms per liter (parts per trillion)
NS - No Standard or Guidance Value
PQL - Practical Quantitation Limit
SIM - Selected Ion Monitoring
ug/L - Micrograms per Liter (parts per billion)
VOCs - Volatile Organic Compounds

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

5.0 SAMPLING LOCATIONS AND PROCEDURES

Sampling locations and procedures are discussed in Sections 2.0, 3.0, and 4.0 of the 26-28 Whitesboro Street Site FSAP.

6.0 SAMPLE CUSTODY AND HOLDING TIMES

Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody procedures. Chain-of-custody procedures are essential for presenting sample analytical results as evidence in litigation or at administrative hearings held by regulatory agencies. Chain-of-custody procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures used in these investigations will follow the chain-of-custody guidelines of *NEIC Policies and Procedures*, prepared by the National Enforcement Investigations Center (NEIC) of the USEPA Office of Enforcement.

6.1 Custody Definitions

- Chain-of-Custody Officer - The employee responsible for oversight of all associated chain-of-custody activities is the onsite Environmental Scientist (or his/her designee).
- Under Custody - A sample is "Under Custody" if:
  - It is in one's possession, or
  - It is in one's view, after being in one's possession, or
  - It was in one's possession and one locked it up, or
  - It is in a designated secure area.

6.2 Responsibilities

The onsite Environmental Scientist will be responsible for monitoring all chain-of-custody activities and for collecting legally admissible chain-of-custody documentation for the permanent project file. The onsite Environmental Scientist will be responsible for:

- Initially reviewing sample labels or tags, closure tapes, and chain-of-custody record forms. The onsite Environmental Scientist shall document this review for the project file.
- Training all field sampling personnel in the methodologies for carrying out chain-of-custody and the proper use of all chain-of-custody forms and record documents.
- Monitoring the implementation of chain-of-custody procedures.

- Submit copies of the completed chain-of-custody forms to the Project Manager daily.

6.3 Chain-of-Custody

Chain-of-custody is initiated in the laboratory when the sample containers are cleaned, packed, and shipped to the Site for use in the field. When the containers are received from the laboratory, they will be checked for any breach of custody including, but not limited to incomplete chain-of-custody records, broken chain-of-custody seals, or any evidence of tampering. Upon receipt of the samples, the laboratory will check for breach of custody as previously described.

6.4 Sample Containers and Holding Times

Table 6-1 identifies the analytical method, container, preservation, and holding time requirements. All holding times begin with the date/time of sample collection, except where noted otherwise in Table 6-1.

Table 6-1

Analytical Method, Sample Container and Preservation Requirements, and Analytical Holding Times
26-28 Whitesboro Street Site
Utica, NY

MATRIX/ANALYSIS	Sample Prep Method [1]	Analytical Method [2]	Sample Bottles [3]			Minimum Vol Rqd	Preservation [4]	Holding Time [5]		Comment
			Type	Size	Quantity			Extraction	Analysis	
Aqueous Samples										
TCL Volatile Organics	SW 846 5030C	SW 846 8260C	Glass	40 mL	2 or 3	40 mL	HCl to pH ≤ 2	NA	14 days	7 days if not pH preserved.
1,4-Dioxane [6]	SW 846 3510C/3520C/3535	SW 846 8270D SIM	Glass	1 L	2	1000 mL	None	7 days	40 days	
PFAS [6]	EPA 537 (modified)	EPA 537 (modified)	HDPE or PP	250 mL	2	250 mL	None	14 days	28 days	

(1) Laboratory may propose alternate extraction/preparation methods, subject to NYSDOH ELAP certification.
(2) More recent versions of SW-846 methods may be used, subject to NYSDOH ELAP certification.
(3) All containers shall be certified clean and provided by the laboratory. Use of pre-preserved containers is preferred.
(4) All samples for chemical analysis should be held at 4 degrees Celsius in addition to any chemical preservation required.
(5) Holding time for extraction from day of collection. Holding time for analysis from date of extraction or collection.
(6) Samples for 1,4-Dioxane and PFAS will be collected during first sampling event. Results from first sampling event shall determine whether analyses for these parameters is required in subsequent sampling events.
SW-846: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods Compendium* . Third Edition, July 2014.
Method 537. *Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)* EPA/600/R-08/092
HDPE - high density polyethylene
PP - Polyproplyene
PFAS - Per- and Polyfluoroalkyl Substances
SIM - Selected Ion Monitoring
TCL - Target Compound List

APPENDIX F
QUALITY ASSURANCE PROJECT PLAN

7.0 ANALYTICAL PROCEDURES

Table 4-1 identifies the specific methods to be performed on the individual matrices. All analyses will be performed in accordance with the following documents:

- *New York State Department of Environmental Conservation Analytical Services Protocol,* July 2005 Edition (or most recent version).
- *Method 537. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)* EPA/600/R-08/092 (or most recent version).

8.0 CALIBRATION PROCEDURES AND FREQUENCY

In order to obtain a high level of precision and accuracy during sample processing procedures, laboratory instruments must be calibrated properly. Several analytical support areas must be considered so the integrity of standards and reagents is upheld prior to instrument calibration. The following sections describe the analytical support areas and laboratory instrument calibration procedures.

8.1 Analytical Support Areas

Prior to generating quality data, several analytical support areas must be considered:

Standard/Reagent Preparation - Primary reference standards and secondary standard solutions shall be obtained from National Institute of Standards and Technology (NIST), or other reliable commercial sources to verify the highest purity possible. The preparation and maintenance of standards and reagents will be accomplished per the methods referenced in Table 4-1. All standards and standard solutions are to be formally documented (i.e., in a bound logbook) and should identify the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and any other pertinent information. All standard solutions shall be validated prior to use. Care shall be exercised in the proper storage and handling of standard solutions (e.g., separating volatile standards from nonvolatile standards). The laboratory shall continually monitor the quality of the standards and reagents through well documented procedures.

Balances - The analytical balances shall be calibrated and maintained in accordance with American Society of Testing Materials (ASTM) specifications. Calibration is conducted with two Class-1 weights that bracket the expected balance use range. The laboratory shall check the accuracy of the balances daily and properly document results in permanently bound logbooks.

Refrigerators/Freezers - The temperature of the refrigerators and freezers within the laboratory shall be monitored and recorded daily. This will verify that the quality of the standards and reagents is not compromised and the integrity of the analytical samples is upheld. Appropriate acceptance ranges (e.g., 4ºC ± 2ºC for refrigerators) shall be clearly posted on each unit in service.

Water Supply System - The laboratory must maintain a sufficient water supply for all project needs. The grade of the water must be of the highest quality (analyte-free) in order to

eliminate false-positives from the analytical results. Ultraviolet cartridges or carbon absorption treatments are recommended for organic analyses. Appropriate documentation of the quality of the water supply system(s) will be performed on a regular basis.

Air Supply System - The laboratory must maintain a sufficient clean (analyte free) air supply for all project needs if required. The grade of the air must be of the highest quality (analyte-free) in order to eliminate false-positives from the analytical results. Appropriate documentation of the quality of the air supply system(s) will be performed on a regular basis by the laboratory.

8.2 Laboratory Instruments

Calibration of instruments is required to verify that the analytical system is operating properly and at the sensitivity necessary to meet method established quantitation limits. Each instrument for organic analysis shall be calibrated with standards appropriate to the type of instrument and linear range established within the analytical method(s). Calibration of laboratory instruments will be performed according to methods specified in Table 4-1.

Calibration of an instrument must be performed prior to the analysis of any samples (initial calibration) and then at periodic intervals (continuing calibration) during the sample analysis to verify that the instrument is still properly calibrated. If the contract laboratory cannot meet the method-required calibration requirements, corrective action shall be taken as discussed in Section 11.0. All corrective action procedures taken by the contract laboratory are to be documented, summarized within the case narrative, and submitted with the analytical results.

9.0 INTERNAL QUALITY CONTROL CHECKS

Internal QC checks are used to determine if analytical operations at the laboratory are in control, as well as determining the effect sample matrix may have on data being generated. Two types of internal checks are performed - batch QC and matrix-specific QC procedures. The type and frequency of specific QC samples performed by the laboratory will be determined by the specified analytical method and project specific requirements. Acceptable criteria and/or target ranges for these QC samples shall meet method-specific QC requirements.

QC results, which vary from acceptable ranges shall result in the implementation of appropriate corrective measures, potential application of qualifiers, and/or an assessment of the impact these corrective measures have on the established data quality objectives. Quality control samples including any project-specific QC will be analyzed are discussed below.

9.1 Batch QC

Method Blanks - A method blank is defined as laboratory demonstrated analyte free water or solid that is carried through the entire analytical procedure. The method blank is used to determine the level of laboratory background contamination. Method blanks are analyzed at a frequency of one per analytical batch.

Matrix Spike Blank Samples - An MSB or LCS is an aliquot of demonstrated analyte free water or solid spiked (fortified) with all or a representative group of the analytes being analyzed. The MSB or LCS is a measure of precision and accuracy used to verify that the analysis being performed is in control. An MSB or LCS will be performed for each matrix as required by the analytical methods referenced in Table 4-1. Acceptable criteria and/or target ranges for these QC samples shall meet method-specific QC requirements.

9.2 Matrix-Specific QC

Matrix Spike Samples - An aliquot of sample is spiked with known concentrations of specific compounds as stipulated by the methodology. The MS/MSD samples are subjected to the entire analytical procedure in order to assess both accuracy and precision of the method for the matrix by measuring the percent recovery of each analyte and RPD between the concentrations of each analyte in the two spiked samples. The samples are used to assess matrix interference effects on the method, as well as to evaluate instrument performance. MS/MSDs are

analyzed at a frequency of one each per twenty samples, as listed in Table 4-1. Acceptable criteria and/or target ranges for these QC samples shall meet method-specific QC requirements.

9.3 Additional QC

Rinsate (Equipment) Blanks – Rinsate blanks are not required when dedicated disposable sampling equipment are used. A rinsate blank is a sample of laboratory demonstrated analyte-free water passed over or through the cleaned sampling equipment. A rinsate blank is used to indicate potential contamination from sample instruments used to collect and transfer samples. The water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. The rinsate blank should be collected, transported, and analyzed in the same manner as the samples acquired that day. Rinsate blanks will be performed at the rate listed in Table 4-1.

Field Blanks - Field blanks are required for sampling events with the per- and polyfluoroalkyl substances (PFAS) analysis. They consist of a set of empty sample bottles provided by the laboratory and demonstrated analyte-free water. The analyte-free water is simply poured into the sample containers in the field. These samples then accompany the bottles with the collected samples for analysis back to the laboratory. Field blanks must return to the laboratory with the same set of bottles they accompanied to the field. Field blanks will be analyzed for PFAS only. Field blanks will be analyzed at the frequency stated in Table 4-1.

Trip Blanks - Trip blanks are not required for non-aqueous matrices. Trip blanks are required for aqueous sampling events. They consist of a set of sample bottles filled at the laboratory with laboratory demonstrated analyte-free water. These samples then accompany the bottles that are prepared at the laboratory into the field and back to the laboratory, along with the collected samples for analysis. These bottles are never opened in the field. Trip blanks must return to the laboratory with the same set of bottles they accompanied to the field. Trip blanks will be analyzed for volatile organics only. Trip blanks will be analyzed at the frequency stated in Table 4-1.

Field Duplicates – A field duplicate (FD) sample pair are independent samples, which are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. Field duplicates are useful in documenting the precision of the sampling process. Blind field duplicates will be collected at the frequency listed on Table 4-1. The field duplicates will be labeled so that the laboratory cannot determine or identify the location from, which the field duplicate was collected.

10.0 CALCULATION OF DATA QUALITY INDICATORS

10.1 Precision

Precision is evaluated using results from field duplicate and/or MS/MSD analyses. The RPD between the parent sample/field duplicate or between the MS/MSD concentrations is used to evaluate precision and calculated by the following formula:

$$RPD = \left[\frac{|X_1 - X_2|}{(X_1 + X_2)/2} \right] x100\%$$

where:

X_1 = *Measured value of sample or matrix spike*

X_2 = *Measured value of duplicate or matrix spike duplicate*

RPD criteria for this project shall meet method-specific QC requirements.

10.2 Accuracy

Accuracy is defined as the degree of difference between the measured or calculated value and the true value. Analytical accuracy is expressed as the %R of a compound that has been added to the environmental sample or laboratory demonstrated analyte free matrix at known concentrations before analysis. Accuracy will be determined from MS, MSD, MSB (or LCS) samples as well as from surrogate compounds and is calculated as follows:

$$\%R = \frac{(X_s - X_u)}{K} x\ 100\%$$

where:

X_s - Measured value of the spike sample

X_u - Measured value of the unspiked sample

K - Known amount of spike in the sample

%R criteria for this project shall meet method-specific QC requirements.

10.4 Completeness

Completeness is calculated on a per matrix basis for the project and is calculated as follows:

$$\%\ Completeness = \frac{(N - X_n)}{N}\ x\ 100\%$$

where:

X_n - Number of invalid measurements

N - Number of valid measurements expected to be obtained

11.0 CORRECTIVE ACTIONS

Laboratory corrective actions shall be implemented to resolve problems and restore proper functioning to the analytical system when errors, deficiencies, or out-of-control situations exist at the laboratory. Full documentation of the corrective action procedure needed to resolve the problem shall be filed in the project records, and the information summarized in the analytical report case narrative. A discussion of the corrective actions to be taken is presented in the following sections.

11.1 Incoming Samples

Problems noted during sample receipt shall be documented by the laboratory. The Project Chemist (or designee) shall be contacted immediately for problem resolution. All corrective actions shall be documented thoroughly.

11.2 Sample Holding Times

If any sample extractions and/or analyses exceed method holding time requirements, the Project Chemist (or designee) shall be notified immediately for problem resolution. All corrective actions shall be documented thoroughly.

11.3 Instrument Calibration

Sample analysis shall not be allowed until all laboratory instrumentation is properly calibrated in accordance with method requirements. If any initial/continuing calibration standards exceed method QC limits, recalibration must be performed and, if necessary, samples back to the previous acceptable continuing calibration standard must be reanalyzed.

11.4 Quantitation Limits

The laboratory must meet all quantitation limits listed in Table 4-2. If difficulties arise in achieving these limits due to a particular sample matrix, the laboratory must notify the Project Chemist for problem resolution. When any sample requires a secondary dilution due to high levels of target analytes, the laboratory must report the results from initial analyses and secondary dilution analyses. Dilution will be permitted only to bring target analytes within the linear range of calibration. If samples are analyzed at a dilution with no target analytes detected, the Project Chemist (or designee) will be immediately notified so that appropriate corrective actions can be initiated.

11.5 Method QC

All QC, including blanks, matrix spikes, matrix spike duplicates, surrogate recoveries, matrix spike blank samples, and other method-specified QC samples, shall meet the requirements of the methods referenced in Table 4-1. Failure of method-required QC will result in the possible qualification of all affected data. If the laboratory cannot find any errors, the affected sample(s) shall be reanalyzed within method-required holding times to verify the presence or absence of matrix effects. If matrix effect is confirmed, the corresponding data shall be flagged accordingly using the flagging symbols and criteria as defined by the data validation guidelines identified in Section 12.2. If matrix effect is not confirmed, then the entire batch of samples may have to be reanalyzed. The Project Chemist shall be notified as soon as possible to discuss possible corrective actions should unusually difficult sample matrices be encountered.

11.6 Calculation Errors

All analytical results must be reviewed systematically for accuracy prior to submittal. If upon data review, calculation and/or reporting errors exist, the laboratory will be required to reissue the analytical data report with the corrective actions appropriately documented in the case narrative.

12.0 DATA REDUCTION, VALIDATION, AND USABILITY

For all analyses, NYSDEC ASP Category B (or equivalent) deliverable requirements will be employed for documentation and reporting of all data. The standard NYSDEC Data Package Summary (or equivalent) will be completed by the analytical laboratory and included in the deliverable data packages. In addition, analytical results will be reported in an electronic data deliverable (EDD) format. After the data is validated, an EDD will be submitted to the NYSDEC in the most recent NYSDEC EQuIS format.

12.1 Data Reduction

Laboratory analytical data are first generated in raw form at the instrument. These data may be either graphic or printed tabular form. Specific data generation procedures and calculations are found in each of the referenced methods. Analytical results must be reported consistently. Data for aqueous samples will be reported in concentrations of nanograms per liter (ng/L), micrograms per liter (µg/L) or milligrams per liter (mg/L).

Identification of all analytes must be accomplished with an authentic standard of the analyte traceable to NIST or other reliable commercial sources. Individuals experienced with a particular analysis and knowledgeable of requirements will perform data reduction.

12.2 Data Validation

Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of validity prior to its intended use.

Data validation will be performed by the Project Chemist and/or environmental chemists under his/her supervision. All analytical samples collected will receive a limited data review. This review will include a review of holding times; completeness of all required deliverables; review of QC results (surrogates, spikes, duplicates, and instrument calibration data blanks) to determine if the data is within the protocol-required limits and specifications; a determination that all samples were analyzed using established and agreed upon analytical protocols; an evaluation of the raw data to confirm the reported sample results; and a review of laboratory data qualifiers. The methods referenced in Table 4-1 as well as the general guidelines presented in the most current USEPA Region II documents will be used to aid the chemist during the data review.

12.3 Data Usability

A Data Usability Summary Report (DUSR) will be prepared in accordance with NYSDEC Division of Environmental Remediation *DER-10 Technical Guidance for Site Investigation and Remediation*, *Appendix 2B, Guidance for Data Deliverables and the Development of Data Usability Summary Reports*, dated May 2010, and will describe the samples and the analytical parameters. Data deficiencies, analytical protocol deviations, and quality control problems are identified and their effect on the data will be discussed. The DUSR, which will be submitted to the NYSDEC, will also include recommendations on resampling/reanalysis.

13.0 PREVENTIVE MAINTENANCE

The laboratory is responsible for maintaining its analytical equipment. Preventive maintenance is provided on a regular basis to minimize down-time and the potential interruption of analytical work. Instruments are maintained in accordance with the manufacturer's recommendations. If instruments require maintenance, only trained laboratory personnel or manufacturer-authorized service specialists are permitted to do the work. Maintenance activities will be documented and kept in permanent logs. These logs will be available for inspection by auditing personnel.

14.0 PERFORMANCE AND SYSTEM AUDITS

Audits are evaluations of both field and laboratory QC procedures, and are performed before or shortly after systems are operational. Performance audits are conducted by introducing control samples into the data production process. These control samples may include performance evaluation samples, or field samples spiked with known amounts of analytes.

System audits are onsite qualitative inspections and reviews of the quality assurance system used by some part of or the entire measurement system. They provide a quantitative measure of the quality of the data produced by one section or the entire measurement process. The audits are performed against a set of requirements, which may be a quality assurance project plan or work plan, a standard method, or a project statement of work. The primary objective of the systems audits is to verify that the QA/QC procedures are being followed.

14.1 Performance and External Audits

In addition to conducting internal reviews and audits, as part of its established quality assurance program, the laboratory is required to take part in regularly scheduled performance evaluations and laboratory audits from state and federal agencies. They are conducted as part of the certification process and to monitor the laboratory performance. The audits also provide an external quality assurance check of the laboratory, and provide reviews and information on the management systems, personnel, standard operating procedures, and analytical measurement systems. Acceptable performance on evaluation samples and audits is required for certification and accreditation. The laboratory shall use the information provided from these audits to monitor and assess the quality of its performance. Problems detected in these audits shall be reviewed by the QA Manager and Laboratory Management, and corrective action shall be instituted as necessary.

14.2 Systems/Internal Audits

As part of its Quality Assurance Program, the Laboratory Quality Assurance Manager shall conduct periodic checks and audits of the analytical systems. The purpose of these is to verify that the analytical systems are working properly, and that personnel are adhering to established procedures and documenting the required information. These checks and audits also assist in determining or detecting where problems are occurring.

The QA Manager periodically will submit laboratory control samples. These samples will serve to check the entire analytical method, the efficiency of the preparation method, and the analytical instrument performance. The results of the control samples are reviewed by the QA Manager who reports the results to the analyst and the Laboratory Director. When a problem is indicated, the QA Manager will assist the analyst and laboratory management in determining the reason and in developing solutions. The QA Manager will also recheck the systems as required.

REFERENCES

Comprehensive Environmental Response Compensation and Liability Act (CERCLA). 1989. *Quality Assurance Manual*, Final Copy, Revision I, October.

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USEPA, 2016a. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. May.

USEPA. 2016b. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)*. May.

APPENDIX G
SITE MANAGEMENT FORMS

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: Preparer's _____ Phone No.: _____
Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application. _____ **Date** **Contractor**

URS
257 West Genesee Street, Suite 400
Buffalo, New York 14202-2657
Telephone: (716)-856-5636
Fax: (716)-856-2545

DATE:

DAY	S	M	T	W	TH	F	S

DAILY CONSTRUCTION REPORT

WEATHER	Bright Sun	Clear	Overcast	Rain	Snow
TEMP	To 32	32-50	50-70	70-85	85 and up
WIND	Still	Moder	High	Report No.	
HUMIDITY	Dry	Moder	Humid		

PROJECT:

CONTRACTOR:

URS JOB No.:

URS PROJECT MANAGER:

AVERAGE FIELD FORCE

Name of Contractor	Non-manual	Manual	Remarks

VISITORS

Time	Representing	Representing	Remarks

EQUIPMENT AT THE SITE:

CONSTRUCTION ACTIVITIES:

See attached photos

Sheet: 1 of

☐ X - designates info on backside of page

By: _____ Title: _____

Reviewed by: _____ Title: _____

DAILY CONSTRUCTION REPORT (cont'd)

REPORT No.:______________________________

PROJECT:
CONTRACTOR:
URS JOB No.: **DATE:**

CONSTRUCTION ACTIVITIES (cont'd):

Sheet: of

By: Title:
Reviewed by: Title:

AECOM

Americas

Task Hazard Assessment

S3AM-209-FM6

Date:	**Project Name / Location:** 26-28 Whitesboro Street Site/ 26-28 Whitesboro Street, Utica, NY
Permit / Job Number:	**Project Number:**
Description of Task:	

Do you have a pre-job hazard assessment (JHA) specific to this task in your hands?

- **Yes** – review the steps, hazards, and precautions. Attach and reference JHA in the form below. Add any additional steps, hazards, and precautions to this form otherwise unidentified on JHA.
- **No** – list all steps, hazards, and precautions associated with the task in the form below.

Basic Task Steps (explain in order how the task will be carried out)	**Hazards** (identify all hazards & potential hazards of each step)	**Risk** (before)	**Control Measures / Precautions** (describe how that hazard will be controlled)	**Risk** (after)	**Revised?** (yes – record time)
			Highest Risk Index		

The Task Hazard Assessment is to be completed at the worksite by the individual(s) who is intended to conduct the task immediately prior to initiating the associated task. Number and attach additional pages if necessary.

Worker/Visitor acknowledgement and review of this content on back of this document. Originator to also sign Worker acknowledgement section.

Originator _____ (Print Name) _____ (Signature)

Supervisor _____ (Print Name) _____ (Signature)

Risk Matrix on Reverse

THIS FORM IS TO BE KEPT ON JOB SITE.

AECOM

WORKER SIGN ON

NAME (Please Print) TIME SIGNATURE

I participated in the development and understand the content of this Task Hazard Assessment.

Task Hazard Assessment Follow-Up/Review

Initials/Time	Initials/Time	Initials/Time

Instructions:
Identify basic steps of the task and associated hazards. Calculate the initial risk rating. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Employees shall monitor the activities for compliance with this document. Workers should **STOP WORK** on a task if conditions change from the planned and agreed approach to the work.

This document should be updated to reflect new conditions or changes in task methods.

VISITOR SIGN ON

I have read and understand the content of this Task Hazard Assessment.

Emergency Meeting / Assembly Area

Emergency Contact #

Method of Communication

Risk Rating Matrix

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 & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	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

CHAIN OF CUSTODY RECORD

URS

PROJECT NO. | SITE NAME

SAMPLERS (PRINT/SIGNATURE)

LAB _____

COOLER _____ of _____

PAGE _____ of _____

DELIVERY SERVICE: _____ AIRBILL NO.: _____

LOCATION IDENTIFIER	DATE	TIME	COMP/ GRAB	SAMPLE ID	MATRIX	TOTAL NO.# OF CONTAINERS	TESTS / BOTTLE TYPE AND PRESERVATIVE	REMARKS	SAMPLE TYPE	BEGINNING DEPTH (IN FEET)	ENDING DEPTH (IN FEET)	FIELD LOT NO.# (IRPIMS ONLY)

MATRIX CODES

AA - AMBIENT AIR; SE - SEDIMENT; SH - HAZARDOUS SOLID WASTE; SL - SLUDGE; WP - DRINKING WATER; WW - WASTE WATER; WG - GROUND WATER; SO - SOIL; DC - DRILL CUTTINGS; WL - LEACHATE; GS - SOIL GAS; WC - DRILLING WATER; WO - OCEAN WATER; WS - SURFACE WATER; WQ - WATER FIELD QC; LH - HAZARDOUS LIQUID WASTE; LF - FLOATING/FREE PRODUCT ON GW TABLE

SAMPLE TYPE CODES

TB# - TRIP BLANK; SD# - MATRIX SPIKE DUPLICATE; RB# - RINSE BLANK; FR# - FIELD REPLICATE; N# - NORMAL ENVIRONMENTAL SAMPLE; MS# - MATRIX SPIKE

(# - SEQUENTIAL NUMBER (FROM 1 TO 9) TO ACCOMMODATE MULTIPLE SAMPLES IN A SINGLE DAY)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY (SIGNATURE)	DATE	TIME

SPECIAL INSTRUCTIONS

Distribution: Original accompanies shipment, copy to coordinator field files

URSF-075C/1 OF 1/CofCR/GCM

AIR SAMPLE
CHAIN OF CUSTODY RECORD

URS CORPORATION
77 GOODELL STREET
BUFFALO, NY 14203
PHONE: 716-856-5636

URS CONTACT: _____

PROJECT NUMBER | SITE NAME

SAMPLERS (PRINT/SIGNATURE)

DELIVERY SERVICE: _____ AIRBILL NO.: _____

LAB _____

SHIPPING CONTAINER _____ of _____

PAGE _____ of _____

LOCATION IDENTIFIER	SAMPLE DATE	SAMPLE TIME	SAMPLE ID	MATRIX CODE	CANISTER SIZE (LITERS)	SAMPLE INFORMATION: CANISTER ID	FLOW CONTROLLER ID	INITIAL PRESSURE/ VACUUM (" Hg)	FINAL PRESSURE/ VACUUM (" Hg)	PRESSURE/VACUUM UPON LAB RECEIPT (" Hg)	REQUIRED ANALYSIS			REMARKS	SAMPLE TYPE CODE

MATRIX CODES: AA - AMBIENT AIR; AI - INDOOR AIR; AQ - FIELD QC; AS - SUB-SLAB AIR; GS - SOIL GAS

SAMPLE TYPE CODES: N# - NORMAL ENVIRONMENTAL SAMPLE; FD# - FIELD DUPLICATE; MS# - MATRIX SPIKE; (# - SEQUENTIAL NUMBER (FROM 1 TO 9) TO ACCOMMODATE MULTIPLE SAMPLES IN A SINGLE DAY)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME	SPECIAL INSTRUCTIONS
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY (SIGNATURE)	DATE	TIME	

Distribution: Original accompanies shipment, copy to project file

DAILY DRILLING RECORD

URS Corporation

PROJECT TITLE: 26-28 Whitesboro Street Site DATE: _____

CLIENT: _____ CONTRACTOR: _____

FROM	TO	PRODUCTIVE HOURS	ACTIVITIES/COMMENTS
TOTAL PRODUCTIVE HOURS			LEVEL B / LEVEL C / LEVEL D (CIRCLE ONE SELECTION)

LABOR:		MATERIALS / SUPPLIES:	
UNITS		UNITS	

WEATHER:

_____ _____

URS ONSITE COORDINATOR CONTRACTOR REPRESENTATIVE

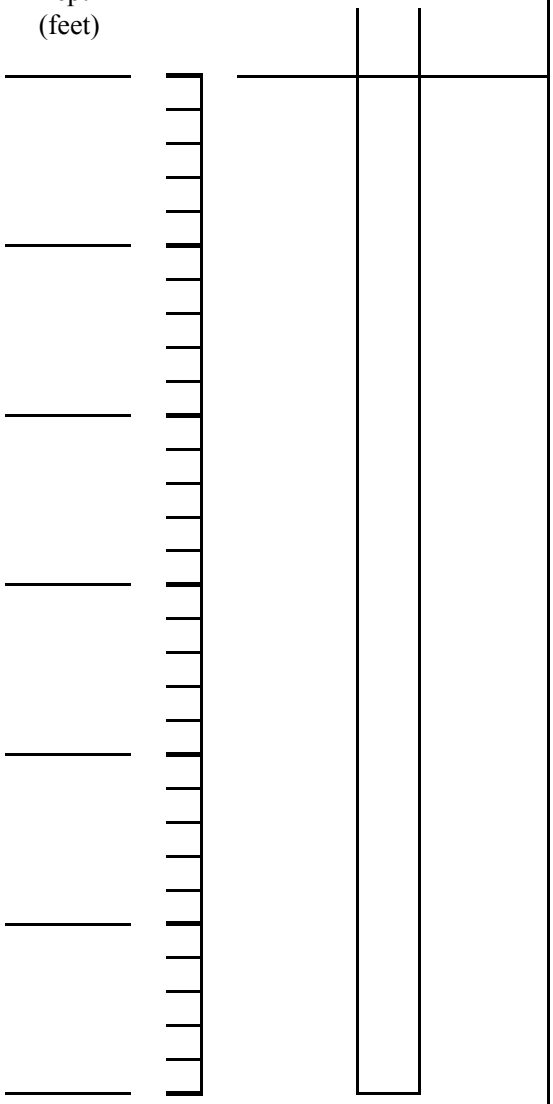
WELL DECOMMISSIONING RECORD

Site Name: 26-28 Whitesboro Street Site	Well I.D.:
Site Location: Utica, NY	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	
Drilling Method(s)	
Borehole Dia. (in.)	
Temporary Casing Installed? (y/n)	
Depth temporary casing installed	
Casing type/dia. (in.)	
Method of installing	
CASING PULLING	
Method employed	
Casing retrieved (feet)	
Casing type/dia. (in)	
CASING PERFORATING	
Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	
GROUTING	
Interval grouted (FBLS)	
# of batches prepared	
For each batch record:	
Quantity of water used (gal.)	
Quantity of cement used (lbs.)	
Cement type	
Quantity of bentonite used (lbs.)	
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	
Volume of grout used (gal.)	

WELL SCHEMATIC*



COMMENTS:

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

LOW FLOW GROUNDWATER PURGING/SAMPLING LOG

SITE: 26-28 WHITESBORO STREET SITE
COMPANY:

Project: _____ Site: _____ Well I.D.: _____

Date: _____ Sampling Personnel: _____ Company: _____

Purging/ Sampling Device: _____ Tubing Type: _____ Pump/Tubing Inlet Location: Screen midpoint

Measuring Point: Below Top of Riser Initial Depth to Water: _____ Depth to Well Bottom: _____ Well Diameter: _____ Screen Length: _____

Casing Type: _____ Volume in 1 Well Casing (liters): _____ Estimated Purge Volume (liters): _____

Sample ID: _____ Sample Time: _____ QA/QC: _____

Sample Parameters: _____

PURGE PARAMETERS

TIME	pH	TEMP (^{o}C)	COND. (mS/cm)	DISS. O_2 (mg/l)	TURB. (NTU)	Eh (mV)	FLOW RATE (ml/min.)	DEPTH TO WATER (btor)
Tolerance:	**0.1**	**---**	**3%**	**10%**	**10%**	**+ or - 10**	**---**	

Information: WATER VOLUMES--0.75 inch diameter well = 87 ml/ft; 1 inch diameter well = 154 ml/ft; 2 inch diameter well = 617 ml/ft; 4 inch diameter well = 2470 ml/ft ($vol_{yl} = \pi r^2 h$)

Remarks:

SITE INSPECTION FORM

Project Name: 26-28 Whitesboro Street Site

Date: _____

Location: 26-28 Whitesboro Street, Utica, NY

Inspector: _____

Company: _____

Cover System	Y	N	If Yes Describe	Actions Required?
Signs of Erosion				
Any Bare Areas				
Signs of Washouts				
Length of Grass Acceptable				
Dead/Dying Grass				
Evidence of Spills/ Dumping				
Evidence of Excavation				
Evidence of Site Development				
Damage (i.e., holes, etc.)				
Other Issues				

Inspector Signtature: _____

MONITORING WELL INSPECTION FORM

SITE: 26-28 WHITESBORO STREET SITE

COMPANY:

SITE NAME: 26-28 WHITESBORO STREET SITE

JOB#:

DATE:

TIME:

WELL ID:

INSPECTOR (PRINT):

EXTERIOR INSPECTION CONDITION

PROTECTIVE CASING/ CURB BOX:

LOCK/HASP CONDITION: LOCK KEY #:

HINGE/ LID: GASKET/SEAL :

SECURITY BOLTS TYPE:

SECURITY BOLTS : THREAD CONDITION:

WELL PAD: BOLLARDS:

LABEL/ ID CONDITION:

MAINTENANCE PERFORMED (e.g., anti seize applied, re-tapping bolt holes, bolt replacement, gasket replacement, etc.)

INTERIOR INSPECTION CONDITION

WELL CASING INTERIOR:

WELL RISER:

ANNULAR SPACE:

J PLUG:

WATER LEVEL: DEPTH TO BOTTOM:

HARD/SOFT BOTTOM:

MAINTENANCE PERFORMED (e.g., removed water, removed bentonite, sorbed sheen, replaced J plug, etc.)

ADDITIONAL COMMENTS:

INSPECTOR (SIGNATURE):

PROJECT MANAGER APPROVAL:

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

Contact Information

Preparer's Name: _____ Phone No: _____

Preparer's Affiliation: _____ Company Code: _____

Purpose of Investigation: _____ Date of Inspection: _____

Contact Name: _____ Affiliation: _____

Phone No: _____ Alt. Phone No: _____ Email: _____

Number of Occupants (total): _____ Number of Children: _____

☐ Occupant Interviewed? ☐ Owner Occupied? ☐ Owner Interviewed?

Owner Name (if different): _____ Owner Phone: _____

Owner Mailing Address: _____

Building Details

Bldg Type (Res/Com/Ind/Mixed): _____ Bldg Size (S/M/L): _____

If Commercial or Industrial Facility, Select Operations:

If Residential Select Structure Type:

Number of Floors: _____ Approx. Year Construction: _____ ☐ Building Insulated? ☐ Attached Garage?

Describe Overall Building 'Tightness' and Airflows(e.g., results of smoke tests):

Foundation Description

Foundation Type: _____ Foundation Depth (bgs): _____ Unit: FEET

Foundation Floor Material: _____

Foundation Wall Material: _____

Foundation Floor Thickness: _____

Foundation Wall Thickness: _____ Unit: INCHES

☐ Floor penetrations? Describe Floor Penetrations: _____

☐ Wall penetrations? Describe Wall Penetrations: _____

Basement is: _____ Basement is: _____ ☐ Sumps/Drains? Water In Sump?: _____

Describe Foundation Condition (cracks, seepage, etc.) : _____

☐ Radon Mitigation System Installed? ☐ VOC Mitigation System Installed? ☐ Mitigation System On?

Heating / Cooling / Ventilation Systems

Heating System: _____ Heat Fuel Type: _____ ☐ Central A/C Present?

Vented Appliances

Water Heater Fuel Type: _____ Clothes Dryer Fuel Type: _____

Water Htr Vent Location: _____ Dryer Vent Location: _____

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

PRODUCT INVENTORY

Building Name: _____ Bldg Code: _____ Date: _____

Bldg Address: _____ Apt/Suite No: _____

Bldg City/State/Zip: _____

Make and Model of PID: _____ Date of Calibration: _____

Location	Product Name/Description	Size (oz)	Condition *	Chemical Ingredients	PID Reading	COC Y/N?
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐
						☐

* Describe the condition of the product containers as **Unopened (UO)**, **Used (U)**, or **Deteriorated (D)**

** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Product Inventory Complete? ☐ Were there any elevated PID readings taken on site? ☐ ☐ Products with COC?

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Site Name: _____ Site Code: _____ Operable Unit: _____

Building Code: _____ Building Name: _____

Address: _____ Apt/Suite No: _____

City: _____ State: _____ Zip: _____ County: _____

Factors Affecting Indoor Air Quailty

Frequency Basement/Lowest Level is Occupied?: _____ Floor Material: _____

☐ Inhabited? ☐ HVAC System On? ☐ Bathroom Exhaust Fan? ☐ Kitchen Exhaust Fan?

Alternate Heat Source: _____ ☐ Is there smoking in the building?

☐ Air Fresheners? Description/Location of Air Freshener: _____

☐ Cleaning Products Used Recently?: Description of Cleaning Products: _____

☐ Cosmetic Products Used Recently?: Description of Cosmetic Products: _____

☐ New Carpet or Furniture? Location of New Carpet/Furniture: _____

☐ Recent Dry Cleaning? Location of Recently Dry Cleaned Fabrics: _____

☐ Recent Painting/Staining? Location of New Painting: _____

☐ Solvent or Chemical Odors? Describe Odors (if any): _____

☐ Do Any Occupants Use Solvents At Work? If So, List Solvents Used: _____

☐ Recent Pesticide/Rodenticide? Description of Last Use: _____

Describe Any Household Activities (chemical use,/storage, unvented appliances, hobbies, etc.) That May Affect Indoor Air Quality:

☐ Any Prior Testing For Radon? If So, When?: _____

☐ Any Prior Testing For VOCs? If So, When?: _____

Sampling Conditions

Weather Conditions: _____ Outdoor Temperature: _____ °F

Current Building Use: _____ Barometric Pressure: _____ in(hg)

Product Inventory Complete? _____ ☐ Building Questionnaire Completed?

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

Building Code: _____ Address: _____

Sampling Information

Sampler Name(s): _____ Sampler Company Code: _____

Sample Collection Date: _____ Date Samples Sent To Lab: _____

Sample Chain of Custody Number: _____ Outdoor Air Sample Location ID: _____

SUMMA Canister Information

Sample ID:					
Location Code:					
Location Type:					
Canister ID:					
Regulator ID:					
Matrix:					
Sampling Method:					

Sampling Area Info

Slab Thickness (inches):					
Sub-Slab Material:					
Sub-Slab Moisture:					
Seal Type:					
Seal Adequate?:	☐	☐	☐	☐	☐

Sample Times and Vacuum Readings

Sample Start Date/Time:					
Vacuum Gauge Start:					
Sample End Date/Time:					
Vacuum Gauge End:					
Sample Duration (hrs):					
Vacuum Gauge Unit:					

Sample QA/QC Readings

Vapor Port Purge:	☐	☐	☐	☐	☐
Purge PID Reading:					
Purge PID Unit:					
Tracer Test Pass:	☐	☐	☐	☐	☐

Sample start and end times should be entered using the following format: MM/DD/YYYY HH:MM

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

LOWEST BUILDING LEVEL LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the lowest building level .
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

FIRST FLOOR BUILDING LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the first floor of the building.
The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

Structure Sampling Questionnaire and Building Inventory

New York State Department of Environmental Conservation

OUTDOOR PLOT LAYOUT SKETCH

Please click the box with the blue border below to upload a sketch of the outdoor plot of the building as well as the surrounding area. The sketch should be in a standard image format (.jpg, .png, .tiff)

Clear Image

Design Sketch

Design Sketch Guidelines and Recommended Symbology

- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sket
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

B or **F**	Boiler or Furnace	o	Other floor or wall penetrations (label appropriately)
HW	Hot Water Heater	**xxxxxxx**	Perimeter Drains (draw inside or outside outer walls as appropriate)
FP	Fireplaces	**######**	Areas of broken-up concrete
WS	Wood Stoves	● SS-1	Location & label of sub-slab samples
W/D	Washer / Dryer	● IA-1	Location & label of indoor air samples
S	Sumps	● OA-1	Location & label of outdoor air samples
@	Floor Drains	● PFET-1	Location and label of any pressure field test holes.

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

Date: _____

Checklist Completed By: _____

Project Number: _____

Property Location: _____

System Installation Date: _____

The purpose of this form is to document the operation and maintenance of the sub-slab depressurization system to provide assurance that the system is functioning as designed or identify and execute any actions required to achieve the mitigation of subsurface vapor intrusion of volatile organic compounds to indoor air

1. MITIGATION SYSTEM INSPECTION

Occupant Interview

Any concerns identified by the building occupants?	YES	NO	

Comments / Action Items

Occupant's Initials: _____

External Piping

Vent pipes securely fastened to building	YES	NO	
Are there any visible openings or breaks in the pipe system	YES	NO	
Is the rain cap present and intact at discharge point	YES	NO	N/A
Inspection of the exhaust point verified that no air intakes have been located nearby	YES	NO	
The sealing/caulking around wall penetrations is intact	YES	NO	

Comments / Action Items

Mitigation Fan

Fan is mounted securely to building (no excessive vibrations during operation)	YES	NO	
Fan cover is installed	YES	NO	
No visible damage to fan or cover	YES	NO	

Comments / Action Items

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

Internal Piping

Vertical and horizontal pipe runs are secured, including at all penetration points	YES	NO	
The sealing/caulking is intact around the extraction point or points through the basement floor, crawlspace floor, and/or crawlspace/basement wall interface.	YES	NO	
Vibration dampener installed and intact (pertains to fan mount)	YES	NO	N/A
Mitigation system operation placard present and visible/legible	YES	NO	
Contains description of major components, valid contact number and instructions for occupant inquiries and/or system failure	YES	NO	
Mitigation system maintenance tag present and filled out	YES	NO	
Date of last inspection shown on tag:___________________________			
U-tube manometer present and intact at each extraction point	YES	NO	

Comments / Action Items

Electrical

Electrical connections secured	YES	NO
Junction boxes are closed	YES	NO
Conduit is supported	YES	NO
Circuit breakers controlling the mitigation fan and alarm circuits operate and are labeled "Mitigation System"	YES	NO
Power switch tagged with intact tamper proof seal	YES	NO
Audible alarm present	YES	NO
Audible alarm switch in "on" position (light on alarm is green)	YES	NO

Comments / Action Items

2. OPERATIONAL CHECKS

Fan is operating

Noise and Vibration within normal range	YES	NO
Alarm sounds when fan is turned off	YES	NO
U-Tube manometer indicating negative sub slab pressure	YES	NO

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

Smoke test performed on internal penetrations and pipe joints

Smoke test indicated no leaks	YES	NO	N/A
Smoke test confirms air flow into sump	YES	NO	N/A
Back draft test confirms proper air flow at combustion appliances	YES	NO	N/A
Smoke test indicated no leaks	YES	NO	N/A

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

3. MAINTENANCE

Fan last replaced on (date): _____

Fan due to be replaced; _____

Additional Maintenance Action Items Performed

_____

_____

_____

_____

4. ADDITIONAL ACTION ITEMS/ COMMENTS/COMPLETION DATES

_____

_____

_____

_____

_____

_____

_____

5. CERTIFICATION

I certify that the information on this form is true, accurate and complete (all blanks filled in) to the best of my knowledge and ability, and that I have the appropriate training and experience to perform this monitoring/inspection:

Name: _____ Affiliation: _____

Signature: _____ Date (dd/mm/yy): _____/_____am/pm

APPENDIX H
FIELD SAMPLING AND ANALYSIS PLAN

APPENDIX I

RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for the 26-28 Whitesboro Street site (the "site"), number B00063, are divided between the Site owner(s) and a Remedial Party, as defined below. The owner is currently listed as the City of Utica (the "owner").

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the NYSDEC is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. To date, no RP has been identified for the Site. Therefore, the NYSDEC will act as the RP.

Nothing on this page shall supersede the provisions of an Environmental Easement, Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the Site.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the Site.

2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in a(n) Environmental Easement remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the Site's Periodic Review Report (PRR) certification to the NYSDEC.

3) In the event the Site is delisted, the owner remains bound by the Environmental Easement and shall submit, upon request by the NYSDEC, a written certification that the Environmental Easement is still in place and has been complied with.

4) The owner shall grant access to the Site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.

5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the owner shall notify the Site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.3 – Notifications.

6) In the event some action or inaction by the owner adversely impacts the Site, the owner must notify the Site's RP and the NYSDEC in accordance with the time frame indicated in Section 1.3 – Notifications and (ii) coordinate the performance of necessary corrective actions with the RP.

7) The owner must notify the RP and the NYSDEC of any change in ownership of the Site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the Site property. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: Sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 1.3 of the SMP. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

8) The owner will conduct mowing on behalf of the RP. The RP remains ultimately responsible for maintaining the engineering controls.

9) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the Site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the Site.

2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the Site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the Site visit and/or any final report produced.

4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .

6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3 – Notifications of the SMP.

7) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

8) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the Site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or site ownership does not affect the RP's obligations with respect to the Site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

APPENDIX J
OPERATION, MONITORING, AND MAINTENANCE PLAN

APPENDIX J

OPERATION, MONITORING AND MAINTENANCE PLAN

26-28 WHITESBORO STREET SITE
SITE # B00063
UTICA, NEW YORK

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY
ALBANY, NEW YORK 12233-7011

Prepared by:

URS Corporation
257 West Genesee Street
Suite 400
Buffalo, New York 14202

December 2018

APPENDIX J
OPERATION, MONITORING AND MAINTENANCE PLAN

TABLE OF CONTENTS

OPERATION, MONITORING AND MAINTENANCE PLAN

TABLES (FOLLOWING TEXT)

FIGURES (FOLLOWING TABLES)

ATTACHMENTS (FOLLOWING FIGURES)

1.0 INTRODUCTION

This Operation, Monitoring and Maintenance (OM&M) Plan was prepared to address annual groundwater sampling in monitoring wells, annual site inspections and quarterly mowing at the 26-28 Whitesboro Street site located in Utica, New York. The OM&M Plan is applicable for sites where the remedy includes any physical components. Since the only such systems for this site consist of monitoring wells, a relatively limited OM&M program is applicable.

Previous operations at this site resulted in subsurface contamination. Site investigations occurred between 1997 and 2008; and in 2017, remedial work occurred that comprised of excavation and installing of a cover system. Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and Metals were identified as the remaining contaminants of concern.

The objective of this OM&M Plan is to describe the post remediation annual groundwater monitoring program, annual site inspection program and reporting requirements. The annual groundwater sampling and site inspection frequency is subject to modification in the future based upon the sampling results (i.e., decrease or increase in frequency) in accordance with the provisions in *DER-10, Technical Guidance for Site Investigation and Remediation*, New York State Department of Environmental Investigation, May 2010.

2.0 SAMPLING AND ANALYSIS PLAN

The two major components of the Sampling and Analysis Plan are the Field Sampling and Analysis Plan (FSAP) and the Quality Assurance Project Plan (QAPP). The FSAP is provided as Appendix H to the SMP. The QAPP is provided as Appendix F to the SMP. The discussions and provisions of those documents are not repeated in this OM&M Plan.

The following known existing wells comprise the wells to be included in the annual groundwater monitoring (Figure 1):

B–2 B-4 B-5 MW-1

For a summary of the well construction information, refer to Table 1. For well boring and construction logs, refer to Attachment 1.

3.0 ANNUAL SITE INSPECTIONS AND QUARTERLY MOWING

In conjunction with the annual groundwater monitoring, an annual inspection will be performed that will document the state of the of the site's cover system and monitoring wells. The inspection will include, but not be limited to, the following:

- Documenting signs of erosion and washouts;
- Observing stressed vegetation;
- Recording the condition of the site's monitoring wells;
- Looking for damage caused by local fauna (i.e., gopher holes, etc.) and/or humans; and,
- Documenting evidence of spills and/or dumping.

For a blank inspection form, refer to Attachment 2.

In addition, landscaping (i.e., mowing) will be performed on a quarterly basis during the growing season.

4.0 SUB-SLAB DEPRESSURIZATION SYSTEM MONITORING

If data from a soil vapor intrusion evaluation dictate that a sub-slab depressurization (SSD) system be installed in any newly constructed building, that SSD system will be subject to periodic monitoring and maintenance visits. During each visit, inspections will be conducted to verify and document that the system is in good working order.

The inspections will include a visual inspection of the system's interior and exterior components. Also, during each routine visit, operations monitoring will be conducted. This will consist of recording the U-Tube manometer measurement and comparing it to the existing data recorded during the system's original and/or latest system inspection. Anticipated operating condition of the system is 2 inches of H_2O as read from the U-tube manometer. The data will be used to evaluate whether the system is performing within an acceptable range of operation.

Additionally, a smoke stick will be used to check for the presence of back-drafts, leaky fittings, and flow into any visible cracks in the floor or walls. The smoke stick will be passed near the equipment near where possible leaks could occur. The behavior of the smoke will be observed if the smoke is sucked into or blown away from the equipment a possible leak will be noted, and repairs made. The system will be shut down temporarily to confirm that the audible alarm functions as designed.

Items identified during the routine monitoring and maintenance visits pertaining to system design and/or performance will be addressed during the inspection visit if possible, or a follow-up visit will be scheduled. Any needed repairs or system modifications will be documented, and the as-built diagram will be updated as necessary. The inspection form to be used during the visit is in Attachment 2.

5.0 REPORTING

The data collected during the implementation of this OM&M Plan will be described in annual Inspection Reports and evaluated in a triennial Periodic Review Report (PRR).

5.1 Records Management

Standardized forms will be used to record the results of well sampling/monitoring activities, as well as findings from the site inspection. These forms are provided with this OM&M Plan in Attachment 2.

5.2 Periodic Review Reports

A summary of the analytical results from the annual sampling events, observations from the site inspections, conclusions, and recommendations of the project evaluations will be included in the triennial PRR. A copy of the laboratory data will be included in the appendix of the report. The PRR will also include the following:

- The site name, municipality, county that the site is located in, and date of the report will appear on the cover;
- Text detailing the site activities completed over the given calendar year;
- Tables with groundwater elevation data and detected analytes in groundwater with applicable criteria;
- A Data Usability Summary Report;
- A Site Location Map;
- A map showing sampling and well locations;
- A map showing the groundwater potentiometric surface;
- A map showing detected analytes in groundwater with applicable criteria;
- Completed sampling forms;
- Completed site inspection forms
- Comments, conclusions and recommendations based on an evaluation and resolution of problems identified; and
- Photographs.

5.3 Submittal Requirements

The PRR will be submitted by the property owner within 60 days of the final sampling/inspection event of the PRR's reporting period. The Inspection Report will be submitted by the property owner within 60 days of each annual sampling/inspection event. Two copies of all reports will be submitted to the NYSDEC. All reports will be bound reports or in an equivalent acceptable electronic format. Sample results will be provided to the property owners within 30 days after data validation is completed.

TABLES

Table 1
Monitoring Well Summary
2628 Whitesboro Street Site

Monitoring Well ID	Install Date	Tax Map Parcel #	Ground Elevation (Ft AMSL)	Screen Setting (Ft bgs)	Well Depth (Ft bgs)
B-2	6/5/2003	318.8-1-48	410.45	6.0 to 16.0	16.0
B-4	6/5/2003	318.8-1-48	409.25	4.0 to 14.0	14.0
B-5	6/5/2003	318.8-1-48	411.70	4.0 to 14.0	14.0
B-13/MW-1	6/1/2005	318.8-1-46	411.76	4.0 to 14.0	14.0

Ft AMSL - elevation in feet above mean sea level

FIGURES

N

B-4

B-2

B-5

MW-1

POST EXCAVATION GRADING LIMITS
AREA=±69,520 SqFt.

LANDS NOW OR FORMERLY
NATIONAL BUILDING RESTORATION CORP.
LIBER 2593 PAGE 85
TAX MAP PARCEL 318.8-1-49

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2812 PAGE 593
TAX MAP PARCEL 318.8-1-47

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2650 PAGE 253
TAX MAP PARCEL 318.8-1-48

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2650 PAGE 252
TAX MAP PARCEL 318.8-1-46

LANDS NOW OR FORMERLY
CITY OF UTICA
INSTRUMENT # 2007-001046
TAX MAP PARCEL 318 8-1-45

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2784 PAGE 540
TAX MAP PARCEL 318.8-1-43

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2639 PAGE 541
TAX MAP PARCEL 318.8-1-42

LANDS NOW OR FORMERLY
THE BOILERMAKER ROAD RACE, INC.
BOOK 2842 PAGE 642
TAX MAP PARCEL 318.8-1-41

LANDS NOW OR FORMERLY
CITY OF UTICA
LIBER 2639 PAGE 541
TAX MAP PARCEL 318.8-1-44

BRICK BUILDING

BRICK ROAD

GRAVEL ROAD

GRAVEL ROAD

WHITESBORO STREET

DIVISION STREET

BENCHMARK: "x" CUT
SOUTH EAST LP BOLT
ELEVATION=411.91'

Monitoring Well Location

Source: Post Cap Survey Drawing, Record of Decision Implementation Report of Findings, Precision Environmental Services Inc., July 2018

40 0 40 Feet

26-28 WHITESBORO STREET SM SITE
SITE PLAN

URS

FIGURE 1

J:\Projects\60592094_2628_White\900_CAD_GIS\920_929_GIS_Graphics\Maps\2 Site Plan_ALT.mxd 12/6/2018

ATTACHMENT 1

WELL BORING AND CONSTRUCTION LOGS

Driller: Prescott-Wolff
Inspector: S. Peplin
Rig Type: GR A300
Drilling Method: Direct push/3¼" HSA

Dvirka and Bartilucci Boring Log

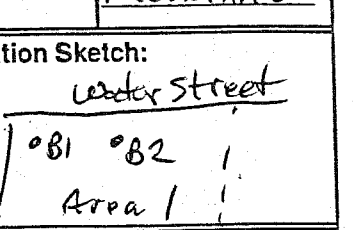
Project Name: White-Whiteshore
Project #: 1909
Boring Depth: 16

Boring ID: B2
Sheet 1 of 1
Location: N center Area 1

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03-1028
Finish (Date & Time): 6/5/03-1259
Weather: Overcast, mid 60°s F rain
Elevation of Ground Surface: ____

Location Sketch:



Sample Interval	Sample No.	Rec Blows (ft)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1029	0.7	0	Grayish brown (5YR3/2) SILT, some f. sand, little clay, trace m. gravel (moist)		1" ø PVC riser
2-4	1032	0.9	0	redbrick at 1.9' redbrick (0.3' thick) wood (0.3' thick) Grayish brown (5YR3/2) SILT and f.c SAND (moist)		refusal @ 4.2' concrete offset 2', refusal @ 4.3' concrete offset, east
4-6	1111	0.4	0	brick-red concrete		
6-8	1113	0.9	0	redbrick Grayish brown (5YR3/2) SILT, some f. sand), little clay (moist)	6'	- slight petroleum like odor
8-10	1117	0.3	0	sand		Sample WB-B2(6-8) collected for VOC, SVOC, Pest/PCB, TAL, CN refusal at 9.6' offset to N, refusal at 3 ft on 3 attempts used 5' solid stem to 5', switched to HSA and augered to 8 ft through concrete
10-12	1242	1.6	0	Dusky brown (5YR2/2) SILT, some f.c Sand), little clay (moist)		
				- wet at 11.5'		
12-14	1245	1.5	0	Moderate brown (5YR 4/4) f.c SAND, little SILT (wet)		1" ø PVC 10 slot screen
14-16	1250	1.1	0	sand		No sand or seal
					16'	
				EOB at 16 ft bg, Install 1-inch PVC well, 10 ft 10-slot		

Soil Stratigraphy Summary ____

d&b boring log GG version.xls

Driller: Parratt-Wolff
Inspector: S. Pepling
Rig Type: IRA300
Drilling Method: direct push

Dvirka and Bartilucci Boring Log

Project Name: Utica Whitesboro Street
Project #: 1909
Boring Depth: 14'

Boring ID: B4
Sheet 1 of 1
Location: center Southwest side Area

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03-1542
Finish (Date & Time): 6/5/03-1614
Weather: Overcast, drizzle 60's F, rain
Elevation of Ground Surface: _____

Location Sketch: Water Street
N
B1 B2
B4 B5 Area
B7

Sample Interval	Sample No.	Rec (Feet)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1543	0.3	0	grass Grayish brown (5YR 5/2) SILT, some f. sand (moist), gravel fragments in nose		1" ø PVC riser no sand or seal
2-4	1548	0.9	0	Same red brick		refusal at 3 ft, offset refusal at 3 ft, HSA to 8 ft bgs very tough
					4'	
						1" ø PVC 10 slot screen
8-10	1606	0.4	0	Dark yellowish brown (10YR 4/2) f. m SAND, some Silt, trace f. gravel (moist)		collected sample WB-B4 (8-10) for VOCs, SVOCs, Pest, PCB, TAL, CN - 14 oz Jar
10-12	1608	0.2	0	Same (wet)		- water at 10' bg
12-14	1610	1.8	0	Same		
					14'	
				EOB at 14 ft bgs, install 1-in ø PVC well ~~tie~~ 10 ft screen, 10 slot		

Soil Stratigraphy Summary _____

Driller: Parratt-Wolff
Inspector: S. Peplis
Rig Type: IR A300
Drilling Method: direct push/3¼ in HSA

Dvirka and Bartilucci Boring Log

Project Name: Whitesboro
Project #: 1909
Boring Depth: 14

Boring ID: B-5
Sheet 1 of 1
Location: center Area 1

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/5/03 · 1416
Finish (Date & Time): 6/5/03 - 1505
Weather: Overcast, upper 60's F, rain
Elevation of Ground Surface: ____

Location Sketch: Water Street; B1, B2, B3, Area 1

Sample Interval	Sample No.	REC (feet) ~~Blows~~	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1418	1.1	0	grass Grayish brown (5YR3/2) SILT and & SAND (moist) cinders, red brick (1-2')		
2-4	1421	0.2	0	Red brick and gravel Cement,	1" ∅ PVC riser	no sand or seal
4-6	1426	0.4	0	Red bricks, cinders, and gravel	4'	refusal @ 5' used HSA to auger to 6', seems clean
6-8	1438	0.2	0	Grayish brown (5YR3/2) SILT, some f-c Sand, trace f-c gravel (moist)	1" ∅ PVC 10 slot screen	
8-10	1445	0.9	0	Moderate brown (5YR 4/4) f. SAND, little f-m gravel, little silt (moist)		collected sample WB-BS (8-10) for VOA, SVOCs, Pest/PCB, TAL-CN
10-12	1448	1.4	0	same (wet)		
12-14	1450	1.0	0	same		no sand or seal
				EOB at 14 ft bg. Install 1-in ∅ PVC well, 10 ft. 10 slot		14'

Soil Stratigraphy Summary ____

Driller: Parratt-Wolff
Inspector: S. Repling
Rig Type: ER A300
Drilling Method: 4 1/4 HSA

Dvirka and Bartilucci Boring Log
Project Name: Utica Whitesboro
Project #: 1909
Boring Depth: 14'

Boring ID: B3/MW
Sheet 1 of 1
Location: SW of BS by 25'

Groundwater Observations			
Date			
Time			
DTW			
Casing/Total Depth			

Start (Date & Time): 6/1/05 · 1115
Finish (Date & Time): 6/1/05-1240
Weather: Clear, warm 60's F
Elevation of Ground Surface: _____

Location Sketch:
BS
MW1
estimate 100,100

Sample Interval	Sample No.	REC ~~Blows~~ (ft)	PID (ppm)	Field Description	Well Schematic	Comments
0-2	1116	0.8	1.6	Grayish brown (5YR 3/2) SILT and f. SAND, trace f. gravel (dry-damp)		
2-4	1123	0.9	0	Red brick		2 3
4-6	1126	0.9	0	same		4 collected MW1 (4-6) for VOCs + SVOCs
6-8	1131	NR	0	Med brown SILT, some f. sand, trace f. gravel (damp)		
8-10	1133	0.7	0	Moderate brown (5YR 4/4) f. SAND, little f. gravel, little silt (moist)		collected MW1 (8-10) for VOCs + SVOCs
				- becomes wet at 9.8		
				EOB @ 14 ft bg install well		14.0

Soil Stratigraphy Summary _____

Dvirka and Bartilucci CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

Well Construction Log

Site Utica Whitesboro St Job No. 1909 Well No. MW-1

Total Depth 14 ft Surface Elevation _____ Top Riser Elevation _____

Water Levels (Depth, Date, Time) _____ Date Installed 6/1/05

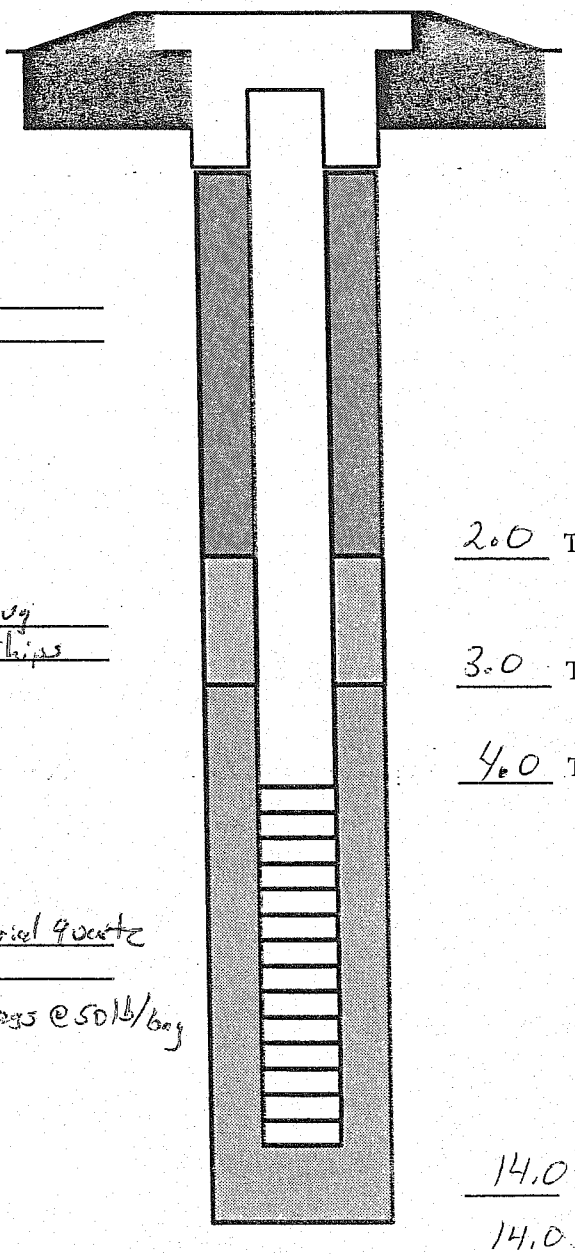
Riser Dia. 2-in Material PVC Length 4 ft
Screen Dia. 2-in Material PVC Length 10 ft Slot Size 10

SCHEMATIC

Surface Seal Type _____

Ground Surface
_____ Riser Elevation
_____ Bottom Surface Seal

Grout Type _____



2.0 Top Seal

Seal Type Enviroplug
Medium Chips
1 bag

3.0 Top Sand Pack

4.0 Top Screen

Sand Pack Type Industrial quartz
Size #1
6.5 bags @ 50lb/bag

14.0 Bottom Screen

14.0 Total Depth of Boring

ATTACHMENT 2

FIELD ACTIVITY FORMS

SITE INSPECTION FORM

Project Name: 26-28 Whitesboro Street Site

Date: _____

Location: 26-28 Whitesboro Street, Utica, NY

Inspector: _____

Company: _____

Cover System	Y	N	If Yes Describe	Actions Required?
Signs of Erosion				
Any Bare Areas				
Signs of Washouts				
Length of Grass Acceptable				
Dead/Dying Grass				
Evidence of Spills/ Dumping				
Evidence of Excavation				
Evidence of Site Development				
Damage (i.e., holes, etc.)				
Other Issues				

Inspector Signtature: _____

MONITORING WELL INSPECTION FORM

SITE: 26-28 WHITESBORO STREET SITE

COMPANY:

SITE NAME: 26-28 WHITESBORO STREET SITE

JOB#:

DATE:

TIME:

WELL ID:

INSPECTOR (PRINT):

EXTERIOR INSPECTION CONDITION

PROTECTIVE CASING/ CURB BOX:

LOCK/HASP CONDITION: LOCK KEY #:

HINGE/ LID: GASKET/SEAL :

SECURITY BOLTS TYPE:

SECURITY BOLTS : THREAD CONDITION:

WELL PAD: BOLLARDS:

LABEL/ ID CONDITION:

MAINTENANCE PERFORMED (e.g., anti seize applied, re-tapping bolt holes, bolt replacement, gasket replacement, etc.)

INTERIOR INSPECTION CONDITION

WELL CASING INTERIOR:

WELL RISER:

ANNULAR SPACE:

J PLUG:

WATER LEVEL: DEPTH TO BOTTOM:

HARD/SOFT BOTTOM:

MAINTENANCE PERFORMED (e.g., removed water, removed bentonite, sorbed sheen, replaced J plug, etc.)

ADDITIONAL COMMENTS:

INSPECTOR (SIGNATURE):

PROJECT MANAGER APPROVAL:

LOW FLOW GROUNDWATER PURGING/SAMPLING LOG

SITE: 26-28 WHITESBORO STREET SITE
COMPANY:

Project: _____ Site: _____ Well I.D.: _____

Date: _____ Sampling Personnel: _____ Company: _____

Purging/ Sampling Device: _____ Tubing Type: _____ Pump/Tubing Inlet Location: Screen midpoint

Measuring Point: Below Top of Riser Initial Depth to Water: _____ Depth to Well Bottom: _____ Well Diameter: _____ Screen Length: _____

Casing Type: _____ Volume in 1 Well Casing (liters): _____ Estimated Purge Volume (liters): _____

Sample ID: _____ Sample Time: _____ QA/QC: _____

Sample Parameters: _____

PURGE PARAMETERS

TIME	pH	TEMP (^{0}C)	COND. (mS/cm)	DISS. O_2 (mg/l)	TURB. (NTU)	Eh (mV)	FLOW RATE (ml/min.)	DEPTH TO WATER (btor)
Tolerance:	**0.1**	**---**	**3%**	**10%**	**10%**	**+ or - 10**	**---**	

Information: WATER VOLUMES--0.75 inch diameter well = 87 ml/ft; 1 inch diameter well = 154 ml/ft; 2 inch diameter well = 617 ml/ft; 4 inch diameter well = 2470 ml/ft ($vol_{yl} = \pi r^2 h$)

Remarks:

WELL DECOMMISSIONING RECORD

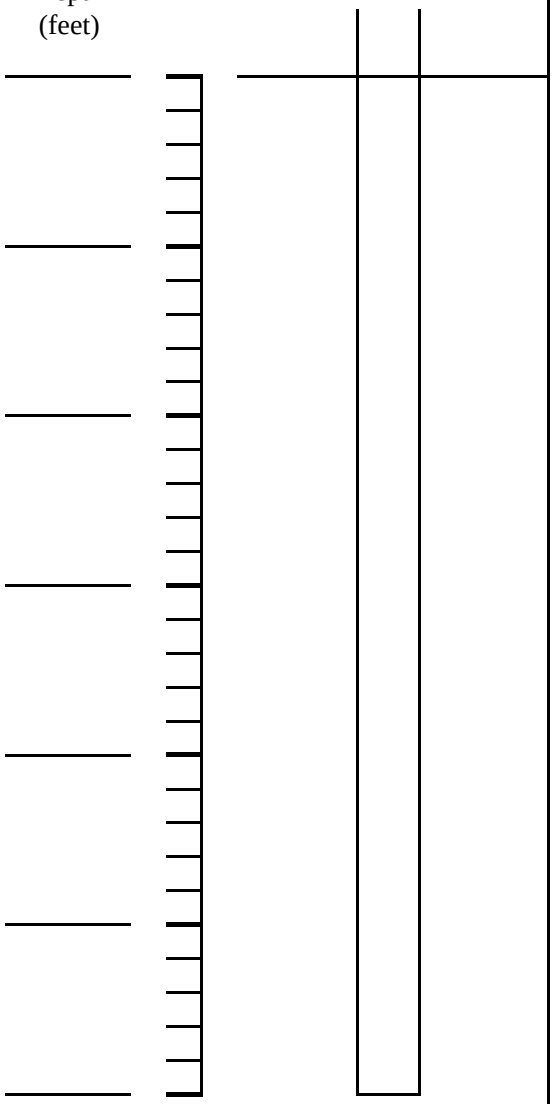
Site Name: 26-28 Whitesboro Street Site	Well I.D.:
Site Location: Utica, New York	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	
Drilling Method(s)	
Borehole Dia. (in.)	
Temporary Casing Installed? (y/n)	
Depth temporary casing installed	
Casing type/dia. (in.)	
Method of installing	
CASING PULLING	
Method employed	
Casing retrieved (feet)	
Casing type/dia. (in)	
CASING PERFORATING	
Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	
GROUTING	
Interval grouted (FBLS)	
# of batches prepared	
For each batch record:	
Quantity of water used (gal.)	
Quantity of cement used (lbs.)	
Cement type	
Quantity of bentonite used (lbs.)	
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	
Volume of grout used (gal.)	

COMMENTS:

WELL SCHEMATIC*



* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

Date: _____

Checklist Completed By: _____

Project Number: _____

Property Location: _____

System Installation Date: _____

The purpose of this form is to document the operation and maintenance of the sub-slab depressurization system to provide assurance that the system is functioning as designed or identify and execute any actions required to achieve the mitigation of subsurface vapor intrusion of volatile organic compounds to indoor air

1. MITIGATION SYSTEM INSPECTION

Occupant Interview

Any concerns identified by the building occupants?	YES	NO	

Comments / Action Items

Occupant's Initials: _____

External Piping

Vent pipes securely fastened to building	YES	NO	
Are there any visible openings or breaks in the pipe system	YES	NO	
Is the rain cap present and intact at discharge point	YES	NO	N/A
Inspection of the exhaust point verified that no air intakes have been located nearby	YES	NO	
The sealing/caulking around wall penetrations is intact	YES	NO	

Comments / Action Items

Mitigation Fan

Fan is mounted securely to building (no excessive vibrations during operation)	YES	NO	
Fan cover is installed	YES	NO	
No visible damage to fan or cover	YES	NO	

Comments / Action Items

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

Internal Piping

Vertical and horizontal pipe runs are secured, including at all penetration points	YES	NO	
The sealing/caulking is intact around the extraction point or points through the basement floor, crawlspace floor, and/or crawlspace/basement wall interface.	YES	NO	
Vibration dampener installed and intact (pertains to fan mount)	YES	NO	N/A
Mitigation system operation placard present and visible/legible	YES	NO	
Contains description of major components, valid contact number and instructions for occupant inquiries and/or system failure	YES	NO	
Mitigation system maintenance tag present and filled out	YES	NO	
Date of last inspection shown on tag:___________________________			
U-tube manometer present and intact at each extraction point	YES	NO	

Comments / Action Items

____

____

____

Electrical

Electrical connections secured	YES	NO
Junction boxes are closed	YES	NO
Conduit is supported	YES	NO
Circuit breakers controlling the mitigation fan and alarm circuits operate and are labeled "Mitigation System"	YES	NO
Power switch tagged with intact tamper proof seal	YES	NO
Audible alarm present	YES	NO
Audible alarm switch in "on" position (light on alarm is green)	YES	NO

Comments / Action Items

____

____

____

2. OPERATIONAL CHECKS

Fan is operating

Noise and Vibration within normal range	YES	NO
Alarm sounds when fan is turned off	YES	NO
U-Tube manometer indicating negative sub slab pressure	YES	NO

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

U-Tube Manometer Reading: Location:__________________ Vacuum __________ in H_20

Smoke test performed on internal penetrations and pipe joints

Smoke test indicated no leaks	YES	NO	N/A
Smoke test confirms air flow into sump	YES	NO	N/A
Back draft test confirms proper air flow at combustion appliances	YES	NO	N/A
Smoke test indicated no leaks	YES	NO	N/A

OPERATION, MONITORING AND MAINTENANCE CHECKLIST

3. MAINTENANCE

Fan last replaced on (date): _____

Fan due to be replaced; _____

Additional Maintenance Action Items Performed

_____

_____

_____

_____

4. ADDITIONAL ACTION ITEMS/ COMMENTS/COMPLETION DATES

_____

_____

_____

_____

_____

_____

_____

5. CERTIFICATION

I certify that the information on this form is true, accurate and complete (all blanks filled in) to the best of my knowledge and ability, and that I have the appropriate training and experience to perform this monitoring/inspection:

Name: _____ Affiliation: _____

Signature: _____ Date (dd/mm/yy): _____/_____am/pm