

FINAL FIELD ACTIVITIES PLAN

PILOT TEST

**SCOBELL CHEMICAL – NYSDOT Site (828076)
REMEDIAL DESIGN**

WORK ASSIGNMENT NO. D009809-26

Prepared for:

**New York State Department of Environmental Conservation
Albany, New York**

Prepared by:

**Earth Environment Engineering and Geology, P.C.
Portland, Maine**

EEEG: US-EI3616216143

March 2026

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TABLE OF CONTENTS

1.0	INTRODUCTION	1-1
1.1	WORK OBJECTIVES	1-2
1.2	SITE BACKGROUND	1-2
1.2.1	SITE DESCRIPTION	1-2
1.2.2	SITE HISTORY	1-3
1.2.3	PREVIOUS INVESTIGATIONS	1-3
2.0	SITE PHYSICAL SETTING	2-1
2.1	TOPOGRAPHY	2-1
2.2	CLIMATE.....	2-1
2.3	SURFACE WATER HYDROLOGY	2-1
2.4	GROUNDWATER HYDROLOGY	2-1
2.5	GEOLOGY	2-3
3.0	CONCEPTUAL SITE MODEL	3-1
3.1	SITE BACKGROUND	3-1
3.2	CONTAMINANTS OF CONCERN AND MEDIA AFFECTED.....	3-1
3.3	SOURCE AREAS	3-1
3.4	COC POINTS OF ENTRY	3-1
3.5	HYDROGEOLOGY AND CONTAMINANT DISTRIBUTION	3-2
3.5.1	OVERBURDEN FLOW ZONE.....	3-2
3.5.2	BEDROCK FLOW ZONE	3-2
3.6	HUMAN EXPOSURE PATHWAYS.....	3-3
4.0	SCOPE OF WORK.....	4-1
4.1	GENERAL FIELD OPERATIONS	4-1
4.1.1	HEALTH AND SAFETY	4-2
4.1.2	ACCESS AND CLEARANCE	4-2
4.1.3	COMMUNITY AIR MONITORING PLAN	4-2
4.1.4	MOBILIZATION	4-4
4.1.5	DECONTAMINATION.....	4-5
4.1.6	INVESTIGATION DERIVED WASTES	4-5
4.2	PILOT TEST ACTIVITIES	4-5
4.2.1	BEDROCK WELL DRILLING.....	4-6
4.2.2	BASELINE GROUNDWATER SAMPLING	4-7
4.2.3	INJECTION STRATEGY	4-8
4.2.4	POST INJECTION GROUNDWATER SAMPLING	4-11
4.2.5	SURVEY.....	4-12
4.3	DATA DELIVERABLE/REPORTING.....	4-12
5.0	REFERENCES	5-1

FIGURES

TABLES

APPENDICES

- Appendix A: Short Form Site-Specific HASP
- Appendix B: Ozark Underground Laboratory Procedures
- Appendix C: Calculations
- Appendix D: Amendment Safety Data Sheets

LIST OF FIGURES

Figure

- 1.1 Site Location
- 2.1 Interpreted Groundwater Contours
- 4.1 Injection Plan
- 4.2 Anticipated Injection Area Radius

LIST OF TABLES

Table

2.1 Monitoring Well Details and Groundwater Elevation

4.1 Proposed Field Tasks and Methodology

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CAMP	Community Air Monitoring Plan
COC	contaminant of concern
CSIA	Compound Specific Isotope Analysis
CSM	Conceptual Site Model
DCE	dichloroethene
DNAPL	dense non-aqueous phase liquid
EEEG	Earth Environment Engineering and Geology, P.C.
°F	degrees Fahrenheit
FAP	Field Activities Plan
HASP	Health and Safety Plan
ID	inside diameter
IDW	investigation-derived wastes
ISCR	In-Situ Chemical Reduction
K	hydraulic conductivity
MACTEC	MACTEC Engineering and Geology, P.C.
MNA	Monitored Natural Attenuation
msl	mean sea level
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PCE	tetrachloroethene
PF	pneumatic fracturing
PID	photoionization detector
ppm	parts per million
QAPP	Quality Assurance Program Plan
ROD	Record of Decision
SCOs	Soil Cleanup Objectives
Site	Scobell Chemical– NYSDOT Site
SOP	Standard Operating Procedure
1,1,1-TCA	1,1,1-trichloroethane
TCE	trichloroethene
$\mu\text{g}/\text{m}^3$	microgram(s) per cubic meter
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WA	Work Assignment
ZVI	zero valent iron

1.0 INTRODUCTION

This Field Activities Plan (FAP) has been prepared by Earth Environment Engineering and Geology, P.C. (EEEG; formerly MACTEC Engineering and Geology, PC [MACTEC]) in response to Work Assignment (WA) No. D009809-26 from the New York State Department of Environmental Conservation (NYSDEC) for the Scobell Chemical – NYSDOT Site (Site No 828076) (Site) in the Town of Brighton, Monroe County, New York (Figure 1.1). This FAP has been prepared in response to the NYSDEC WA Approval Letter for D009809-26 dated October 13, 2023 and with the January 2020 Superfund Standby Contract between MACTEC and the NYSDEC.

The Site is currently listed as a Class 2 site (i.e., significant threat to the public health or environment) by the NYSDEC. The Site has been identified as a source of volatile organic compounds (VOCs), primarily trichloroethene (TCE), detected in soil, bedrock, groundwater, and soil vapor at and downgradient of the Site. This FAP presents a technical scope of work to conduct an in-situ chemical reduction (ISCR) pilot study. Work will be conducted in accordance with the NYSDEC DER-10 Guidance (NYSDEC, 2010).

This FAP is organized into six sections as follows:

- *Section 1.0* – Introduction and WA Objectives.
- *Section 2.0* – Site Physical Setting – Describes the physical and geologic and hydrogeologic setting of the Site.
- *Section 3.0* – Conceptual Site Model (CSM) – Presents a working conceptual model describing how contaminants may have been released into the environment, how the chemicals may migrate, and the receptors that may be affected.
- *Section 4.0* – Scope of Work - Describes the field activities, sampling, and analysis that will be performed to evaluate the potential effectiveness of ISCR and bioremediation in the bedrock aquifer.
- *Section 5.0* – FAP References.

The FAP is supplemented by the following attached documents:

- *Appendix A* - EEEG Short Form Site-Specific Health and Safety Plan (HASP)
- *Appendix B* – Tracer Sampling Procedures
- *Appendix C* – Calculations
- *Appendix D* – Amendment Safety Data Sheets

1.1 WORK OBJECTIVES

The objectives covered in this FAP are to:

- Install four new open hole bedrock injection wells north of the Site; three for planned amendment injections and one for downgradient monitoring or future injections;
- Collect rock chip samples from fracture zones for analysis of VOCs to evaluate bedrock zones of potentially higher contamination;
- Conduct baseline groundwater monitoring of 15 wells for VOCs and monitored natural attenuation (MNA) parameters to evaluate current conditions prior to injections;
- Conduct injections of bioamendments and microbes through straddle packers with pneumatic fracturing within three intervals at eight locations (total of 24 injection intervals) to remediate VOC contamination in bedrock fractures;
- Conduct quarterly monitoring events starting one month post injections for VOC and MNA parameters at the 14 of the wells used to evaluate baseline groundwater concentrations to evaluate effects of injections;
- Conduct sampling for compound specific isotope analysis (CSIA) and microbial analysis at select wells during the second quarterly monitoring event to evaluate potential degradation pathways; and
- Conduct tracer analysis using charcoal samplers during the baseline and quarterly groundwater monitoring events to evaluate for previously placed tracers.

This FAP is prepared to provide the technical scope of work associated with the above activities in the area north of the Site.

1.2 SITE BACKGROUND

The Site background is discussed in the following sub-sections. Unless otherwise noted, information in the following sub-sections is from the WA issuance letter (NYSDEC, 2021).

1.2.1 SITE DESCRIPTION

The Scobell Chemical–NYSDOT Site is currently owned by the New York State Department of Transportation (NYSDOT) and is located at 1 Rockwood Place in a mixed commercial, industrial, and residential area in the northern section of the Town of Brighton and immediately east of the City of Rochester boundary. The Site occupies approximately 2 acres, contains no structures, is covered with grass and scrub growth, and is surrounded by a chain link fence. The Site borders the New York State (NYS) Highway 590 and 490 exchange, with Highway 590 bordering the east and south sides of the

Site. Commercial/industrial property borders the Site to the west. A small surface water drainage ditch parallels the New York Central Railroad Line that is present immediately north of the property. Grass Creek is located north of the Site beyond the railroad line. The nearest residential area is located along Blossom Road approximately 600 feet north of the Site.

1.2.2 SITE HISTORY

The Site is the location of a former chemical repackaging company that operated at this location from the 1920s until 1986. During this time, assorted chemicals were purchased by the company in bulk and repackaged into smaller containers for resale. The Site had one main building, two smaller structures and four above ground storage tanks. The overall amount and type of materials handled is unclear; however, subsurface soil and groundwater contamination has resulted from past operations.

In 1988 as part of a NYSDOT highway reconstruction project all the Site buildings were removed. During this project, the NYSDOT discovered contamination at the Site including abandoned drums and contaminated structures, as well as soil and bedrock contamination. Drums, containing chlorinated VOCs, pesticides/herbicides, and toluene, were found in one of the warehouses. In addition, deteriorated containers, discolored soils, and stained asphalt were found across the Site. As a result of the contamination, the NYSDOT excavated both soil and bedrock for off-site disposal from half of the property for the ability to finish the highway interchange reconstruction. The remainder of the Site was placed on the NYS Registry of Inactive Hazardous Waste Disposal Sites.

1.2.3 PREVIOUS INVESTIGATIONS

Several investigations have been conducted at the Site to date. Findings indicate the primary contaminants of concern (COCs) include TCE, tetrachloroethene (PCE), 1,1-dichloroethene (DCE), cis-1,2-DCE, vinyl chloride, 1,1,1-trichloroethane (TCA), benzene, toluene, and xylene.

Soil contamination was identified at the Site in exceedance of the Soil Cleanup Objectives (SCOs) for the protection of groundwater, however, the Site is zoned for commercial use and concentrations detected at only one location exceeded the SCOs for commercial use.

The primary contamination at and downgradient of the Site is TCE. The TCE has migrated to bedrock fractures below and downgradient of the Site, where it is present as a dense non-aqueous phase liquid (DNAPL). This DNAPL appears to be present primarily in fractures located between approximately 420 and 430 feet above mean sea level (msl) and extends more than 300 feet downgradient of the Site

(observed in MW-4D). This DNAPL is resulting in groundwater contamination (both overburden and bedrock) outside the DNAPL plume. Concentrations of Site contaminants in groundwater were determined to decrease with distance downgradient from the Site but were still present in groundwater at concentrations above the groundwater standards in monitoring wells approximately 2,000 feet northeast (downgradient) of the Site (MW-32S and 32D).

The contamination in groundwater was determined to be volatilizing to soil vapor, resulting in detectable levels of soil vapor contamination at properties adjacent to the Site, as well as 500 feet north of the Site. These properties have been mitigated with sub-slab depressurization systems.

Previous investigations also indicated that groundwater contamination was discharging to surface water, resulting in the presence of TCE in Grass Creek, located north of the Site; however, the most recent concentrations were below the surface water standard. Record of Decision, Previous Actions, and Current Work

An amended Record of Decision (ROD) was issued in 2013 (NYSDEC, 2013), based on the results of the 2013 Focused Feasibility Study. The remedial goals as stated in the 2013 ROD were to meet all standards, criteria and guidance values and be protective of human health and the environment. However, under the evaluation criteria the ROD states that “an unrestricted use remedy for this Site would be cost prohibited and is not achievable considering the contaminant mass that is diffused into the bedrock matrix.”

The remedy chosen to remediate the DNAPL and groundwater in the bedrock was ISCR through injection of zero valent iron (ZVI) in bedrock fractures. The amended ROD also included Long Term Monitoring to monitor the effectiveness of the DNAPL treatment alternative and monitor downgradient natural attenuation.

The chosen remedy in the 2013 ROD met the Remedial Action Objectives through ZVI injections to reduce contaminant mass, and deed restrictions and a Site Management Plan to eliminate potential exposure to Site related contamination. The ROD also included continued monitoring/mitigation of downgradient structures to mitigate the potential for soil vapor intrusion into nearby structures.

Based on the amended ROD, a pilot test was conducted between 2015 and 2018, with ZVI injections occurring in the most contaminated source area at the Site. Results of the pilot test indicated that although the ZVI resulted in an increased reduction of contaminant mass, the ZVI was pacified faster than

anticipated and will therefore not be a successful standalone remedy for the DNAPL present at the Site. ZVI without modification or additional amendments is therefore not recommended for full scale treatment of the DNAPL source area (MACTEC, 2020a).

Since ZVI alone was not recommended for full scale treatment, other options are being considered. One option evaluated was extracting groundwater at the Site, combined with surfactant flushing and bioremediation. To evaluate the potential for groundwater extraction, as well as if microbes necessary for the bioremediation of chlorinated compounds are present at the Site, a pre-design investigation pilot study was conducted in 2022 which included subsurface geophysical survey to determine the orientation of vertical north-south trending fractures, groundwater sample collection from two monitoring wells to evaluate existing microbial population and MNA parameters, installation of two bedrock extraction wells, 24-hour pumping tests on the two extraction wells, and groundwater sample collection from the extraction wells for VOCs, scaling, and fouling bacteria analysis.

The extraction well pumping tests conducted on-Site in April 2022 demonstrated that there is clearly a fracture network from which contaminated water can be pumped at rates between 1 and 1.5 gallons per minute; however, there are limitations to the conclusions that can be drawn from the data collected during the tests. Drawdown, the metric by which one can determine zone of influence, was limited to one or two wells on-Site during each test and thus could not be used to make strong conclusions about the influence each well had on the groundwater at the Site. Many of the observation wells, specifically the former injection wells, appear to be impacted by iron precipitate. These wells are believed to be entirely or mostly isolated from the fracture network that the extraction wells targeted, and it is believed that the fractures initially targeted by the iron injections are similarly impacted/blocked by iron precipitate. The iron filled fractures act as a barrier to groundwater flow within the fractured bedrock and would decrease the effectiveness of potential extraction and re-injection of groundwater in this area of the Site.

Although it was determined that pumping is possible at the Site, groundwater characteristics indicated that an extraction system could have issues with scale formation and biofouling and would need frequent maintenance; however, microbial data indicated that there are strongly reducing conditions at the Site and the population of microbes necessary for the complete degradation of TCE to non-toxic daughter products are present within bedrock groundwater and are fairly robust, including in well MW-4D where TCE was present as a DNAPL (MACTEC, 2023).

Due to the complexity of the Site in respect to the ZVI filled fractures, it was determined that a pilot test to evaluate the potential for surfactant flushing and bioremediation should be conducted north of the Site, in an area unaffected by the ZVI. An additional pilot test to evaluate fracture zones, contaminant concentrations and flow rates, and to estimate extraction pumping flow rates in bedrock on the Rochester Gas and Electric (RG&E) property north of the Site (on the north side of the railroad tracks) was conducted in 2024. This included the installation of five wells (RW-1 to RW-5) for possible injections and pumping, borehole geophysics, compound specific isotope analysis, and bench testing of possible biological amendments and biological amendments combined with ZVI. Although zones of high concentration of contaminants were identified in the new wells, flow rates were not sufficient to allow for the possibility of a recirculating pumping system to be used for groundwater treatment. However, bench testing did indicate that bioremediation of the high concentration groundwater contamination was possible, and that the addition of ZVI to the bioamendments could greatly improve the rate of degradation of the TCE and its daughter products cis-1,2-DCE and vinyl chloride (EEEG, 2024).

Since a recirculating groundwater system was deemed not possible without fracturing the bedrock, a smaller scale co-solvent and surfactant flush of five bedrock wells was conducted in 2025 to evaluate the effectiveness of contaminant mass removal from bedrock fractures and groundwater using an in-well push-pull system. Data from this pilot study indicated a decrease in TCE concentrations in and around where co-solvent and surfactant solutions were gravity-fed into bedrock wells. TCE concentrations in groundwater three months after the completion of the flush were generally lower than prior to the flush, indicating an affinity of TCE to transfer from groundwater to the co-solvent and surfactant solution with some longer lasting effects of the removal (EEEG, 2026).

In addition to the co-solvent/surfactant flush testing in 2025, a tracer test was conducted to evaluate groundwater flow direction and velocity north of the Site in the vicinity of the new injection wells. Data collected confirms groundwater flow direction to the northeast from this area through preferential pathways and heterogeneities in the bedrock fracture network, versus more open bedding plane fractures (EEEG, 2026).

Based on previous investigations and pilot studies conducted, a large-scale pilot test has been designed to target the downgradient residual source of TCE contamination that is present in shallow bedrock fractures approximately 20 to 35 feet bgs. The remedial action will include the injection of amendment consisting of a vegetable oil based electron donor solution (EDS-ER), liquid iron sulfide (ISR-CL), ZVI

(microscale ZVI to be mixed with the EDS), and associated nutrients, activators, and microbes. Field activities for the large-scale pilot test are described in this work plan.

2.0 SITE PHYSICAL SETTING

The sections below describe the topography, climate, surface water and groundwater hydrology, and geology in the area surrounding the Site.

2.1 TOPOGRAPHY

The Site is located at a topographic high approximately 450 feet above msl. The Site itself is relatively flat, however the topography drops steeply to the south and east of the Site, where the highway was excavated into bedrock and is approximately 30 feet lower in elevation than the Site. North of the Site, on the north side of the railroad tracks, the topography slopes gently down to the north, with the exception of a large man-made mound northeast of the Site. The land elevation drops gradually to 400 feet above msl approximately 5,000 feet northeast of the Site, before dropping steeply to Irondequoit Creek, located at an elevation of 250 feet above msl approximately 7,000 feet northeast of the Site.

2.2 CLIMATE

The climate of the area is characterized by moderately warm summers and cold winters. Mean monthly temperatures range from 26.2 degrees Fahrenheit (°F) in January to 72.3°F in July. Average annual precipitation is 35 inches. Average annual snowfall is 102 inches (For the period of 1991-2020 [National Oceanic and Atmospheric Administration, 2026]).

2.3 SURFACE WATER HYDROLOGY

The Site is a topographic high and is covered in vegetation; therefore, it is expected that surface water will generally infiltrate into the ground. However, in heavy rain events, water on the south side of the Site will flow south to the highway, and water on the north side of the Site will flow north to the drainage ditch along the railroad line, both of which flow into Grass Creek, located north of the Site.

2.4 GROUNDWATER HYDROLOGY

Vertical gradients at the Site are in the downward direction, from overburden to bedrock.

Overburden. Overburden groundwater at the Site is present from 2 to 9 feet bgs. This water is not present at all times of the year, and is interpreted as being primarily perched, either on intermediate surficial deposits, or on the till above bedrock.

Bedrock. Shallow bedrock groundwater is present at approximately 10 to 20 feet bgs across the study area. Groundwater flow from the Site is interpreted to be predominantly to the north and northeast and primarily controlled by bedrock fracture patterns. Although hydraulic heads and interpreted groundwater contours indicate flow from the Site primarily to the east and northeast, contaminant concentrations in bedrock indicate groundwater flow is primarily in the northerly direction, with perhaps an easterly component at the Site. Although the bedding planes and bedding fractures in the Lockport Dolomite are relatively flat lying, previous lineament analysis conducted in the vicinity of the Site indicated stress fractures striking in the north-northeast direction (Resolution Resources, Inc., 1999). Based on groundwater concentrations, and lineament analysis, it is interpreted the groundwater exhibits anisotropic flow, with flow direction controlled primarily by the stress fractures and flowing in a northerly direction, with some leaking to the east along bedding plane fractures. This resultant flow pattern would not be perpendicular to interpreted groundwater contours but include flows along primary and secondary fracture patterns. A conceptualized interpretation of this flow is shown on Figure 2.1. Well details and 2025 water level measurements are presented in Table 2.1.

Hydraulic conductivity (K) in shallow bedrock at and downgradient of the Site was estimated to range from 3.86×10^{-5} centimeters per second (cm/sec) to 9.74×10^{-4} cm/sec (NYSDEC, 2002). Based on these K values, and an estimated bedrock porosity of 0.001, estimated bedrock seepage velocity ranges from one to ten feet per day. MACTEC calculated higher K values than those indicated previously (MACTEC, 2013). Using the MACTEC 2013 K values, new seepage velocities were calculated for the area where bedrock groundwater is anticipated to be most contaminated. Estimated seepage velocities ranged from nine to 60 feet per day (MACTEC, 2020a). This seepage velocity could be higher or lower based on actual bedrock conditions and has not been evaluated in the area of the previous ZVI injections.

Tracer data collected in 2025 also matches the conceptual site model indicating groundwater flow appears to be slowly migrating from the high concentration areas (vicinity of MW-4D) to the northeast. Tracer dyes were not detected in wells south, west, or north of the tracer placement wells, confirming that natural groundwater flow is primarily to the northeast. Tracer test analysis confirms bedrock groundwater flow is controlled largely by preferential pathways and heterogeneities in the bedrock fracture network, versus more open bedding plane fractures. Calculations completed with the tracer data indicated groundwater flow transports tracer dyes at least 4 feet per day in the fractures intercepting RW-4 and 2.3 feet per day in the fractures intercepting RW-2 (EEEG, 2026).

2.5 GEOLOGY

The Site is located within the Erie-Ontario Lowlands Physiographic Province of NYS within which low plains with little relief characterize the province. The glaciated topography is an expression of nearly flat-lying sedimentary rock formations covered by glaciolacustrine deposits and till. Kame moraine deposits are found in the Pinnacle Hill located southwest of the Site. The bedrock structure is homoclinal with a gentle southerly dip into the Appalachian Basin. The bedrock is gently deformed with some scattered, small folds and faults (NYSDEC, 2002).

The overburden at the Site consists of sandy fill (approximately 4 feet thick) and sandy/silty till to bedrock (overburden ranges from 5.5 to 15.5 feet thick).

Bedrock in the area of the Site consists of Lockport Dolomite, made up of 3 members; Clinton Formation (six to eight feet thick in the vicinity of the Site), Penfield formation (49 to 58 feet thick in the vicinity of the Site), and the DeCew Formation (reportedly 12 feet thick). These are underlain by Rochester Shale (Gates Dolomite and Rochester Shale members are reportedly 150 feet thick).

The bedrock surface in the vicinity of the Site slopes down slightly to the north and northeast, with the Site being a bedrock high. Although the Bedrock bedding plane in Rochester generally dips one to two degrees to the south, Site data indicates that in the immediate vicinity of the Site, the bedding planes are fairly flat lying, with a possible slight dip to the north. Although Lockport Dolomite is fairly competent, the primary water bearing fractures likely exist along distinct bedding planes. The bedrock is also noted to have high angle vertical fractures/joints that trend primarily north to northeast. Bedrock tends to be more competent (i.e. less fracturing) with depth.

3.0 CONCEPTUAL SITE MODEL

This CSM is based on information that is currently available; it is considered a dynamic model, subject to modification as more data becomes available. The CSM presented below presents the current understanding of the Site.

3.1 SITE BACKGROUND

The Site is in an industrial/commercial area of the Town of Brighton. The Site was used for chemical distribution and repackaging from 1920 until 1988 including toluene, TCE, and PCE.

3.2 CONTAMINANTS OF CONCERN AND MEDIA AFFECTED

The primary contaminant that has been detected is TCE and its breakdown products (daughter products). Other contaminants identified in Site media include PCE, 1,1,1-TCA, toluene, xylene, and benzene. These contaminants have migrated to bedrock fractures, some as a DNAPL, contaminating bedrock and groundwater at and downgradient of the Site. These contaminants have also been detected in soil vapor.

3.3 SOURCE AREAS

Although actual source areas were not identified during previous investigations (e.g., no broken floor drains or leaking storage tanks were identified), areas of elevated concentrations of chlorinated solvents and toluene were identified in Site soil. Chlorinated solvent concentrations exceeded the SCOs for the protection of groundwater but did not exceed the SCOs for commercial or industrial use. Concentrations of toluene were detected above the SCOs for both commercial and industrial use.

3.4 COC POINTS OF ENTRY

The COCs appear to have entered the subsurface at the Site via releases to the ground surface as a result of improper handling/storage of chemicals at the Site (e.g., from leaking drums, above ground storage tanks, potential discharges to floor drains, etc.). Although elevated concentrations of COCs were identified in Site soils, the specific entry point(s) were not identified. These contaminants have migrated through sandy fill and sandy/silty glacial till to bedrock (overburden ranges from 5.5 to 15.5 feet thick). TCE and PCE are DNAPLs, meaning they are heavier than water and do not readily mix with water. Therefore, if released in sufficient quantities, these chemicals tend to sink within the water column until

they reach an impenetrable barrier, where they remain as a neat product and slowly dissolve into the water column, or diffuse into the surrounding matrix.

3.5 HYDROGEOLOGY AND CONTAMINANT DISTRIBUTION

Both PCE and TCE tend to be recalcitrant (i.e., persistent) in the environment. It is not unusual to find either contaminant persisting in the environment decades after their purported discontinued use. Both compounds degrade through reductive dechlorination. The presence of daughter products resulting from dechlorination of both PCE and TCE, as well as the presence of bacteria capable of dechlorinating PCE and TCE, suggests that subsurface Site conditions may be suitable for their natural degradation. However, TCE as a DNAPL has been identified within bedrock fractures at the Site (MW-3D) and approximately 300 feet downgradient of the Site (MW-4D), which will act as a continued source of groundwater contamination. Because the discharge area was not identified, the exact flow path for this DNAPL from the Site is not known; however, based on the current CSM, vertical fractures in shallow bedrock below the Site transported the contamination to large horizontal fractures (distinct bedding planes) which appear to act as the primary transport mechanism for both DNAPL and groundwater off-Site to the north. It is hypothesized that flow within the horizontal fractures at and north of the Site is controlled by dissolution channels created in the dolostone at the intersection of the high angled fractures and bedding plane fractures.

3.5.1 OVERBURDEN FLOW ZONE

The overburden groundwater table appears to be perched in a thin zone above the overburden/bedrock interface. Most of the shallow overburden groundwater on-Site flows to the south, towards the I-590 ramp, whereas shallow overburden groundwater off-Site, to the north of the railroad tracks, flows to the northeast. Most of the wells installed in the overburden were observed to be dry during the December 2014 sampling event; these have not been evaluated since 2014 due to overburden groundwater not being considered an important contaminant transport mechanism in the vicinity of the Site.

3.5.2 BEDROCK FLOW ZONE

Bedrock groundwater flow from the Site is predominantly to the northeast. Contaminants associated with the Site have been detected in overburden groundwater and extending vertically down to deep bedrock groundwater (to approximately 70 feet deep or 370 feet above msl) downgradient of the Site. However, the primary groundwater migration path for chlorinated solvents from the Site appears to be

in shallow bedrock groundwater between approximately 420 to 430 feet above msl. Within this interval, an approximate 4-foot zone of bedrock with several horizontal fractures contains the majority of the contaminant mass (MACTEC, 2013). It is likely that these horizontal fractures, which are the result of bedding planes, undulate slightly, allowing pockets, or blebs of residual DNAPL to remain trapped in low spots, or within larger aperture “channels” of the bedding planes. This contamination has also migrated into the pore spaces of the bedrock (primary porosity) surrounding the contaminated fractures (secondary porosity). The presence of DNAPL within the fracture zones and within the bedrock matrix will act as a continuing source of groundwater contamination. This is evidenced by the steady state of TCE concentrations in groundwater measured between 1998 and 2025. TCE contamination also exists in a dissolved phase in the groundwater present in bedrock fractures at the Site where DNAPL is present (MACTEC, 2013).

3.6 HUMAN EXPOSURE PATHWAYS

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

Contaminated groundwater from the Site is not utilized for public consumption. The area and surrounding residents are served by a public water supply that obtains its water from a source unaffected by the contamination associated with the Site. Access to the Site is restricted, however, contact with contaminated groundwater and soil is unlikely due to the depth of contamination below the ground surface.

VOCs in the groundwater may migrate as soil vapor, which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Currently, there are no occupied buildings on the Site. However, the potential may exist for the inhalation of Site contaminants due to soil vapor intrusion for any future on-Site building development and occupancy. Sampling conducted has indicated that the potential exists for inhalation of Site-related contaminants via soil vapor intrusion in off-Site buildings. Sub-slab depressurization systems (systems that ventilates/removes air beneath the building to create sub-slab vacuum) have been installed at several off-Site buildings to prevent the inhalation of Site related contamination.

4.0 SCOPE OF WORK

Based on results of the previous pilot tests in 2022 and 2025, the continued presence of DNAPL and high concentrations of chlorinated compounds in groundwater at the Site, it is necessary to evaluate additional alternatives to remove contaminant mass from the Site. Using results of the previous pilot tests and bench tests, a large-scale pilot test has been designed.

This FAP has been developed for the purpose of evaluating a combined ISCR/bioamendment using abiotic degradation with zero valent iron and iron sulfides, and biological degradation with bioamendments and bioaugmentation on the RG&E property north (downgradient) of the Site.

A summary of the field tasks and methodologies, as well as sample IDs are described in Table 4.1, as well as in the following subsections. Proposed injection locations and existing well locations are shown on Figure 4.1.

4.1 GENERAL FIELD OPERATIONS

Companion documents to this FAP that will govern the execution of the field exploration activities include EEEG's Program Quality Assurance Program Plan (QAPP) (EEEG, 2025) and HASP (MACTEC, 2020b). In addition to these program documents, Appendix A provides a Site-specific HASP.

Subcontractors selected to support the field activities include:

- Blood Hound, LLC – Utility locating services.
- Nothnagle Drilling Inc– Installation of open hole bedrock wells
- Cascade Remediation Services, LLC. - Perform injections of amendment using a packer system and pneumatic enhancement tooling.
- ALS – Performance of laboratory services for groundwater sample analysis.
- Sirem (through Tersus Environmental, LLC) – Performance of laboratory services for microbes.
- Tersus Environmental, LLC – Performance of laboratory services for CSIA testing and microbial analysis (through Sirem Laboratories), as well as pilot design support.
- EWMI – Transport and disposal of Investigation Derived Waste (IDW).

4.1.1 HEALTH AND SAFETY

The Site-specific HASP is provided as Appendix A to this document. EEEG anticipates that the fieldwork will be conducted in Level D personal protection. Specific investigation activities, utility clearance procedures, and required level of personal protection are set forth in the Site-specific HASP. Criteria for upgrading or downgrading the specified level of protection are also provided in the Site-specific HASP. Additional health and safety requirements are set forth in the Program HASP (MACTEC, 2020b). Should Site conditions pose a threat to those present on-Site, and/or should Site conditions warrant an upgrade from Level D, as defined by the HASP, work will stop and the situation will be reevaluated by the NYSDEC and EEEG. The New York State Department of Health (NYSDOH) Community Air Monitoring Plan (CAMP) will also be followed.

4.1.2 ACCESS AND CLEARANCE

Current proposed explorations are limited to the RG&E property and NYSDOT property located across the railroad tracks north of the Site. The NYSDEC will be responsible for coordinating access. EEEG, the NYSDEC and RG&E currently have an approved access agreement in place. A NYSDOT permit has been acquired for the proposed well on the NYSDOT property.

For clearing exploration locations of utilities, the utility locate contractor (Blood Hound) will be responsible for marking locations in the field. The drilling contractor (Nothnagle) will be responsible for coordinating utility clearance with Dig Safely – New York. EEEG will confirm drilling locations and utility clearance prior to conducting drilling activities.

4.1.3 COMMUNITY AIR MONITORING PLAN

4.1.3.1 Purpose

The purpose of the community air monitoring plan (CAMP) is to provide a measure of protection for the downwind community from potential airborne contaminant releases as a result of remedial work activities performed at the Site. Site-specific procedures described below are consistent with the NYSDOH generic CAMP (NYSDEC, 2010). The proposed borings are located on the RG&E property to the north of the site.

4.1.3.2 Particulate Air Monitoring

Particulate monitoring will be conducted continuously during ground intrusive activities (e.g., installation of soil/bedrock borings and monitoring wells). Dust/particulate monitoring will be conducted: 1) in the immediate vicinity of the drilling activities for driller health and safety and, 2) 50 feet towards the nearest occupied properties (i.e., Ellison Park Apartments) to evaluate potential community exposure. The dust monitor placed near the drill rig will also occasionally be used to assess up-wind dust concentrations. Dust monitoring may be suspended during periods of precipitation.

Particulate air monitoring will be conducted with a TSI DustTrak II (or a similar device). This instrument is equipped with an audible alarm (indication of exceedance) and is capable of measuring particulate matter less than 10 micrometers in size (PM-10). The device will continually record emissions (calculating 15-minute running average concentrations) generated during field activities. The dust monitoring device will be checked periodically throughout each day of intrusive activities to assess emissions and the need for corrective action.

Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of Site activities. As work and weather conditions change throughout the day, the locations where the dust monitoring devices are set up may be adjusted accordingly.

Particulate monitoring response and action levels include:

- If the PM-10 particulate level is 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) greater than background for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that the PM-10 particulate levels do not exceed $150 \mu\text{g}/\text{m}^3$ above background level and provided that no visible dust is migrating from the work area.
- If after implementation of dust suppression techniques, the PM-10 particulate levels are greater than $150 \mu\text{g}/\text{m}^3$ above background, work will 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 PM-10 particulate concentration to within $150 \mu\text{g}/\text{m}^3$ of the background level and in preventing visible dust migration.

4.1.3.3 VOC Air Monitoring

VOC air monitoring will be conducted in conjunction with the dust monitoring program. VOC air monitoring will be conducted using a RAE Systems MiniRAE 3000 VOC instrument (or a similar photoionization detection [PID] device). This will provide real-time recordable air monitoring data.

VOC monitoring will be conducted for ground intrusive (continuous monitoring) and non-intrusive activities (periodic monitoring).

VOCs will be continuously monitored: 1) in the immediate vicinity of the drilling operation for driller health and safety and, 2) 50 feet towards the nearest occupied properties (i.e., Ellison Park Apartments) to evaluate potential community exposure. Upwind/background concentrations will be measured before field activities commence and periodically throughout the day to confirm background conditions. The drilling area VOC monitoring device will also be checked periodically throughout the day to assess emissions and the need for corrective action.

VOC monitoring response and action levels include:

- If the ambient air concentration of total organic vapors at the work area or downgradient exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will 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.
- If total organic vapor levels at the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. Work activities can resume provided the total organic vapor level 200 feet downwind of the work area or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, below 5 ppm over background for the 15 minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of Site activities. As work and weather conditions change throughout the day, the locations of the VOC monitoring devices may be adjusted accordingly.

4.1.4 MOBILIZATION

Mobilization will include obtaining utility clearances for proposed locations, procurement of subcontractors, and the acquisition and coordination of supplies. An access agreement is in place between RG&E, EEEG, and the NYSDEC; however, if issues arise, the NYSDEC will be responsible for confirming access to the Site.

4.1.5 DECONTAMINATION

Sampling methods and equipment for this field program have been chosen to minimize decontamination requirements reducing the potential for cross contamination. Disposable sampling equipment will be used as much as practical to minimize decontamination time and water disposal. Non-disposable sampling equipment will be decontaminated before and after the collection of each sample. Decontamination methods and materials are described in EEEG Standard Operating Procedure #S21 – Field Equipment Decontamination (EEEG, 2025).

Non-disposable sampling equipment will be decontaminated by 1) washing the sample collection equipment with potable water and Alconox[®], rinsing with potable water, rinsing with deionized water, and then allowing the equipment to air dry, or 2) steam cleaning the equipment and then allowing the equipment to air dry. Drilling equipment (i.e. drill rods and casing) will be decontaminated by steam cleaning with potable water prior to each boring and before leaving the Site on a temporary decontamination pad constructed at the Site. Decontamination water will be collected, containerized, and stored on pallets in an agreed upon area on the RG&E property (i.e., in the grassy area adjacent to the access gate to the transformer station) in labeled containers awaiting treatment and/or proper disposal based on IDW characterization sampling results.

4.1.6 INVESTIGATION DERIVED WASTES

The method of disposing of IDW will be based upon whether the wastes are considered hazardous or non-hazardous. Wastes generated during the field investigation will be containerized using United States Department of Transportation (USDOT) approved 55-gallon containers staged on RG&E property in an area approved by the property owner. In addition, storage tanks may be used for a portion of the work. Transport and disposal of these containers and material will be arranged by EEEG on behalf of the NYSDEC.

4.2 PILOT TEST ACTIVITIES

The fieldwork is anticipated to be conducted as described in the following subsections. The fieldwork will be conducted in accordance with the specifications presented in the QAPP (EEEG, 2025), a stand-alone document.

Field activities will include the following items and anticipated dates:

- Install three new open-hole bedrock injection wells surrounding RW-2 to allow injection of biological amendments. Collection of bedrock chips from select fractures will be conducted for VOC analysis during installation to further evaluate locations/elevations of contaminant mass. Well installation is planned for late February 2026, with results from bedrock chip samples planned for late March 2026.
- Install one new open-hole bedrock well to be used as a monitoring well, or potential future injection well, further east of the proposed injections. Collection of bedrock chips from select fractures will be conducted for VOC analysis during installation to further evaluate locations/elevations of contaminant mass. Well installation is planned for early April 2026, with results from bedrock chip samples planned for late March 2026.
- Collect a round of baseline groundwater samples from 15 wells to evaluate pre-injection baseline conditions. Sampling will be conducted in mid to late April 2026, prior to injections.
- Conduct permeability enhanced injections at eight locations (five existing well and three new wells) of selected bioamendment and ZVI for in-situ mass reduction of contaminant mass present in the saturated bedrock fractures. Injections will be attempted through five-foot packers at three locations in each injection well for 24 total injection intervals at the following approximate depths: 20 to 25 feet, 25 to 30 feet, and 30 to 35 feet bgs. Injections are planned for late April and are anticipated to take up to three weeks to complete.
- Collect water level and specific conductance data during injections from four wells around the well where injections are incurring to evaluate radius of influence.
- Collect groundwater samples post injection on a quarterly basis starting one month post injections from a select set of wells to evaluate effects of injections. Groundwater sampling planned for early June 2026 and early September 2026.
- Collect tracer test samples pre and post injections to continue to evaluate bedrock flow paths.

4.2.1 BEDROCK WELL DRILLING

The four wells will be installed in the vicinity of the contaminant plume on the RG&E property and the NYSDOT property. The locations of the four proposed open bedrock wells have been selected to surround existing high concentration well RW-2 and to allow better potential aerial coverage of the injected amendment in the areas with the highest groundwater concentrations of VOCs, as well as one well further downgradient for monitoring effects of injection. One well, RW-6, will be installed approximately 75 feet west of RW-2, one well, RW-7, will be installed approximately 90 feet north of RW-2 (north of the drainage ditch), one well, RW-8, will be installed approximately 100 feet east of RW-2 and 70 feet northeast of RW-3, and one well, RW-9, will be installed approximately 70 feet east of RW-8.

Wells will be advanced using a tracked drilling rig. Borings will be augured to bedrock (approximately at 10 feet bgs) using 6 ¼ -inch inside diameter (ID) hollow stem augers. The boreholes will then be

continued four feet into bedrock using a tri-cone bit and a four-inch ID steel casing will be cemented into place. The well boreholes will then be completed into bedrock using coring techniques to approximately 35 feet bgs (approximately 25 feet below top of bedrock) for the proposed injection wells. Bedrock cores will be reviewed and screened with a PID. Based on visual and PID readings, rock chip samples will be collected from up to three fracture zones at each location and analyzed for VOCs using the methanol extraction of rock chips technique following standard operating procedure (SOP) S15 of the QAPP. This SOP outlines the procedure for chipping bedrock pieces from the fracture surface and using methanol to extract the VOCs out of the rock chips as would be done for soil using EPA Method 5035. The methanol is then analyzed for VOCs using USEPA Method 8260 to calculate the concentration of VOCs in bedrock in micrograms per kilogram. This procedure has been completed previously at the site in select borings to evaluate fracture zones that likely contain the most contaminant mass. Results of this analysis will help fill data gaps in areas where bedrock samples have not previously been analyzed, as well as to aid in remedial amendment injection decision making (i.e., ensure effort is made to inject amendment into areas of identified high concentrations of VOCs). Soil boring and rock coring techniques are described in SOP S16 of the QAPP (EEEG, 2025).

Each of the proposed injection and monitoring wells will be completed as open-hole bedrock wells and will be completed with a 2-foot stick-up, locking cover, drain hole, and concrete apron.

Upon completion of well installations, the newly installed injection wells will be developed using pump and surge techniques as described SOP S23 of the QAPP (EEEG, 2025).

4.2.2 BASELINE GROUNDWATER SAMPLING

Baseline. Following installation of new wells, and prior to commencing injections, groundwater samples will be collected from 15 wells using low flow procedures (SOP S3) to evaluate baseline groundwater characteristics prior to injections (See Table 4.1). Samples will be collected for VOCs by USEPA Method 8260 and the following select MNA parameters:

- Nitrate-nitrogen – SM 4500
- Sulfate – USEPA Method 300
- Chloride – SM 4500 CL
- Alkalinity – SM 2320 B
- Dissolved gases – RSK-175 (methane, ethane, ethene)
- Total Organic Carbon – USEPA Method 415.1

- Iron – USEPA Method 6010D.

The laboratory will provide NYSDEC Category B data package with an electronic data deliverable.

In addition to the above, charcoal tracer samplers that are currently attached to bailers will be collected from wells where they were previously placed: MW-01, MW-4D, MW-5D, MW-7S, MW-20D, MW-21D, MW-22D, MW-23D, MW-29D, MW-29DD, RW-3, and RW-5 (MW-01 not shown on Figure 4.1, but is approximately 400 feet north of MW-7S). Samples will be collected by first lowering the line with bailers by three feet, and then pulling up the bailers to collect fresh water in the bailers. Charcoal samplers will be placed in laboratory supplied ziplocks and water from the bailers will be collected in laboratory supplied containers. Samples will be shipped to Ozark Underground Laboratories using the Chain of Custody included in Appendix B. Charcoal samplers will be replaced with new samplers and placed in wells MW-01, MW-7S, MW-22D, and MW-23D. Charcoal/tracer sampling procedures are included in Appendix B.

Purge water will be treated on-site with granular activated carbon and containerized in labeled 55-gallon drums and stored in an area agreed upon by the property owner awaiting analytical results indicating the water can be discharged to the ground surface.

4.2.3 INJECTION STRATEGY

Following completion of well installations and baseline groundwater sampling, injections will begin in the open rock wells to target 20 to 35 feet bgs. Cascade will perform the injection activities with the oversight of EEEG. There are 8 planned injection wells (RW-1 to RW-8; with RW-1 to RW-5 wells having a six-inch inside diameter, and RW-6 to RW-8 planned to have a four-inch inside diameter). To minimize pushing contaminants from the hot-spots out to less contaminated areas untreated, injections will be conducted starting north of MW-4D and RW-2, and proceeding in a counterclockwise direction, prior to injecting into the center of contaminated area; i.e., RW-7, RW-6, RW-5, RW-4, RW-3, RW-8, RW-2, RW-1. This will also allow placement of amendment around the hot spots, so that contaminants that may get pushed out of the hot spot area will be pushed into areas where amendment is already present. Each of the injection wells are planned for injections within three five-foot intervals, for 24 injection intervals total. Intervals are planned for approximately 35 to 30 feet, 30 to 25 feet, and 25 to 20 feet.

Prior to injections, transducers capable of measuring water levels and specific conductance will be placed in four wells surrounding the first injection point (RW-8, MW-5D, , MW-21D, and RW-2).

Transducers will be set to record at 30 second intervals and will be started prior to the first injection. Initial readings will be recorded in the field logbook along with depth to water measurements. The transducers will identify changes in water levels during injections and also change in specific conductance to evaluate influence of injections and if injected material, which will include bromide to increase conductance, has reached the probe. Depending on observations from the first injection well, transducers may be moved prior to subsequent injections.

The primary injection methodology will be permeability enhanced injections through a straddle-packer configuration with Pneumatic Fracturing (PF) as the means of permeability enhancement. Straddle-packer configuration is achieved using inflatable rubber bladders (packers) to isolate geologic sections of an open-hole bedrock well. Expandable packers are positioned one above the other on a metal pipe. Their configuration permits pneumatic pressure and injection material to pass through the pipes to the targeted interval. The packers will be inflated with compressed air to hydraulically isolate the deepest injection interval first, followed by subsequent intervals using a bottom-up approach.

Drillers will observe and collect the following operational parameters during PF:

- Down-hole initiation and maintenance pressures at the injection point to evaluate existence of new and existing fractures and ease of propagation and injections;
- Pressure influences at surrounding monitoring wells to evaluate qualitative estimate of distribution of injected nitrogen; and
- Ground surface deflection at the injection point to evaluate potential for surface heave in vicinity of injections.

Immediately following PF, amendment slurry will be injected (see below for mixture). Once mixed, the amendment will be pumped through a piston pump (or other similar pump), 1.25-inch injection hosing, through the well head fitted with a pressure gauge, drill rods, packers, and out through the injection nozzle. Injection rates, based on prior injections at the Site, are estimated to be between 15 to 20 gallons per minute (gpm).

This injection procedure will be completed at each interval sequentially with the bottom-up approach. During the injection process, water levels and specific conductance will be measured and recorded in nearby wells to evaluate the potential radius of influence for each injection. The anticipated radius of influence for each injection location is shown on Figure 4.2.

Injected amendments will be mixed on Site except the KB-1[®], which will be added separately at the time of injections. In addition, bromide will be added to the initial injections as a tracer to evaluate radius of influence. It is assumed that approximately one cup bromide will be added to a five-gallon bucket of water, and the conductivity of the water will be measured and compared to the conductivity measurements from the in-well transducers discussed above. If possible, this bucket will be emptied into the amendment stream at the beginning of the injection. This will be conducted at each of the initial injection intervals. Actual procedures may vary based on Cascade’s mixing and injection set up. Decisions to stop adding bromide will be based on findings/observations during previous injections (e.g., if increased conductivity has already been observed in monitoring wells with transducers, additional bromide will not be beneficial in evaluating radius of influence).

Quantities of the amendments have been determined based on the volume of groundwater in the treatment area, bench test results (EEEG, 2024), and typical injection strategy quantities (the basis of design calculations for the quantity and amendment makeup is included in Appendix C). Amendments will be mixed with potable water prior to injections. For proper amendment distribution and pore-volume replacement, a total of up to 60,000 gallons of potable water is planned for injections. The exact quantity of potable water will be dependent upon field observations and water level data during injections. The following total quantities of amendments are planned to be injected into the 24 injection intervals (amendment safety data sheets are included in Attachment D):

- 20,650 lbs. (2,100 gallons) of ISR-CL.
- 16,000 lbs. of 45- μ m ZVI powder.
- 6,300 lbs. (821 gal.) of EDS-ER.
- 1,500 lbs. (196 gal.) of EDS-Activator.
- 1,500 lbs. (1,187 gal) of Substrate Shuttle.
- 75 lbs. of TersOx[™] Nutrients-QR.
- 400 lbs. of KB-1[®] Primer.
- 80 liters of KB-1[®] Microbes.
- Bromide, one cup per injection interval (will be used as long as field transducer measurements are deemed useful for injection tracking purposes).

Injection procedures may change based on injection contractors preferred methods, and findings during initial injections. The water and amendments will be mixed in batches by Cascade Remediation Services

using the above ratios. It is anticipated that approximately 2,500 gallons of amendment mixture will be injected at each interval; however, if transducer data or field observations indicate that material is being transported further than anticipated, or there is difficulty in injecting that quantity, the volume of water in the mixture may be reduced to inject a more concentrated mixture. In addition, if an interval does not include existing fractures that can be enhanced (i.e., the PF is not successful), the planned volume for that interval may be distributed to other intervals within that injection well, or into other nearby wells.

4.2.4 POST INJECTION GROUNDWATER SAMPLING

Quarterly Monitoring. Approximately one month following completion of injections (considered part of the first quarter, with injections), and then on a quarterly basis, groundwater samples will be collected from 14 wells within and surrounding the injection area using low flow procedures (SOP S3 in the QAPP [EEEG, 2025]) to evaluate the presence of biodegrading microbes and general groundwater characteristics. Samples will be collected for VOCs by USEPA Method 8260 and the same select MNA parameters as the baseline sampling.

During the four-month post injection sampling event (second quarter), groundwater samples will also be collected from MW-12D (upgradient of injections), MW-4D (source area), MW-5D (downgradient) and MW-22D (further downgradient) for analysis of carbon 13 CSIA by Sirem Laboratories. In addition, groundwater samples will be collected from MW-4D (source area) and MW-5D (downgradient) for microbial analysis by Sirem following quantitative polymerase chain reaction (qPCR) KB-1 Trac.

Charcoal samplers will be collected and replaced with new samplers in wells MW-01, MW-7S, MW-22D, and MW-23D as discussed in Section 4.2.2 during both the one-month (first quarter) and four-month (second quarter) sampling events. Charcoal sample locations may be modified based on prior sampling results.

Purge water will be treated on-site with granular activated carbon and containerized in labeled 55-gallon drums and stored in an area agreed upon by the property owner awaiting analytical results indicating the water can be discharged to the ground surface.

It is anticipated that two rounds of sampling will be conducted by EEEG under the current contract WA.

4.2.5 SURVEY

Newly installed well locations will be surveyed by Patriot Design Group. Horizontal locations will be tied to the NYS Plane Coordinate System using North American Datum of 1983 to an accuracy of 0.1 foot. Vertical elevations of groundwater wells will be tied to existing monitoring well data using North American Vertical Datum of 1988, and measured to an accuracy of 0.01 feet. Horizontal locations and vertical elevation data will be presented to EEEG in a database to be used with geographic information system software. Well locations will be presented on an aerial photograph of the Site and surrounding area.

4.3 DATA DELIVERABLE/REPORTING

Data obtained under this FAP, including analytical laboratory data, will be reviewed and incorporated into a pilot test letter report, which will summarize findings of the pilot test, including a comparison of laboratory analytical results to applicable NYS groundwater standards (NYS, 1999) and the ability of the injected material to treat the VOC contamination within the fractured bedrock. Discussions will include analysis of injections and groundwater sampling completed. Boring logs and environmental sampling data will be included as appendices to the report. Although post injection sampling should be conducted for at least a year prior to making further decisions, this initial data will help determine if additional injections are needed in this vicinity of the plume, or if injections should be continued in other areas of the groundwater plume, including below the Site itself.

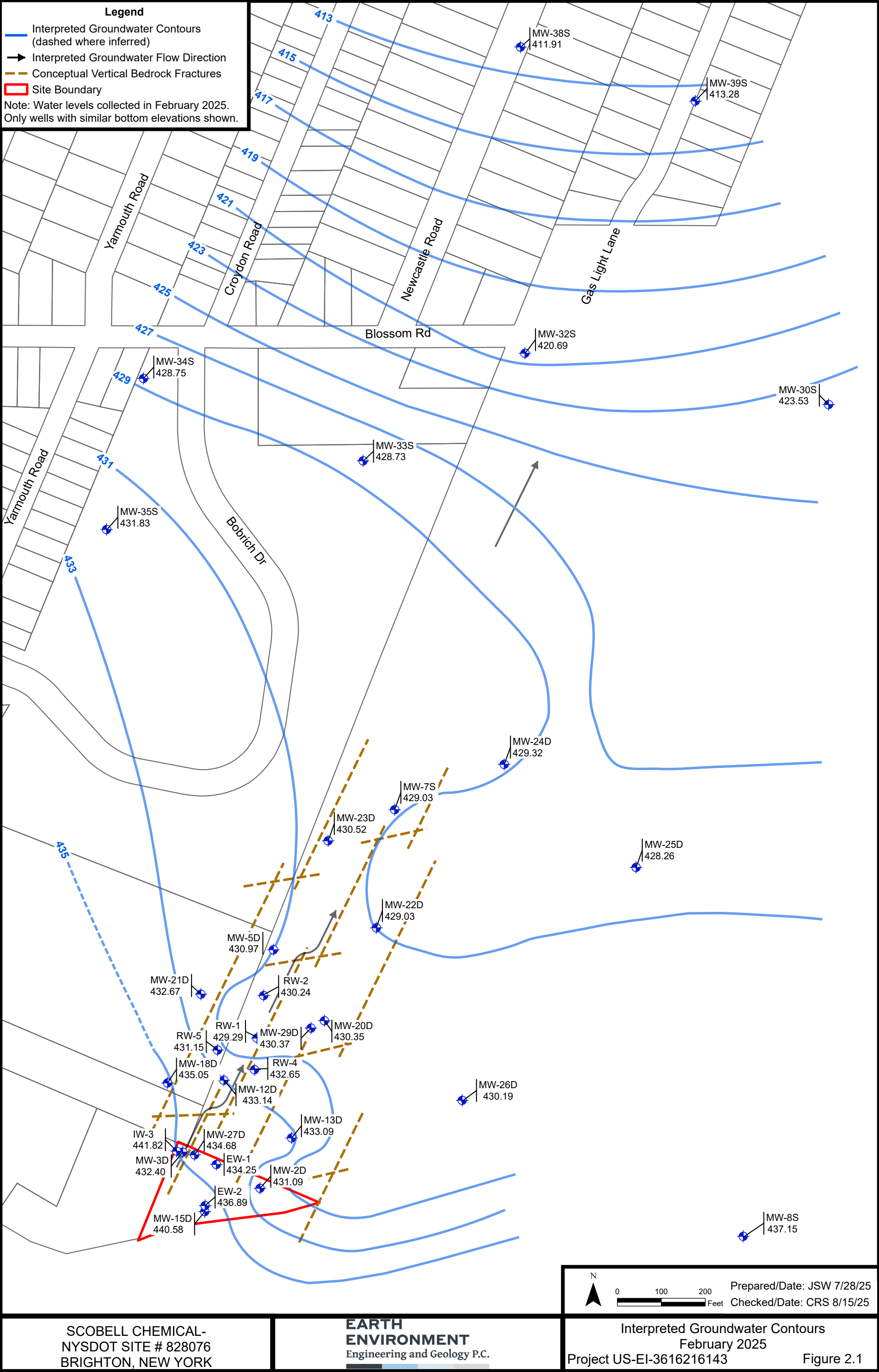
The report will be submitted in a draft format to the NYSDEC for review and comment. Upon receipt of NYSDEC comments, EEEG will address the comments and submit a final report in PDF format. Analytical data will be uploaded to EQuIS and laboratory deliverables will be submitted electronically (PDF and EDD) with the report.

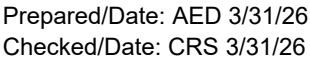
5.0 REFERENCES

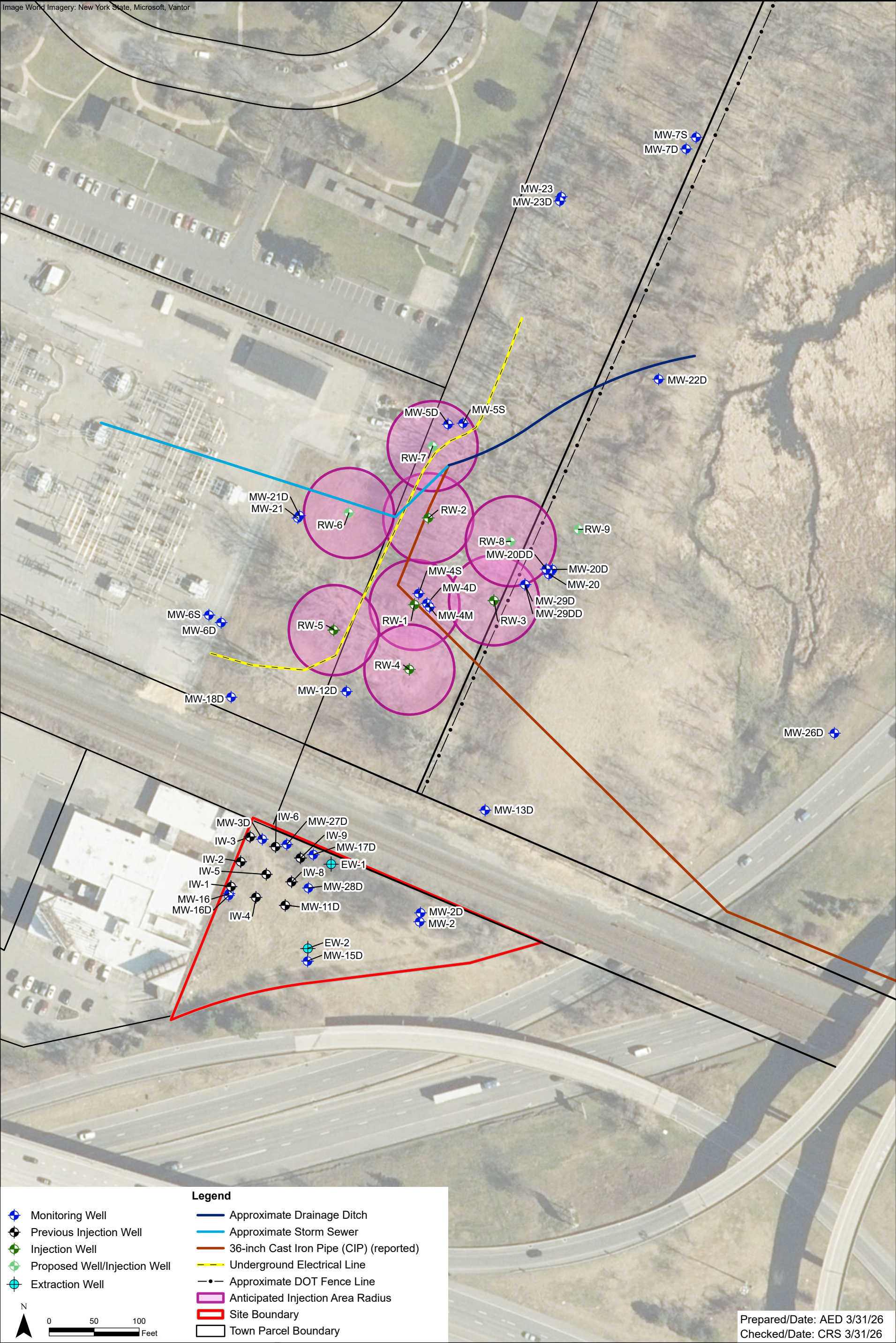
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FIGURES

Document: P:\Projects\NYSDEC_General Information\0009809\Database\GIS\Scobell\GIS\APRX\2025_Results\GW_2025.aprx PDF: P:\Projects\NYSDEC\Contract\0007619\Projects\Scobell Chemical - RD4 D_Deliverables\4.1_Reports\2019-FINAL Pre-Design-Pilot Report\Figures\Figure 2.1 - GW Contours May 2025.pdf 8/15/2025 1:21 PM jennifer.walker







SCOBELL CHEMICAL-
NYSDOT SITE # 828076
BRIGHTON, NEW YORK

**EARTH
ENVIRONMENT**
Engineering and Geology P.C.

Anticipated Injection Area Radius
Project 3616216143

Figure 4.2

TABLES

Table 2.1: Well Details and Groundwater Elevation

Monitoring Well ID	Part of Long Term Monitoring Sampling	Northing	Easting	Ground Elevation (ft)	Casing Elevation (ft)	Riser Elevation (ft)	Depth to Bedrock (BGS)	Screen Monitored Depth (ft) (BGS)	Top of Screen Monitored Elevation	Bottom of Screen Monitored Elevation	Depth to Water (ft BTOR/C)	Grounwdater Elevation (ft)
OB-1	Yes	1148583.0	1425879.3	436.85	439.78	439.58	6.50	4.5 to 9.5	432.35	427.35	NM	NM
MW-01	Yes	1148541.5	1425560.5	438.84	440.47	440.63	--	33.41	--	405.43	17.71	422.92
MW-1D	Yes	1147127.8	1424706.9	455.14	N/A	457.56	16.00	36 to 46	419.14	409.14	24.90	432.66
MW-2	No	1147272.5	1425193.3	453.73	456.18	455.94	10.70	6 to 11	447.73	442.73	NM	NM
MW-2D	Yes	1147282.4	1425194.4	453.59	N/A	456.14	11.10	26 to 36	427.59	417.59	25.05	431.09
MW-3D	Yes	1147364.0	1425018.5	452.15	454.72	454.42	7.50	26 to 36	426.19	416.19	22.02	432.40
MW-4S	Yes	1147636.9	1425192.3	443.64	N/A	446.29	11.70	4.5 to 14.5	439.14	429.14	14.68	431.61
MW-4M	Yes	1147626.1	1425201.4	443.73	446.24	Casing	11	13 to 21	430.73	422.73	14.83	431.41
MW-4D	Yes	1147621.7	1425204.5	443.63	445.99	445.88	11.70	25 to 35	418.63	408.63	18.67	427.21
MW-5S	No	1147825.7	1425241.6	442.70	442.70	442.36	10.70	3 to 13	439.76	429.76	NM	NM
MW-5D	Yes	1147824.9	1425224.9	442.48	N/A	445.02	10.70	22.5 to 32.5	419.98	409.98	14.05	430.97
MW-6S	No	1147613.0	1424959.3	443.10	445.57	445.10	6.00	12 to 25	431.10	418.10	NM	NM
MW-6D	Yes	1147604.8	1424972.8	443.12	445.67	445.34	5.50	58 to 73	385.12	370.12	10.39	434.95
MW-7S	Yes	1148143.9	1425500.5	440.81	443.25	443.07	8.00	12 to 25	428.81	415.81	14.04	429.03
MW-7D	Yes	1148130.4	1425489.4	441.16	443.38	442.52	8.00	52 to 65	389.16	376.16	7.90	434.62
MW-8S	Yes	1147172.2	1426293.4	452.89	455.41	454.76	6.00	12.5 to 25	440.39	427.89	17.61	437.15
MW-8D	No	1147187.9	1426286.9	453.25	455.08	454.51	6.00	64.5 to 78.5	388.75	374.75	NM	NM
MW-9S	No	1146429.2	1425219.3	453.19	453.19	452.81	8.00	19 to 25	434.19	428.19	NM	NM
MW-9D	No	1146415.0	1425227.2	453.27	453.27	452.94	8.00	68 to 78	385.27	375.27	NM	NM
MW-11D	Yes	1147290.6	1425044.0	453.46	455.34	Casing	9.6	14 to 27.5	439.46	425.96	NM	NM
MW-12D	Yes	1147527.9	1425112.0	444.41	446.44	Casing	12.5	15 to 36.2	429.41	408.21	13.30	433.14
MW-13D	Yes	1147396.4	1425266.1	456.11	458.21	Casing	16	19 to 42	437.11	414.11	25.12	433.09
MW-15D	Yes	1147228.8	1425068.8	454.10	456.13	Casing	11	13 to 35.9	441.10	418.20	15.55	440.58
MW-16	No	1147303.5	1424981.7	452.87	455.54	455.37	7.80	5 to 8	447.87	444.87	NM	NM
MW-16D	Yes	1147301.3	1424981.2	452.87	455.53	Casing	7.8	10 to 29	442.87	423.87	11.45	444.08
MW-17D	Yes	1147347.0	1425075.3	451.76	454.42	Casing	8.1	10 to 30	441.76	421.76	16.99	437.43
MW-18D	Yes	1147521.8	1424984.0	445.25	447.06	Casing	11.3	13.3 to 28.3	431.95	416.95	12.01	435.05
MW-20	No	1147658.5	1425336.9	444.04	446.39	446.17	14.50	8.7 to 13.7	435.34	430.34	NM	NM
MW-20D	Yes	1147663.7	1425340.7	444.05	446.21	Casing	12	14 to 31.5	430.05	412.55	15.86	430.35
MW-20DD	Yes	1147664.0	1425334.0	443.99	446.30	446.00	11.50	35.2 to 50.2	408.79	393.79	21.60	424.40
MW-21	No	1147720.5	1425058.1	441.85	443.99	443.83	12.50	7 to 12	434.85	429.85	NM	NM
MW-21D	Yes	1147723.5	1425059.8	441.71	443.93	Casing	12.5	14.5 to 29.5	427.21	412.21	11.26	432.67
MW-22D	Yes	1147874.9	1425458.8	443.74	445.67	Casing	13.7	15.5 to 30.5	428.24	413.24	16.64	429.03
MW-23	No	1148077.5	1425350.6	441.41	441.41	440.96	10.00	4.8 to 9.8	436.61	431.61	NM	NM
MW-23D	Yes	1148072.9	1425349.1	441.31	441.31	440.79	9.50	11.5 to 26.5	429.81	414.81	10.27	430.52
MW-24D	Yes	1148246.8	1425749.7	442.91	445.54	Casing	8.2	9.5 to 25	433.41	417.91	16.22	429.32
MW-25D	Yes	1148012.4	1426049.6	437.31	439.29	Casing	5	7 to 22	430.3	415.3	11.03	428.26
MW-26D	Yes	1147481.8	1425654.1	435.78	437.53	Casing	9	11 to 26	424.8	409.8	7.34	430.19
MW-27D	Yes	1147358.3	1425045.7	451.97	453.98	Casing	6	8.3 to 35.4	443.7	416.6	19.30	434.68
MW-28D	Yes	1147310.0	1425069.7	453.36	453.89	Casing	9	10.6 to 31.70	442.8	421.7	14.10	439.79
MW-29D	Yes	1147646.7	1425310.4	443.60	446.27	445.94	13.9	17.0 to 29.6	426.6	416.2	15.90	430.37
MW-29DD	Yes	1147646.7	1425310.4	443.60	446.27	445.77	13.9	40.6 to 55.1	400.9	391.2	21.47	424.80
MW-30S	Yes	1149065.3	1426487.3	429.01	431.33	430.86	8.50	8.1 to 13.1	420.9	415.9	7.33	423.53
MW-31S	Yes	1149180.1	1425983.8	435.56	435.56	435.21	10.20	9.4 to 13.4	426.2	422.2	12.32	422.89
MW-32S	Yes	1149182.0	1425796.8	433.58	433.58	433.24	6.80	12 to 17	421.6	416.6	12.55	420.69
MW-32D	Yes	1149182.0	1425796.8	433.58	433.58	433.24	6.80	19.9 to 24.9	413.7	408.7	16.14	417.10
MW-33S	Yes	1148937.0	1425428.7	436.00	436.00	435.51	5.00	8.9 to 14.9	427.1	421.1	6.78	NM
MW-34S	Yes	1149125.1	1424929.3	439.65	439.65	439.25	7.00	9.9 to 14.9	429.8	424.8	10.50	428.75
MW-35S	Yes	1148780.6	1424845.5	439.84	439.84	439.50	6.00	10.1 to 15.1	429.8	424.7	7.67	431.83
MW-36S	No	1148397.5	1424648.5	440.78	440.78	440.23	9.00	10 to 15	430.8	425.8	NM	NM
MW-37S	Yes	1149894.3	1425385.6	423.56	423.56	423.23	5.00	5.7 to 15.7	418.6	408.6	NM	NM
MW-38S	Yes	1149878.5	1425786.8	423.66	423.66	423.38	7.50	8 to 18	415.7	405.7	11.47	411.91
MW-39S	Yes	1149756.0	1426184.2	426.95	426.95	426.63	13.50	6.8 to 16.8	420.2	410.2	13.35	413.28
IW-1	No	1147311.5	1424983.8	452.70	452.55	Casing	8	10 to 35.6	442.7	417.1	NM	NM
IW-2	No	1147339.1	1424994.5	452.56	452.25	Casing	7.5	9.9 to 36	442.7	416.6	NM	NM
IW-3	No	1147366.8	1425004.9	452.09	451.84	Casing	7.5	10 to 36.3	442.1	415.8	10.02	441.82
IW-4	No	1147299.3	1425011.6	453.01	452.69	Casing	8.5	10.5 to 36.2	442.5	416.8	NM	NM
IW-5	Yes	114732.8	1425023.0	452.99	452.74	Casing	9.2	11 to 35.3	442.0	417.7	15.94	436.80
IW-6	No	1147355.4	1425033.3	452.47	452.23	Casing	7.4	9.4 to 36	443.1	416.5	NM	NM
IW-8	No	1147316.4	1425051.2	453.2	453.09	Casing	9	10.6 to 31.7	442.6	421.5	NM	NM
IW-9	No	1147343.1	1425060.9	452.42	452.17	Casing	8	10 to 22	442.4	430.4	NM	NM
EW-1	Yes	1147336.6	1425095	--	452.5	451.63	8.9	24.6 to 33.6	427.9	418.9	17.38	434.25
EW-2	Yes	1147242.8	1425069.2	--	453.7	453.22	8.9	25.2 to 34.7	428.02	418.52	16.33	436.89
RW-1	Yes	1147624.2	1425187.5	443.20	445.57	Casing	11.5	15.5 to 35	427.7	408.2	16.28	429.29
RW-2	Yes	1147720.5	1425202.8	442.30	444.85	Casing	11.5	15.5 to 35	426.8	407.3	14.61	430.24
RW-3	Yes	1147629.3	1425275.8	444.10	446.61	Casing	11.2	15.2 to 35	428.9	409.1	16.31	430.30
RW-4	Yes	1147552.4	1425181.8	443.80	446.23	Casing	11	15.0 to 35	428.2	408.2	13.58	432.65
RW-5	Yes	1147596.2	1425097.9	443.60	445.86	Casing	12.5	16.5 to 35	427.1	408.6	14.71	431.15

Notes:
ft = feet
BGS = below ground surface
Horizontal Datum: NAD 83(2011) New York State Plane Coordinate System, West Zone
Vertical Datum: NAVD 88
Units: U.S. Survey Feet
-- = Unknown

BTOR = Below top of riser
BTOC = Below top of casing
NM = Not Measured

Table 4.1: Proposed Field Tasks and Methodology

Methodology and Rationale	Loc I.D.	Medium	Depth bgs ft.	Sample I.D.	VOCs	MNA	Microbes	CSIA	Tracer
					8260C	See Note	See Note		Charcoal Filter/Water
					Complete	Chem Rev	None	None	None
Install three open hole bedrock injection wells using coring techniques and collect VOC rock chip samples for analysis.	RW-6 to RW-8	Open Rock Well	35 feet	Up to 3 VOCs Each (Described below)					
Collect samples for rock chip analysis during installation of new injection wells.	RW-6	Rock	TBD	828076-RW-6	1				
	RW-6	Rock	TBD	828076-RW-6	1				
	RW-6	Rock	TBD	828076-RW-6	1				
Collect samples for rock chip analysis during installation of new injection wells.	RW-7	Rock	TBD	828076-RW-7	1				
	RW-7	Rock	TBD	828076-RW-7	1				
	RW-7	Rock	TBD	828076-RW-7	1				
Collect samples for rock chip analysis during installation of new injection wells.	RW-8	Rock	TBD	828076-RW-8	1				
	RW-8	Rock	TBD	828076-RW-8	1				
	RW-8	Rock	TBD	828076-RW-8	1				
Pneumatic fracturing (PF) will be conducted at each five foot interval followed by amendment injections. PF will enhance existing fractures to allow fluid injections. Will use bottom-up approach.	RW-1 to RW-8	Bedrock Well, Open Rock Well	20 to 25 feet, 25 to 30 feet, 30 to 35 feet	No Samples					
During injection activities at first well, RW-8, water level and salinity will be monitored in the four wells surrounding the injection area to determine the radius of influence. Well locations may be altered for subsequent injections.	RW-2	Bedrock Well	35 feet	No Samples					
	MW-5D	Bedrock Well	55 feet	No Samples					
	MW-20D	Bedrock Well	29 feet	No Samples					
	MW-21D	Bedrock Well	35 feet	No Samples					
To evaluate baseline - pre-injection concentrations of VOCs and MNA parameters, collect groundwater samples from listed wells at and in vicinity of injection locations. .	RW-2	Groundwater	30 feet	828076-RW-002030	1	1			
	RW-3	Groundwater	30 feet	828076-RW-003030	1	1			1
		Groundwater (duplicate)	30 feet	828076-RW-003030D	1				
	RW-4	Groundwater	30 feet	828076-RW-004030	1	1			
	RW-5	Groundwater	30 feet	828076-RW-005030					1
	RW-6	Groundwater	30 feet	828076-RW-006030	1				
	RW-7	Groundwater	30 feet	828076-RW-007030	1				
	RW-8	Groundwater	30 feet	828076-RW-008030	1				
	RW-9	Groundwater	30 feet	828076-RW-009030	1				
	MW-01	Groundwater	30 feet	828076-MW-01030					1
	MW-4D	Groundwater	30 feet	828076-MW-04D030	1	1			1
	MW-5D	Groundwater	30 feet	828076-MW-05D030	1	1			1
	MW-7S	Groundwater	30 feet	828076-MW-07S030					1
	MW-12D	Groundwater	30 feet	828076-MW-05D030	1	1			
	MW-20D	Groundwater	30 feet	828076-MW-20D030	1	1			1
	MW-20DD	Groundwater	50 feet	828076-MW-20DD050	1	1			
		(Matrix Spike)	50 feet	828076-MW-20DD050MS	1				
		(Matri Spike Duplicate	50 feet	828076-MW-20DD050MSD	1				
	MW-21D	Groundwater	28 feet	828076-MW-21D028	1	1			1
	MW-22D	Groundwater	25 feet	828076-MW-22D025	1	1			1
	MW-23D	Groundwater	21 feet	828076-MW-23D021					1
	MW-29D	Groundwater	30 feet	828076-MW-29D030	1	1			1
	MW-29DD	Groundwater	50 feet	828076-MW-29DD50					1

Table 4.1: Proposed Field Tasks and Methodology

To evaluate concentrations of VOCs and MNA parameters one month (first quarter) post injections, collect groundwater samples from listed wells at and in vicinity of injection locations.	RW-2	Groundwater	30 feet	828076-RW-002030	1	1			
	RW-3	Groundwater	30 feet	828076-RW-003030	1	1			
		Groundwater (duplicate)	30 feet	828076-RW-003030D	1				
	RW-4	Groundwater	30 feet	828076-RW-004030	1	1			
	RW-8	Groundwater	33 feet	828076-RW-005033	1				
	RW-9	Groundwater	30 feet	828076-RW-009030	1				
	MW-01	Groundwater	30	828076-MW-01030					1
	MW-4D	Groundwater	30	828076-MW-04D030	1	1			
	MW-5D	Groundwater	30	828076-MW-05D030	1	1			
	MW-7S	Groundwater	30	828076-MW-07S030					1
	MW-12D	Groundwater	30	828076-MW-05D030	1	1			
	MW-20D	Groundwater	30	828076-MW-20D030	1	1			
	MW-20DD	Groundwater	50	828076-MW-20DD050	1	1			
		(Matrix Spike)	50	828076-MW-20DD050MS	1				
		(Matri Spike Duplicate	50	828076-MW-20DD050MSD	1				
	MW-21D	Groundwater	30 feet	828076-MW-21D028	1	1			
	MW-22D	Groundwater	25 feet	828076-MW-22D025	1	1			1
	MW-23D	Groundwater	21 feet	828076-MW-23D021	1				1
	MW-29D	Groundwater	30 feet	828076-MW-29D030	1	1			
To evaluate concentrations of VOCs and MNA parameters four months (second quarter) post injections, collect groundwater samples from listed wells at and in vicinity of injection locations. Also collect samples for CSIA and microbial analysis.	RW-2	Groundwater	30 feet	828076-RW-002030	1	1			
	RW-3	Groundwater	30 feet	828076-RW-003030	1	1			
		Groundwater (duplicate)	30 feet	828076-RW-003030D	1				
	RW-4	Groundwater	30 feet	828076-RW-004030	1	1			
	RW-8	Groundwater	30feet	828076-RW-008030	1				
	RW-9	Groundwater	30 feet	828076-RW-009030	1				
	MW-01	Groundwater	30	828076-MW-01030					1
	MW-4D	Groundwater	30	828076-MW-04D030	1	1	1	1	
	MW-5D	Groundwater	30	828076-MW-05D030	1	1	1	1	
	MW-7S	Groundwater	30	828076-MW-07S030					1
	MW-12D	Groundwater	30	828076-MW-05D030	1	1	1		
	MW-20D	Groundwater	30	828076-MW-20D030	1	1			
	MW-20DD	Groundwater	50	828076-MW-20DD050	1	1			
		(Matrix Spike)	50	828076-MW-20DD050MS	1				
		(Matri Spike Duplicate	50	828076-MW-20DD050MSD	1				
	MW-21D	Groundwater	30 feet	828076-MW-21D028	1	1			
	MW-22D	Groundwater	25 feet	828076-MW-22D025	1	1	1		1
	MW-23D	Groundwater	21 feet	828076-MW-23D021	1				1
	MW-29D	Groundwater	30 feet	828076-MW-29D030	1	1			

Notes:

Sample ID: 828076 = NYSDEC Site No.; ____ represents the 3 digit sample depth bgs be determined in field; 8260B VOCs = Target Compound List Volatile Organic Compounds

Duplicates, matrix spike, and matrix spike duplicate will be collected at a frequency of 5% (1:20 samples). bgs = below ground surface

NA = not applicable

MNA = Nitrate-nitrogen by USEPA Method 4500-NO3, Sulfate by USEPA Method 300, chloride by SM 4500 CL, Alkalinity by SM 2320, ethene, ethane, and methane by RSK 375, TOC by USEPA Method 415.1, iron by USEPA Method 6010B.

In addition, oxygen and reduction/oxidation potential and pH will be measured in the field.

CSIA - Compound Specific Isotope Analysis by Sirem (through Tersus)

Microbes: qPCR KB-1 Array by Sirem

Tracer: Remove and replace charcoal tracers for Ozark Underground Laboratories

APPENDIX A

PROJECT SPECIFIC HEALTH AND SAFETY PLAN (HASP)

Site-Specific Health and Safety Plan Short Form

Site: Scobell Chemical – Site No. 828076 Job #/Task # 3616216143.03
 Street Address: 80 Rockwood Ave, Brighton, NY
 Proposed Date(s) of Investigation: 03/23/26 – 10/30/26
 Prepared by: Delaney Wood Date: 01/29/26
 *Approved by: Chuck Staples Date: _____
 Site Description: **(attach map)** A vacant parcel abutting highway, rail lines, and a commercial property. Historic practices resulted in the contamination of Site media with trichloroethene (TCE), tetrachloroethene (PCE), 1,1-dicloroethene (DCE), cis-1,2-DCE, vinyl chloride, 1,1,1-trichloroethane (TCA), benzene, toluene, and xylene. TCE has been detected as a product (DNAPL) in bedrock fractures at the Site.
 Comments: See Field Activities Plan for 2026 Pilot Test dated January 2026.

*Approval also serves as certification of a Hazard Assessment as required by 29 CFR 1910.132

Tasks:

WSP	Sub	Task Description	JHA Attached?
☐	☒	Bedrock Well Installation	☒
☒	☐	Groundwater Sampling	☒
☒	☒	Pilot Test Injection of Amendments	☐
☐	☐		☐

High Hazard Activities (Check all that apply):

WSP	Sub	Activity	WSP	Sub	Activity
☐	☐	Confined space entry	☐	☒	Operating drill rig
☐	☐	Entering excavations	☐	☐	Operating other heavy equipment
☐	☐	Hot work	☐	☐	Using aerial lift
☐	☐	Lockout/tagout	☐	☐	Working from scaffolding
☐	☐	Operating forklift	☐	☐	Working at heights >6 feet

Life Saving Actions (Check all that apply):

The following WSP Life Saving Actions potentially apply to the work being conducted at the site:

- ☐ Plant / People / Interface – Working around heavy equipment
- ☐ Suspended Loads
- ☒ Driving
- ☐ Hazardous Atmospheres / Substances
- ☐ Working on or Near Water
- ☐ Lone or Remote Work
- ☐ Ground Stability
- ☐ Energy Sources
- ☐ Working at Height

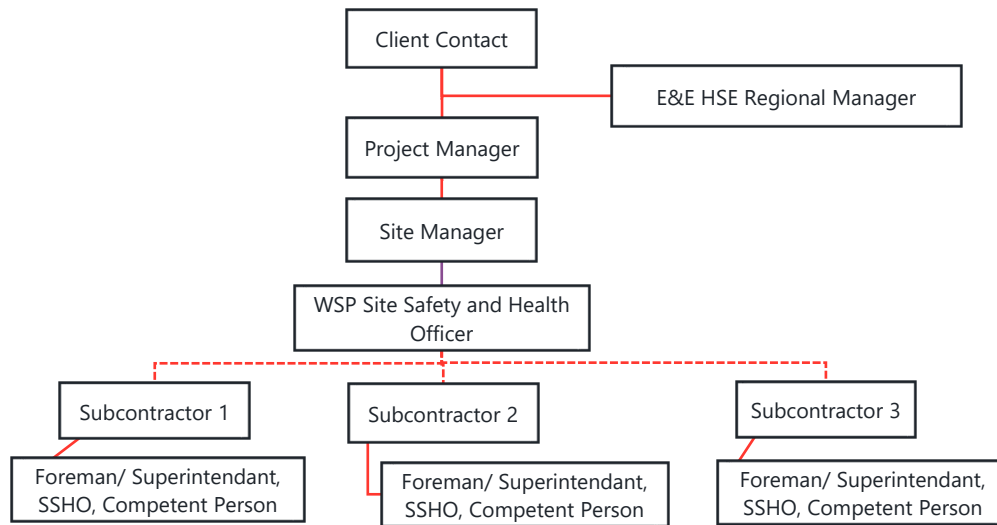
Journey Management Plan:

A Journey Management Plan (JMP) is to be developed to address non-routine/non-commute type travel to and from the project site. See the [WSP Journey Management Plan](#). A JMP is a critical control for WSP employee's and project team's safety. All WSP employees should install and activate the [free International SOS Assistance App](#) on their mobile devices.

Site-Specific Health and Safety Plan Short Form



Project Organization Chart:



Dates of Required Training and Medical Surveillance:

Add additional training topics, as required.

Name:	Delaney Wood	ADD NAME	Adam Norvelle	ADD NAME	ADD NAME
Job duties:	Site Manager	SSHO	Field Personnel	Field Personnel	Field Personnel
	Dates	Dates	Dates	Dates	Dates
Medical Surveillance	10/23/25				
40-Hour Initial	08/31/24				
8-Hour Supervisor ²					
8-Hour Refresher	09/18/25				
First Aid ¹	01/10/25				
CPR ¹	01/10/25				
Hazard Communication					
Fire Extinguisher					

¹ At least one worker must be trained in First Aid/CPR

² Required for Site Manager and Site Health and Safety Officer

Goals/Targets:

The following goals/targets have been established for the project:

- ☒ Zero OSHA Recordable Incidents
- ☐ Weekly HSE Inspections (documented Project Safety Checklist)
- ☐ 1 Leadership (PM) HSE Inspections
- ☒ At least one HSE Observations (iSMS) per week for duration of field program

Site-Specific Health and Safety Plan Short Form

Meetings:

The following meetings will be held at the site:

Meeting	Lead by		Frequency				
	WSP	Sub	Initial	Daily	Weekly	Monthly	As Needed
☒ Project Kick-off ¹	☒	☐	☒	☐	☐	☐	☐
☒ Tailgate ²	☒	☐	☐	☒	☐	☐	☐
☐ Safety Committee ¹	☐	☐	☐	☐	☐	☐	☐
☐ Incident Reviews ¹	☐	☐	☐	☐	☐	☐	☒
☒ E&I Monthly Safety Topics ¹	☐	☐	☐	☐	☐	☒	☐
☐ HSE Closeout Meetings ¹	☐	☐	☐	☐	☐	☐	☒

¹ Attended by subcontractor management representative.

² Attended by all subcontractor employees and supervisors.

Inspections:

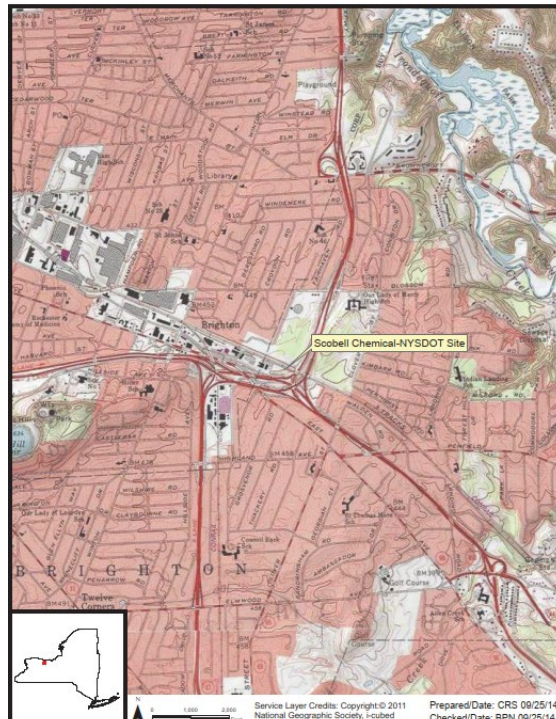
Regular inspections will be conducted by WSP and/or subcontractor personnel. Inspections will be documented, and corrective actions established for all findings. Corrective actions will be tracked to closure. Safety observations will be entered into [iSMS](#).

	Lead by		Frequency			
Inspection Type	WSP	Sub	Daily	Weekly	Monthly	Before Use
☒ HSE (Visual)	☐	☒	☒	☐	☐	☐
☐ HSE (Documented)	☒	☒	☐	☒	☐	☐
☐ Leadership HSE (e.g., PM)	☐	☐	☐	☐	☐	☐
☐ Scaffolding	☐	☐	☐	☐	☐	☐
☐ Excavations	☐	☐	☐	☐	☐	☐
☐ Heavy Equipment	☒	☒	☒	☐	☐	☐
☐ PPE	☒	☐	☒	☐	☐	☐
☐ Tools/Equipment	☒	☐	☒	☐	☐	☐
☐ HSE Observations (iSMS)	☒	☐	☐	☒	☐	☐
☐ eFLRA	☐	☐	☒	☐	☐	☐

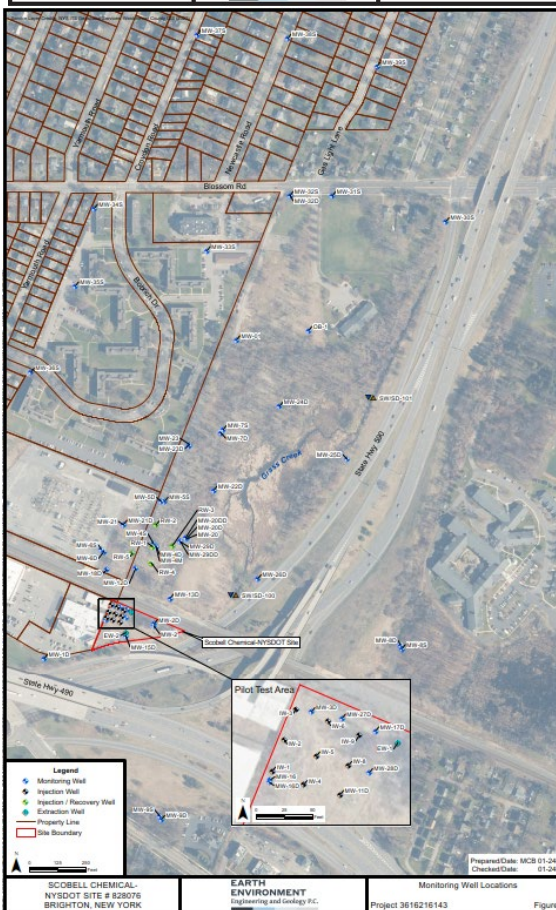
Site-Specific Health and Safety Plan Short Form



INSERT SITE MAP(S) HERE



SCOBELL CHEMICAL-NYSOT SITE # 828076 BRIGHTON, NEW YORK	EARTH ENVIRONMENT Engineering and Geology P.C.	Site Location Project 3616216143 Figure 1



SCOBELL CHEMICAL- NYSOT SITE # 828076 BRIGHTON, NEW YORK	EARTH ENVIRONMENT Engineering and Geology P.C.	Monitoring Well Locations Project 3616216143 Figure 2

Site-Specific Health and Safety Plan Short Form

Known or Suspected Contaminants (include PELs/TLVs): [LINK to Contaminant Fact Sheet Library](#)

Contaminants of Concern (COC) (Attach Fact Sheets*)	Maximum Concentrations		PEL/TLV**
	Soil (mg/kg)	Water/Groundwater (µg/l)	
Tetrachloroethene (PCE)	46	1,200	25 ppm / 100 ppm STEL / 200 ppm C
Trichloroethene (TCE)	300	980,000	10 ppm / 25 ppm STEL / 200 ppm C
Vinyl Chloride (VC)	Unknown	640	1 ppm
1,1,1-Trichloroethene (TCA)	13	Unknown	350 ppm / 450 ppm STEL
Cis-1,2-Dichloroethene (Cis-1,2-DCE)	0.460	2,100	200 ppm
Toluene	1,100	470	20 ppm / 150 ppm STEL / 300 ppm C
Benzene	Unknown	46	0.5 ppm / 2.5 ppm STEL

*Workers must be made aware of the signs, symptoms, and first aid for each COC. Information is located on the COC fact sheets.

**See [\(LINK\)](#) for OSHA PELs and ACGIH TLVs

Air Monitoring Action Levels:

PID/FID Reading ¹	Detector Tube ¹	Dust Meter ¹	LEL ² /O ₂ ¹	Action
Any readings above bkg	<0.5 ppm			Monitor with vinyl chloride draeger tube - Level D
<5 ppm	<0.5 ppm	<1.5 mg/M ³		Continue working wearing Level D PPE
≥5 ppm	<0.5 ppm	<1.5 mg/M ³		Stop work. Move up wind, re-evaluate site protocols prior to further action for EEEG personnel.
≥5 ppm	<0.5 ppm	≥15 mg/M ³	>10% LEL	Stop work. Evacuate area. Consider return with ventilation system and spark proof/intrinsically safe equipment.
			<19.5% O ₂	Stop work and evacuate area.

¹ Sustained readings measured in the breathing zone

² Readings at measured at the source (borehole, well, etc.)

Job Hazard Analyses (JHA):

Check and attach all that apply (add applicable JHAs not already listed) ([LINK to JHA Library](#)):

Activity Specific JHAs:

- ☒ Mobilization/Demobilization and Site Preparation
- ☒ Working in the Wild or Field
- ☒ Field Work - Oversight
- ☒ Decontamination Procedures
- ☒ Utility Clearance Activities
- ☒ Groundwater Sampling
- ☒ General Ergonomics
- ☒ Drilling Operations Oversight
- ☒ General Cold Stress
- ☒ General Heat Stress

Hazard Specific JHAs:

- ☒ General Biological Hazards
- ☐ Working with Preservatives (Acids)
- ☒ General PPE Use
- ☒ Mixing and Injection of Amendment Solution (Aqueous), Powder and/or Slurry
- ☐
- ☐
- ☐
- ☐
- ☐
- ☐

Site-Specific Health and Safety Plan Short Form

PID/FID Reading ¹	Detector Tube ¹	Dust Meter ¹	LEL ² /O ₂ ¹	Action
☒			☐	Compressed Gas Handling

Review of JHAs and Field Level Risk Assessments (eFLRA)

Supervisors shall conduct a daily tailgate meeting, specifying the applicable JHAs and ensure that everyone involved in the work acknowledges the JHA applicable to their work.

The work area shall be inspected for any additional hazards prior to initiating work. Where additional hazards are present, the hazards and controls shall be identified prior to initiating the work and documented on the JHA and the Field Level Risk Assessments (eFLRA) form.

If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to the work described in the JHA shall require a review by a Qualified Person.

- eFLRA QR Code:



- eFLRsA Form (online / printable): [LINK](#)

PPE and Monitoring Instruments:

Initial Level of PPE *

☒ Level D ☐ Modified Level D ☐ Level C * Cannot use Short Form HASP for Level B or A or Confined Space Entry work

Personal Protective Equipment	Site Tasks															
	Utility Locating	Groundwater Sampling	Mixing of Amendment	Injection of Amendment	Bedrock Drilling	Bedrock Well Installation	Rock Chip Sampling	Decontamination	General Site Work (Inspections, maintenance)							
Hard hat			A	X	X	X	A	A	A							
Safety glasses	X	X	X	X	X	X	X	X	X							
Safety Goggles			X													
Hearing protection (earmuffs, earplugs)				A	X	X	A									
Safety-toed boots	X	X	X	X	X	X	X	X	X							
High-visibility/ reflective vest	X	X	X	X	X	X	X	X	X							
Nitrile gloves - thicker (outer)	A	A	A	A	A	A	A	A	A							
Nitrile gloves - thin (inner)	A	X	X	X	X	X	X	X	A							
Other chemical resistant gloves: _____			A	A					A							
Uncoated Tyvek coverall			X													

X = required A = available

Site-Specific Health and Safety Plan Short Form

Monitoring Instruments Required*

Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows:

- When work begins on a different portion of the site.
- When contaminants other than those previously identified are being handled.
- When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling.)
- When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon.)

☒ PID: ☒ 10.0/10.6 eV Lamp ☐ 11.7 eV Lamp ☐ FID

☐ Hydrogen Sulfide meter ☐ Carbon Monoxide meter ☐ Other: _____

☒ LEL/O2 Meter ☐ Dräger Pump (or equivalent) List Tubes: _____

☒ Dust Meter: ☐ Respirable dust ☒ Total dust (during drilling)

*Monitoring instruments will be calibrated daily in accordance with manufacturer's instructions. Results will be recorded in the field logbook.

Chemicals Brought to the Site:

List all chemicals brought to the site (e.g., preservatives, decon solutions, calibration gases, gasoline, etc.).

Product Identifier: (Note: Name listed below must match name on label and SDS)	SDS Attached?
ISOBUTYLENE	☒
HYDROCHLORIC ACID	☒
CALIBRATION SOLUTIONS (YSI - PH 4, PH 7, ORP, SPECIFIC CONDUCTANCE 1.413)	☒
ALCONOX	☒
METHANOL	☒
NITRIC ACID	☒
SULFURIC ACID	☒
ZERO VALENT IRON (ZVI)	☒
EDS-ER	☒
EDS-ACTIVATOR	☒
EDS SUBSTRATE SHUTTLE	☒
TERSOX NUTRIENTS-QR	☒
KB-1	☒
KB-1 PRIMER	☒

Chemicals will be kept in their original containers. If transferred to another container, aside from day use by one individual, the new container will be clearly labeled with the name of the chemical (product identifier), signal word, hazard statement, pictogram(s), precautionary statement, and name, address and telephone number of the chemical manufacturer, importer or other responsible party.

Work Zones:

The work zones will be defined relative to the location of the work activity. The Exclusion Zone is considered the area within a 10-foot diameter of the sampling location. The Contamination Reduction Zone defined as the area within a 20-foot diameter of the sampling location. The Decontamination Zone is to be located upwind of the work area. Work zones will be maintained through the use of:

- ☐ Warning Tape
- ☒ Cones and Barriers
- ☒ Visual Observations

Site-Specific Health and Safety Plan

Short Form

Decontamination Procedures and Equipment:

Note: See Decontamination JHA for further information

Level D Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Boots, and Gloves Wash and Rinse (if worn)	Scrub outer boots, and outer gloves decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal (if worn)	Remove outer boots and gloves. Deposit in plastic bag.
Station 4: Inner glove removal	Remove inner gloves and place in plastic bag.
Station 5: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Modified Level D and Level C PPE Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Canister or Mask (Level C only) Change	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	Boots, chemical resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6: Face Piece Removal (Level C only)	Facepiece is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet.
Station 7: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Site-Specific Health and Safety Plan Short Form

Site Communication:

- ☒ Verbal
- ☐ Two-way radio
- ☒ Cellular telephone
- ☒ Hand signals
 - Hand gripping throat _____ Out of air, can't breathe
 - Grip partner's wrist or both hands around waist _____ Leave area immediately
 - Hands on top of head _____ Need assistance
 - Thumbs up _____ OK, I am all right, I understand
 - Thumbs down _____ No, negative
- ☐ Horn
- ☐ Siren
- ☐ Other: _____

Site-Specific Health and Safety Plan Short Form



EMERGENCY CONTACTS

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
Fire Department:	911		
Hospital: Highland Hospital ER	585-341-6880		
WorkCare (early injury case management)	1-(844) 268-1852		
Police Department:	911		
	Office	Cell	
Site Safety and Health Officer: Delaney Wood	207-910-1125	207-629-7060	
Client Contact: Donald Roe	(518) 402-9693	(518) 764-4897	
Project Manager: Chuck Staples	207-910-1109	207-450-9772	
*Regional HSE Manager: Jeff Tweeddale	See Cell	860-805-5883	
*USA Director of HSE: Tom Sprinkle	See Cell	571-212-3487	
*E&E HSE Director: Jonathan Olsen	See Cell	512-987-6209	
EPA/DEP (if applicable):			
Other: Brighton Police Non-Emergency	(585) 784-5150		

*See Incident Flow Chart for Regional HSE Manager's Contact Information

Emergency Equipment:

The following emergency response equipment is required for this project and shall be readily available:

- ☒ Field First Aid Kit (including bloodborne pathogen kit/supplies)
- ☐ Fire Extinguisher (ABC type)
- ☐ Eyewash (Note: 15 minutes of free-flowing fresh water)
- ☐ Other: _____

Emergency Procedures:

- The SSHO (or alternate) should be immediately notified via the on-site communication system. The HSO assumes control of the emergency response.
- The SSHO notifies the Project Manager and client contact of the emergency.
- If the emergency involves an injury to a WSP employee, the SSHO or Site Manager are to implement the WSP Early Injury Case Management program. See WorkCare poster below:

Site-Specific Health and Safety Plan

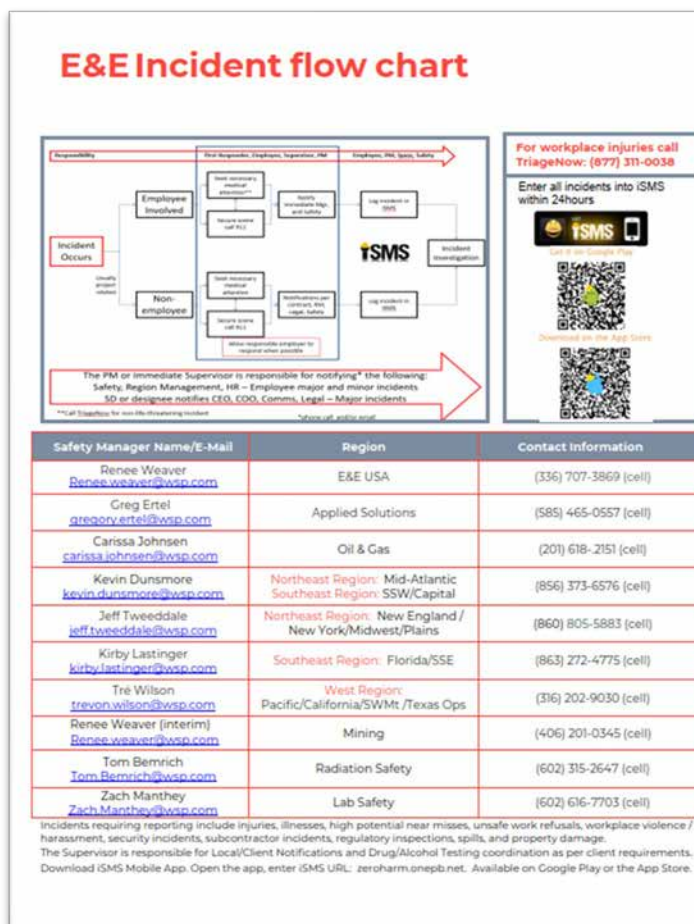
Short Form

- If applicable, the SSHO shall notify off-site emergency responders (e.g., fire department, hospital, police department, etc.) and shall inform the response team as to the nature and location of the emergency on-site.
- If applicable, the SSHO evacuates the site. Site workers should move to the predetermined evacuation point (See Site Map).
- For small fires, flames should be extinguished using the fire extinguisher but only if trained within the past year. Use the **PASS** method (**P**ull the pin, **A**im at the base of the fire, **S**queeze the trigger, use a **S**weeping motion to put out the fire) when extinguishing fires. Large fires should be handled by the local fire department.
- In an unknown situation or if involved in a toxic gas emergency, appropriate PPE (e.g., level C or B PPE), is required. If appropriate PPE is unavailable, site workers should evacuate and call-in emergency personnel.
- For chemical spills, follow the job specific JHA and SDS for spill containment and spill handling procedures.
- If chemicals are accidentally spilled or splashed into eyes or on skin, use eyewash bottle/station for the eyes and wash affected area. Site worker should shower as soon as possible after incident.
- If the emergency involves toxic gases, workers will back off and reassess. Prior to re-entering the work zone, the area must be determined to be safe, that the required PPE and air monitoring equipment is available. Entry is prohibited if PPE or air monitoring equipment is inadequate.
- An injured worker must be decontaminated appropriately.
- Within 24 hours after any emergency response, the incident shall be entered into [iSMS](#). When the use of drugs or alcohol cannot be ruled out as a factor in the incident, contact your Regional HSE Manager to determine if post-accident drug testing is required.

Site-Specific Health and Safety Plan Short Form



• INCIDENT FLOW CHART / WorkCare



Do you know what to do if there's a work-related injury or illness?

Either/Or

- Step 1: Injury Emergency**
For life threatening injury or illness, immediately call 911
- Step 1: Injury Non-Emergency**
For non-emergency work-related injury or illness, call WorkCare (844) 268-1852
- Step 2: All - Notify**
Notify Supervisors / Project Manager / HSE Manager within two hours of incident
- Step 3: All - iSMS**
Enter the incident into iSMS within 24 hours

WorkCare
WORK MATTERS. HEALTH COUNTS.

(844) 268-1852
24/7 Telehealth Consultations

WorkCare is our new trusted occupational health services provider

Scan QR code to add WorkCare to your contacts

Site Specific Emergency Procedures are as follows:

Site-Specific Health and Safety Plan Short Form



Field Team Review:

I acknowledge that I understand the requirements of this HASP, and agree to abide by the procedures and limitations specified herein. I also acknowledge that I have been given an opportunity to have my questions regarding the HASP and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during on-site activities.

Name: _____	Date: _____
Name: _____	Date: _____
Name: _____	Date: _____
Name: _____	Date: _____
Name: _____	Date: _____

Site-Specific Health and Safety Plan Short Form

Routes to Emergency Medical Facilities:

HOSPITAL (for immediate emergency treatment):

Facility Name: Highland Hospital (Primary)

Address: 1000 South Ave, Rochester, NY 14620

Telephone Number: 585-473-2200

DIRECTIONS TO PRIMARY HOSPITAL (attach map):



80 Rockwood Pl
Rochester, NY 14610

Take Rockwood Pl to NY-96 N/East Ave

1. Head toward Rockwood St 1 mi (0.2 mi)
2. Turn right onto Rockwood Pl 167 ft
3. Turn left onto Rockwood St 0.1 mi
- 148 ft

Take I-490 W and S Goodman St to Rockingham St

4. Turn right onto NY-96 N/East Ave 0 min (2.9 mi)
5. Turn left onto S Winton Rd 0.3 mi
- 118 ft
6. Turn right to merge onto I-490 W 1.8 mi
7. Take exit 17 for Goodman St/Broadway 0.2 mi
8. Turn left onto S Goodman St 0.5 mi
9. Turn right onto Rockingham St 2 min (0.4 mi)

10. Turn left onto South Ave 30 sec (0.1 mi)

Drive to your destination

11. Turn left onto Bellevue Dr 2 min (449 ft)
- 112 ft
12. Turn left 134 ft
13. Turn right 164 ft
- Destination will be on the right

Highland Hospital
1000 South Ave, Rochester, NY 14620

Site-Specific Health and Safety Plan Short Form

CLINIC (for non-emergency medical treatment)

Facility Name: WellNow Urgent Care

Address: 235 N Winton Rd, Rochester, NY 14610

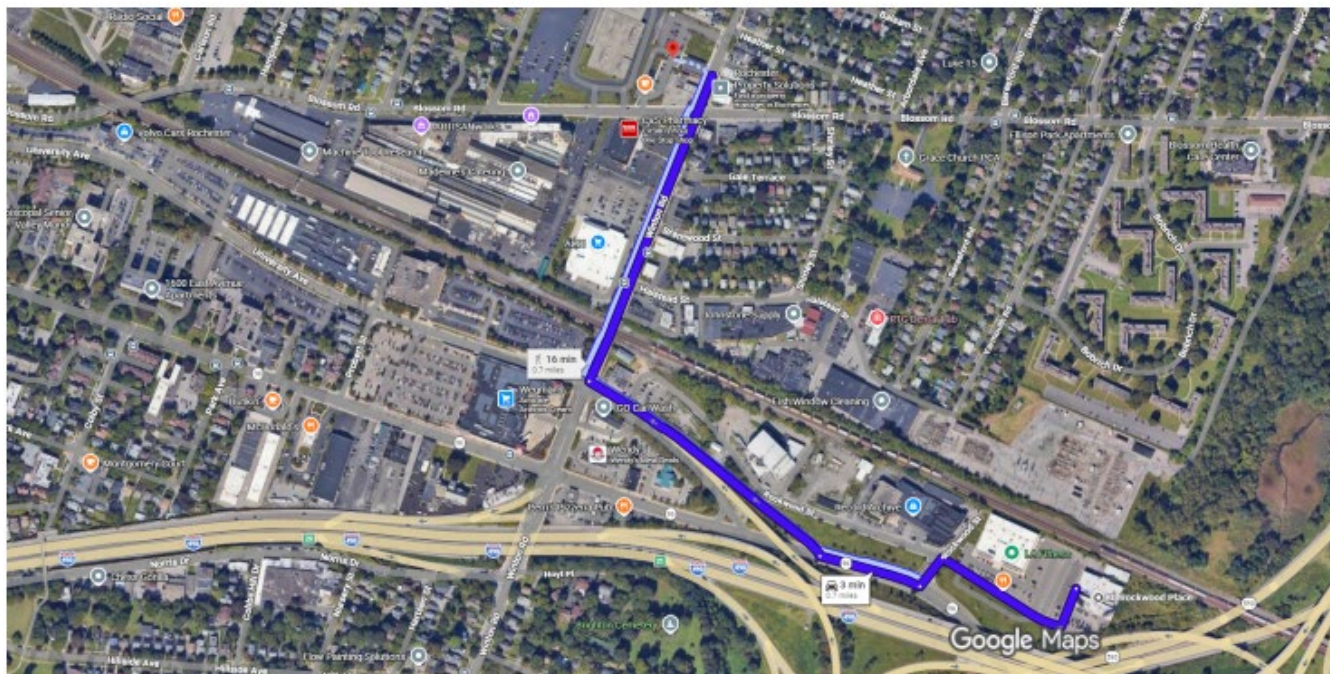
Telephone Number: 585-441-3914

DIRECTIONS TO CLINIC (attach map):



80 Rockwood Pl, Rochester, NY 14610 to WellNow Urgent Care,
235 Winton Rd N, Rochester, NY 14610

Drive 0.7 mile, 3 min



Imagery ©2026 Airbus, Maxar Technologies, Map data ©2026 Google 200 ft

80 Rockwood Pl
Rochester, NY 14610

- ↑ 1. Head toward Rockwood St 167 ft
 - ↪ 2. Turn right onto Rockwood Pl 0.1 mi
 - ↶ 3. Turn left onto Rockwood St 148 ft
 - ↪ 4. Turn right onto NY-96 N 423 ft
 - ↪ 5. Turn right onto University Ave 0.2 mi
 - ↪ 6. Turn right onto Winton Rd 0.3 mi
- i Destination will be on the left**

WellNow Urgent Care
235 Winton Rd N, Rochester, NY 14610

Site-Specific Health and Safety Plan Short Form

Expectations For Health Safety and Wellbeing Management



The WSP [HSW Safety Expectations](#) includes elements that apply to the global operations, and E&I. The purpose of this document is to set out WSP's "Expectations for Health, Safety and Wellbeing Management". These Expectations are based on international best practices, including ISO 45001: Occupational Health and Safety Management System; and ISO 45003: "Occupational Health and Safety Management - Psychological Health and Safety at Work: Managing Psychological Risks - Guidelines".

These principles tie into the WSP - USA Health, Safety and Wellness (HSW) Policy Statement: [LINK](#)

WSP Zero Harm

Our Zero Harm Vision is a commitment shared by WSP and all employees to consider and effectively reduce or mitigate health, safety, and wellbeing risks from our activities.

Our goal is to ensure that our activities result in:

- Zero Fatalities
- Zero permanently disabling injuries
- Zero injuries to members of the public
- Zero long term harm to health



By Actively Caring for your personal safety, and for those around you, we can prevent accidents and injury. Caring together, we can attain Zero Harm.

Tailgate Meeting Form



Check One:

☐ Initial Kickoff Safety Meeting ☐ Regular/Daily Tailgate Safety Meeting ☐ Unscheduled Tailgate Safety Meeting

Date: _____ Site: Scobell Chemical

Site Manager: Chuck Staples Site Health and Safety Officer: _____
Print *Print*

Order of Business

Topics Discussed (Check all that apply)

☐ Scope of Work	☐ Decontamination Procedures for Personnel and Equipment
☐ Site History/Site Layout	☐ Physical Hazards and Controls (e.g., overhead utility lines)
☐ Personnel Responsibilities	☐ Anticipated Weather (snow, high winds, rain)
☐ Training Requirements	☐ Temperature Extremes (heat or cold stress symptoms and controls)
☐ Hazard Analysis of Work Tasks (chemical, physical, biological and energy health hazard effects)	☐ Biological Hazards and Controls (e.g., poison ivy, spiders)
☐ Applicable SOPs (e.g., Hearing Conservation Program, Safe Driving, etc.)	☐ Site Control (visitor access, buddy system, work zones, security, communications)
☐ Safe Work Practices	☐ Sanitation and Illumination
☐ Engineering Controls	☐ Logs, Reports, Recordkeeping
☐ Chemical Hazards and Controls	☐ Incident Reporting Procedures
☐ Signs and symptoms of over exposure to site chemicals	☐ Near Misses/Hazard ID including worker suggestions to correct and work practices to avoid similar occurrences
☐ Medical Surveillance Requirements	☐ General Emergency Procedures (e.g., locations of air horns and what 1 or 2 blasts indicate)
☐ Action Levels	☐ General Emergency Response Procedures (e.g., earthquake response, typhoon response, etc.)
☐ Monitoring Instruments and Personal Monitoring	☐ Medical Emergency Procedures (e.g., exposure control precautions, location of first aid kits, etc.)
☐ Perimeter Monitoring, Type and Frequency	☐ Route to Hospital and Medical Care Provider Visit Guidelines
☐ PPE Required/PPE Used	☐ Site/Regional Emergency Response Procedures (e.g., exposure control precautions, location of first aid kits, etc.)
☐ Define PPE Levels, Donning, Doffing Procedures	☐ Hazardous Materials Spill Procedures

PPE required for the tasks to be conducted: _____

Required Permits: _____

Site Access or other issues: _____

Tailgate Meeting Form



Safety Suggestions by Site Workers: _____

Action Taken on Previous
Suggestions: _____

Injuries/Incidents/Personnel Changes since last meeting: _____

Observations of unsafe work practices/conditions that have developed since previous meeting: _____

Location of (or changes in the locations of) evacuation routes/safe refuge areas: _____

Additional Comments: _____

Attendee signatures below indicate acknowledgment of the information and willingness to abide by the procedures discussed during this safety meeting

Name (Print)

Company

Signature

Meeting Conducted by: _____ Title: _____

Print

Signature: _____ Time: _____

Print

Activity Hazard Analyses (AHAs)

AHA - Compressed Gas Handling and Use

Activity / Task:	Compressed Gas Handling and Use	Overall RAC for AHA (see "Methodology" Step 4):					S
Project Location:	Brighton, NY	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Effective / Issue Date:	11/08/19		AHA Revision No.:	2			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: Using compressed gas This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
					L = Low Risk		
MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment							
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
		 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☒ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS	

AHA - Compressed Gas Handling and Use

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Eye protection, hand protection, and foot protection Job Step-specific PPE (as required): Head protection, back brace is optional Other Required Equipment: Specialized cart for moving cylinders, back brace is optional	Competent / Qualified Personnel: - Experienced and properly trained personnel Training Requirements: MyLP – Compressed Gas Cylinder Safety (\$20 Online) MyLP - HAZCOM (\$25 Online)	- Inspect cylinders, gauges, hoses, and attachments before use. - Tag and return damaged or defective cylinders to the supplier. - Inspect PPE before use.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	- Wear standard PPE at all times. - Standard PPE includes safety glasses, work gloves, and safety shoes. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. Determine potential presence of biohazard(s). If biohazard(s) possible,	Identified potential biological hazards	S	Review/comply with Raleigh Office AHA 007 (General Biological Hazards).	L
3. All work steps that require lifting, bending, twisting, back/knee strain, etc.	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 002 (General Ergonomics).	L
4. Check cylinder for leaks	Release of pressure flying /falling object, debris, cuts	S	- Verify cylinder contents are labeled with a DOT label to understand type of hazard. Do not deface label. - Inspect new cylinders when received; Compressed Gas Cylinder Inspection Form may be used. (HSE-PRO-100330 ATTACHMENT 1). - Make sure safety relief devices are intact and not damaged. - Check for corrosion, pitting, cuts, gouges, digs, bulges, neck defects, and general distortion. - Tag and return any damaged or defective cylinder to the supplier. - Never remove product labels or shipping hazard labels. - Wear a hard hat if overhead hazards exist. - Use soap bubbles, sound, etc. to locate/identify leaks.	S
5. If leak is detected and cannot be easily fixed	Explosion, fire, asphyxiation	S	- Remove cylinder to isolated area with good ventilation. - Allow cylinder to completely discharge. Do not vent inside a building. - If gas is flammable or toxic, post appropriate warning signs around the isolated area. - Tag cylinder out of service, mark location of leak, return to supplier, and inform them of the problem.	S

AHA - Compressed Gas Handling and Use

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
6. Load and transport cylinders	Cuts, falling objects, slip/trips/falls, back strain	S	▪ Wear a hard hat if overhead hazards exist. ▪ Wearing a back brace is optional. ▪ Maintain footing and balance and always tie/secure cylinders so they cannot fall ▪ Use a cylinder cart when moving cylinders. Cylinders must be secured and transported in a vertical position. ▪ Valves must be closed during transport. ▪ Never do any of the following: - o Lift cylinders by their cylinder cap by any means (e.g., hands, a sling, or a magnet). - o Drag, drop, or slide cylinders, even for short distances. - o Use cylinders as rollers for moving material or other equipment. - o Tamper with pressure-relief devices. - o Permit oil, grease, or other readily combustible substances to come in contact with cylinders, valves, or other equipment in oxidizer service. - o Attempt to catch a falling cylinder.	S
7. Secure each cylinder separately	Flying object, release of pressure	S	▪ Secure each cylinder separately during transport. ▪ Strap cylinder.	S
8. Unload cylinders and move cylinders to work area	Cuts, falling objects, slip/trips/falls, back/knee strain	S	▪ Wear a hard hat if overhead hazards exist. ▪ Wearing a back brace is optional. ▪ Maintain footing and balance. ▪ Use a cylinder cart when moving cylinders. Cylinders must be transported in a vertical position. ▪ Do not drag, drop, slide, or roll cylinders. ▪ Valves must be closed during transport. ▪ Ensure valve caps are tightly secured.	S
9. Remove valve caps and install regulators	Cuts, pinch points, eye hazard	S	▪ Wear a hard hat if overhead hazards exist. ▪ Check all connections and pressure regulators, manifolds, hoses, gauges and relief valves for integrity and tightness.	S
10. Install hoses, open cylinder main valves and set regulators to proper pressures	Eye hazard, cuts, pinch points, falling objects	S	▪ Wear a hard hat if overhead hazards exist. ▪ Ensure that acetylene pressure does not exceed 8 psi and oxygen pressure does not exceed 22 psi.	S
11. Close cylinder main valves, reduce regulator pressures to 0 psi, remove hoses and remove regulators	Release of pressure, eye hazard, cuts, pinch points, falling objects	S	▪ Wear a hard hat if overhead hazards exist.	S

AHA - Compressed Gas Handling and Use

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
12. Remove cylinders from work area, load and transport cylinders	Cuts, falling objects, slip/trips/falls, back/knee strain	S	- Wear a hard hat if overhead hazards exist. - Wearing a back brace is optional. - Maintain footing and balance. - Use a cylinder cart when moving cylinders. Cylinders must be transported in a vertical position. - Do not drag/slide or roll cylinders. - Valves must be closed during transport. - Ensure valve caps are tightly secured and always tie/secure cylinders so they cannot fall.	S
13. Unload cylinders and move back to storage area	Cuts, falling objects, slip/trips/falls, back/knee strain	S	- Wear a hard hat if overhead hazards exist. - Wearing a back brace is optional. - Maintain footing and balance. - Use a cylinder cart when moving cylinders. Cylinders must be transported in a vertical position. - Do not drag/slide or roll cylinders. - Valves must be closed during transport. - Ensure valve caps are tightly secured.	S
14. Storing/securing cylinders at a fixed location	Flying objects, release of pressure	S	- Secure at 2/3 of height of cylinder using the appropriate material. - Valves must be closed and valve protection caps in place when cylinder is not in use. - Never allow any of the following to occur: - Allow storage temperature to exceed 125 degrees F. - Permit spoking or open flames in oxidizer or flammable gas storage areas. - Expose cylinders to corrosive materials such as ice melting compounds	S
15. Store/segregate cylinders into hazard classes	Explosion, fire, death	S	- Store only like gases together. - Store in a cool, dry, ventilated area where they are protected from damage and weather. - Cylinders may not be stored on the ground to prevent rusting. - Keep cylinders away from open flames and sources of heat and combustibles. - Oxygen cylinders, including empties, and fuel cylinders shall be stored in areas separated by a minimum of 20 feet or by a 5-foot high, 1-hour minimum fire rated wall. - Cylinder storage areas shall be prominently posted with the hazard class or the name of the gases stored in the storage area. - Signs must be posted in areas where flammable compressed gases are stored. The signs must identify the substance(s) and the appropriate precautions (e.g., Hydrogen – Flammable Gas – No Smoking or Open Flames).	S
16. Segregate filled and empty cylinders	Explosion, fire, death	S	- Store only like gases together. - Label or tag empty cylinders. - Store charged or full cylinders away from empty cylinders.	S

AHA - Decontamination Procedures

Activity / Task:	Decontamination Procedures	Overall RAC for AHA (see "Methodology" Step 4):					S
Project Location:	Brighton, NY	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Effective / Issue Date:	07/06/21		AHA Revision No.:	1			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: • Personnel and equipment decontamination procedures. • No chemical or exotic agents are anticipated for decontamination needs. • Check additional Life Saving Actions as applicable to your project. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
Step 4: Annotate the overall highest RAC-Residual at the top of AHA.					L = Low Risk		
MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment							
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☒ HAZARDOUS ATMOSPHERES/SUBSTANCES		
		 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☐ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS	

AHA - Decontamination Procedures

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): See project-specific HASP Job Step-specific PPE (as required): Face shield, goggles, high visibility vest, hard hat, gloves, boot covers, cover-all/Tyvek suit, respirator (see HASP) Other Required Equipment: Steam/hot water/pressure washer, decontamination equipment (e.g., plastic sheeting, wading pools, brushes, tables, chairs, drums, plastic bags, duct tape), air monitoring equipment if required, signs and barricade equipment (see HASP)	Competent / Qualified Personnel: - See project-specific HASP Training Requirements: MyLP – Emergency Response including spills or releases (\$40 ClickSafety) MyLP – US Field Safety Training (in-house, online) - Check Catalog Listing - MyLP for training options relative to site specific hazards.HAZWOPER if applicable Catalog Listing - HAZWOPER if required - SDS for decon solution(s) - Site Specific HASP Orientation - Toolbox safety meeting - Task kick-off meeting	- Inspect all PPE prior to use. - Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	- Wear standard PPE at all times. - Review project-specific HASP for standard PPE. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. Mobilization/demobilization	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 076 (Mobilization/Demobilization & Site Preparation).	S
3. Determine potential presence of biohazard(s). If biohazard(s) possible,	Identified potential biological hazards	S	Review/comply with Raleigh Office AHA 007 (General Biological Hazards).	L
4. All work steps that include lifting, bending, twisting, back/knee strain, etc. hazards	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 002 (General Ergonomics).	L
5. Establish decontamination station	Materials handling issues, back strain, and other musculoskeletal disorders	S	- Use proper lifting techniques - Use mechanical aids, if available, to move heavy items. - Set up signs, hazard tape, barricades, etc. (see HASP).	L

AHA - Decontamination Procedures

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
6. Decontamination/steam cleaning	Struck by steam/hot water/pressure washing	S	- Workers not directly engaged in steam cleaning operations must stay clear. - Workers using steam cleaning equipment must be trained on operation and safety devices/procedures using the owner's/operator's manual. - Use face shield and safety glasses or goggles if steam cleaning. - Stay out of the splash/steam radius. - Pressure washer must have dead man switch. - Do not direct steam at anyone. - Do not hold objects with your feet or hands. - Ensure that direction of spray minimizes spread of contaminants of concern. - Use shielding as necessary.	M
	Exposure to contaminants	S	- Conduct air monitoring (see HASP). - Wear proper PPE (see HASP). - See SDSs for hazards associated with the decon solutions used (if other than water is used).	S
	Slips/trips/falls	M	- Be cautious as ground/plastic can become slippery - Use boots or boot covers with good traction	L
7. Vehicle decontamination	Vehicle traffic in and out of the CRZ	S	- Always wear a hard hat, steel toe boots, and a high visibility vest (unless Tyveks are used and are high visibility). - Vehicle drivers are not to exit the vehicle in the CRZ. - Identify an individual to communicate with vehicle drivers and maintain order - Trucks will be lined with plastic and kept out of direct contact with any contaminated materials during loading. Wear PPE when removing plastic lining from truck beds. - If not in the vehicle, obtain eye contact with the driver, so he is aware of your presence and location in the CRZ. - If you are driving the vehicle, be aware of personnel in the CRZ and maintain communication with the identified personnel.	S
	Exposure to contaminants	S	- Use safety glasses or goggles, polycoated Tyvek (if level of contamination poses dermal hazard or to keep work clothes dry), high visibility vest (if high visibility Tyveks are not used) hard hats, steel toe boots, and gloves while cleaning contaminated materials. - Do not doff PPE until decontamination of the vehicle is complete and a decontamination certificate has been issued by the HSO. - Conduct air monitoring (see HASP). - See SDSs for hazards associated with the decon solutions (if other than water alone is used).	S
	Slips/trips/falls	M	- Be cautious as ground/plastic/decks can become extremely slippery. - Keep surfaces clean and ship-shape, organized. - Wash down sediment and pump into container for IDEW Disposal as necessary. - Use boots or boot covers with good traction.	L

AHA - Decontamination Procedures

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
8. Equipment and sample decontamination	Chemical exposure when handling contaminated sample jars and equipment	S	- Wear PPE as outlined in the HASP. - Refer to SDS for specific hazards associated with decon solutions. - Monitor breathing zone for contaminants. - Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.) if appropriate (see HASP).	S
	Materials handling related injuries, back strain, and other musculoskeletal disorders	S	- Use proper lifting techniques when lifting heavy equipment. - Use 2-person lift for heavy coolers.	L
9. Personal decontamination	Exposure to contaminants	S	- Avoid bringing contaminated materials via shoes and clothing into the CRZ by examining such prior to exiting the EZ. - Removal of PPE will be performed by the following tasks in the listed order: - Gross boot wash and rinse and removal - Outer glove removal - Suit removal - Respirator removal (if worn) - Inner glove removal - Contaminated PPE is to be placed in the appropriate, provided receptacles. - Respirators will be removed and decontaminated at a specified location within the CRZ by a designated technician, then placed in storage bag. - Employees will wash hands, face, and any other exposed areas with soap and water. - Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. - See SDSs for hazards associated with the decontamination solutions used. - Decon solutions will be disposed of according to the work plan (see HASP).	S
10. Clean and clear work area	Housekeeping, slip/trip/fall, back strain and other musculoskeletal disorders	M	- Follow good housekeeping protocols. - Clear area of all tools, materials, and debris. - Use proper lifting techniques when removing signs and barricade equipment.	L
11. Mobilization/demobilization	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 076 (Mobilization/Demobilization & Site Preparation).	S

AHA - Fieldwork Oversight

Activity / Task:	Fieldwork Oversight	Overall RAC for AHA (see "Methodology" Step 4):					S
Project Location:	Raleigh Office & Applicable Project Sites	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Effective / Issue Date:	03/29/21		AHA Revision No.:	1			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: - Conducting fieldwork oversight. - Check additional Life Saving Actions as applicable to your project. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
		Step 4: Annotate the overall highest RAC-Residual at the top of AHA.					L = Low Risk
		MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment					
Check all Life Saving Actions that apply:		 ☒ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☒ DRIVING	 ☐ SUSPENDED LOADS	 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☐ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS			

AHA - Fieldwork Oversight

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Eye protection and foot protection Job Step-specific PPE (as required): Site/client specific - see HASP Other Required Equipment: Project specific - review HASP	Competent / Qualified Personnel: - Project specific - see HASP Training Requirements: - HAZWOPER (40-hour, 8-hour Refresher, Supervisory, as applicable) - OSHA 10 Construction as applicable - E&I: Supervisor Safety Education and Training – PPT MyLP – Heath & Safety Leadership for Supervisors and Managers (\$45 ClickSafety -4 Hours) as applicable - E&E: MyLP – Emergency Response including spills or releases (\$40 ClickSafety) MyLP – US Field Safety Training (in-house, online) - Check Catalog Listing - MyLP for training options relative to site specific hazards.HAZWOPER if applicable Catalog Listing - HAZWOPER if required - Site-specific HASP Orientation - Toolbox safety meeting - Task kickoff meeting	- Inspect all PPE prior to use. - Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. - Check HASP for additional equipment inspection requirements.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	- Wear standard PPE at all times. - Standard PPE includes safety glasses and safety shoes. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. Determine potential presence of biohazard(s). If biohazard(s) possible,	Identified potential biological hazards	S	Review/comply with Raleigh Office AHA 007 (General Biological Hazards).	L
3. All work steps that include lifting, bending, twisting, back/knee strain, etc. hazards	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 002 (General Ergonomics).	L
4. Is the use of a company vehicle necessary? If yes,	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 001 (General Vehicle Travel).	S

AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
5. Are temperature extremes present during work? If yes,	Multiple (see specified AHAs)	S	- Review/comply with Raleigh Office AHA 003 (General Heat Stress) if applicable. - Review/comply with Raleigh Office AHA 004 (General Cold Stress) if applicable.	L
6. Is the use of a trailer necessary? If yes,	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 005 (General Trailer Use).	S
7. Does work occur in the field or wild? If yes,	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 008 (Working in the Wild or Field).	M
8. Does work occur over or near water? If yes,	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 082 (Working Over or Near Water).	S
9. Prepare for site visit	None	NA	- Obtain and review HASP prior to site visit, if possible. - Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots). - Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current. - Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment). - First aid kits shall be available at the work site and on each transport vehicle. - Familiarize yourself with route to the site. - Check weather forecast. Pack appropriate clothing and other items (e.g., sunscreen) for anticipated weather conditions. - Verify that subsurface utilities have been identified.	NA
10. Traveling to the site by vehicle	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 076 (Mobilization/Demobilization and Site Preparation).	S
11. Initial arrival - assess site conditions	Communication	S	- Talk to each other. Develop communication methods (agree on hand signals, warning alarms). - Log all workers and visitor on and off the site. - Let other crewmembers know when you see a hazard. - Avoid working near known hazards. - Always know the whereabouts of fellow crewmembers. - Carry a radio and spare batteries or cell phone. - Hold tailgate meetings.	M
	Insect bites and stings	S	- Review/comply with Raleigh Office AHA 007 (General Biological Hazards). - Discuss the types of insects expected at the Site and be able to identify them. - Look for signs of insects. - Inform crew members if allergic to insects and what to do if you need assistance. - Avoid wearing heavy fragrances.	L

AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
(continued)			▪ Carry first aid and sting relief kits. ▪ Carry identification of known allergies and necessary emergency medication. ▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails.	
11. Initial arrival - assess site conditions (continued)	Poisonous plants	S	▪ Review/comply with Raleigh Office AHA 007 (General Biological Hazards). ▪ Wear long sleeves, long pants, and boots. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with high visibility spray paint if working at a fixed location. ▪ Look for signs of poisonous plants and demark area to aid in avoiding plant. ▪ Do not touch any plant part to any part of your body/clothing. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.	L
	Vermin, leaches, animal borne disease	S	▪ Review/comply with Raleigh Office AHA 007 (General Biological Hazards). ▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Wear long sleeve shirt and full-length pants.	L
	Chemical hazards	S	▪ Wear chemical resistant PPE as identified in the HASP. ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone. ▪ Read MSDSs for all chemicals brought to the site. ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labeled.	S
	Overhead power lines	H	▪ Identify the location of all overhead power lines at the site. ▪ Maintain clearances depending on voltage - All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV or less). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead power lines known to be 50 kV or less and 35 feet from all others. ▪ Re-locate work so it is not close to power lines. ▪ Avoid storing materials under overhead power lines.	S
	Underground utilities	H	▪ All utilities will be marked prior to excavation activities. ▪ For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet. ▪ Use lineman's gloves when locating underground power lines. ▪ Work at adequate offsets from utility locations. ▪ Immediately cease work if unknown utility markings are discovered.	S
(continued)				

AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
11. Initial arrival - assess site conditions (continued)	Cold stress	S	- Review/comply with Raleigh Office AHA 004 (General Cold Stress). - Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. - Take layers off as you heat up; put them on as you cool down. - Wear head protection that provides adequate insulation and protects the ears. - Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. - Acclimate to the cold climate to minimize discomfort. - Maintain adequate water/fluid intake to avoid dehydration. - Be aware of signs of hypothermia, its prevention, detection, and treatment. - Have extra protection available, in case of an emergency such as blankets and heating devices. - Don't work under extremely adverse weather conditions. - Stay in tune to current weather and extended forecasts.	L
	Heat stress	S	- Review/comply with Raleigh Office AHA 003 (General Heat Stress). - Curtail or suspend physical work when conditions are extremely severe. - Use the OSHA-NIOSH Heat Index App to calculate the heat index (or compute using a Wet Bulb Globe Temperature Index) to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed). - Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load.	L
	Lightning and thunder	S	- Monitor weather channels to determine if electrical storms are forecasted. - Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.). - Suspend all field work at the first sound of thunder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds.	M
	Severe weather	S	- Watch for clouds and incoming weather. - Monitor weather forecasts. - Train workers about weather and appropriate precautions. - Identify a shelter and a safe place in event of tornado etc.	M
	Sun	S	- Keep body protected. - Wear sunscreen, wide brimmed hat or hard hat. - Schedule work for cool part of day. - Take breaks in the shade.	L
(continued)				

AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
11. Initial arrival - assess site conditions (concluded)	High crime areas	S	- Do not enter areas where threats are present. - Contract security where applicable. Use the buddy system. - Maintain contact with support such as radio or cell phone. - Do not work after dark.	L
	Operations conducted at an active facility	S	- Stay well clear of operations being conducted at the facility. - Keep alert for moving materials, equipment, or vehicles. - Determine client specific PPE needs prior to arriving at the site. - Determine client specific emergency response procedures and follow as appropriate. - Participate in client required safety training. - Get copies of client's SDSs for any client chemicals that workers may be exposed to. - Provide SDSs to client for all chemicals brought to the site.	L
	Remote locations	S	- Carry a two-way radio or cell phone. Verify cell phone is charged. - Work in teams. - Make sure someone on crew is certified in first aid. - Carry a first aid kit.	L
	Slips/trips/falls	M	- Wear slip-resistant footwear. - Pay attention to where you place your feet. - Slow down and use extra caution around logs, rocks, and animal holes. - Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. - Site SHSO will inspect the entire work area to identify and mark hazards. - Clear area of trip hazards; mark or barricade those that cannot be moved. - Use caution when walking around excavated areas. - Use caution when walking on or around loose soil.	L
12. Cell phone/electronic device use in the field	Distractions leading to innumerable hazards	S	- Designate a safe location/distance away from the work area and traffic patterns for cell phone use. - All phone calls can wait until you have stopped work and moved to a safe location. - Never use a cell phone in an Exclusion Zone unless first moving to a safe location. Use of radios are recommended instead of cell phone use. - Remove chemically protective gloves before cell phone/electronic device handling. - Stand still when using cell phones and electronic devices. - Don't turn your back on traffic or heavy equipment movements. - Operating mobile equipment requires both hands. No cell phone use is allowed while operating mobile equipment including hands free.	M

AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
13. Set up decon station	Back strain and other musculoskeletal disorders	S	▪ Refer to SDS for specific hazards associated with decon solutions. ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP). ▪ Removal of PPE will be performed by the following tasks in the listed order: - Gross boot wash and rinse and removal - Outer glove removal - Suit removal - Respirator removal (if worn). - Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.	L
14. Oversight during drilling, or construction operations (continued)	Working near mobile/heavy equipment/ vehicles	S	▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the swing radius and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Personnel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. Ground personnel will stay clear of all suspended loads. ▪ Ground personnel will wear high visibility vests. ▪ Eye contact with operators will be made before approaching equipment.	M
	Eye injury	S	▪ Wear appropriate safety glasses (tinted for sun). ▪ Watch where you walk, especially around trees and brush with protruding limbs.	M
	Foot injury	S	▪ Wear steel toed boots. ▪ Wear insulated steel toed boots during winter. ▪ Ensure shoes/boots have good traction. ▪ Pay attention to where you place your feet, especially when walking on uneven terrain.	M
	Head injury	S	▪ Wear hard hat. ▪ Do not walk or work under scaffolding or other elevated work unless there are guardrails and toe boards in place. ▪ Flag or mark protruding objects at head level.	M

AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
14. Oversight during drilling, or construction operations (concluded)	Chemical hazards	S	- Wear chemical resistant PPE as identified in the HASP. - Use monitoring equipment, as outlined in HASP, to monitor breathing zone. - Read SDSs for all chemicals brought to the site. - Be familiar with hazards associated with site contaminants. - Ensure that all containers are properly labeled. - Wash hands and face prior to consumption of food, beverage, or tobacco.	S
	Dust - particulates (respiratory)	S	- Use dust suppression methods. - Stand upwind of point of dust generation.	S
	Overhead power lines	H	Maintain clearances depending on voltage - All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV or less). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead power lines known to be 50 kV or less and 35 feet from all others.	S
	Underground utilities	H	- All utilities will be marked prior to excavation activities. - Work at adequate offsets from utility locations. - Immediately cease work if unknown utility markings are discovered.	S
	Standing/static posture	S	- Change posture on a frequent basis. - Stretch prior to any physical activity.	L
	Slips/trips/falls	M	- Pay attention to where you place your feet. - Slow down and use extra caution around logs, rocks, and animal holes. - Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. - Wear laced boots with a minimum 8" high upper and nonskid soles for ankle support and traction. - Clear area of trip hazards; mark or barricade those that cannot be moved. - Use caution when walking around excavated areas. - Stay back at least 5 feet from excavated areas. - Use caution when walking on or around loose soil. - Be aware of surroundings. Avoid muddy areas if possible.	L
15. Sampling oversight (continued)	Chemical hazards	S	- See HASP for appropriate level of PPE. - Wear chemical resistant PPE as identified in the HASP. - Use monitoring equipment, as outlined in HASP, to monitor breathing zone. - Be familiar with hazards associated with site contaminants. - Wash hands and face prior to consumption of food, beverage, or tobacco. - Calibrate meters in a clean, well ventilated area. - Store calibration gases in well vented area. Ensure chemical labels and warnings are legible.	S

AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
15. Sampling oversight (continued)	Decontamination	S	▪ Refer to SDS for specific hazards associated with decon solutions. ▪ Monitor breathing zone for decon solutions (e.g., methanol, etc.), if appropriate (see HASP). ▪ Removal of PPE will be performed by the following tasks in the listed order: - Gross boot wash and rinse and removal - Outer glove removal - Suit removal - Respirator removal (if worn). - Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.	S
	Back strain and other musculoskeletal disorders due to heavy lifting	S	▪ Good lifting techniques (lift with legs not back). ▪ Mechanical devices (e.g., hand truck, cart, forklift, etc.) should be used to reduce manual handling of materials. ▪ Team lifting should be utilized if mechanical devices are not available. (mandatory for items over 50 lb). ▪ Split heavy loads into smaller loads. ▪ Make sure that path is clear prior to lift. ▪ Redesign work area to avoid low lifts ▪ Stretch prior to lifting. ▪ Maintain a healthy lifestyle and level of physical fitness.	L
	Hand tools	S	▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools. ▪ Daily inspections will be performed. ▪ Remove broken or damaged tools from service and tag out as defective. ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ Do not use excessive force or impact. ▪ Do not use tool improperly. Ensure all workers are trained.	L
(continued)				

AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
15. Sampling oversight (concluded)	Slips/trips/ falls	M	▪ Pay attention to where you place your feet. ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and nonskid soles for ankle support and traction. ▪ Clear area of trip hazards; mark or barricade those that cannot be moved. ▪ Use caution when walking around excavated areas. ▪ Stay back at least 5 feet from excavated areas. ▪ Use caution when walking on or around loose soil. ▪ Be aware of surroundings. Avoid muddy areas if possible.	L
	Working near mobile equipment, struck by vehicle	S	▪ Ground personnel in the vicinity of vehicles operations will be within the view of the operator at all times. ▪ Ground personnel will not stand directly behind vehicles when it is in operation. ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads. ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low-level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary. ▪ Place cones in the front and rear of the vehicle. ▪ Prior to driving off, walk around vehicle to collect cones and identify any hazards - especially low-level hazards that may be difficult to see when in the vehicle. ▪ Set up "Workers in the Road" or similar warning signs and cones to alert traffic. ▪ Use emergency flashers and roof top flashing light (recommended) to alert oncoming vehicular traffic. ▪ Remain alert at all times as to the traffic outside the vehicle. Step to the side of the road when distracted by by-standers. Keep unofficial personnel out of the work area. ▪ Exit vehicle with caution. ▪ Wear High Visibility Vest when outside the vehicle. ▪ Utilize vehicle as a shield from oncoming traffic, as practical.	M
16. IDW pickup oversight (continued)	Chemical hazards	S	▪ See HASP for appropriate level of PPE. ▪ Wear chemical resistant PPE as identified in the HASP. ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone. ▪ Be familiar with hazards associated with site contaminants. ▪ Wash hands and face prior to consumption of food, beverage, or tobacco.	S

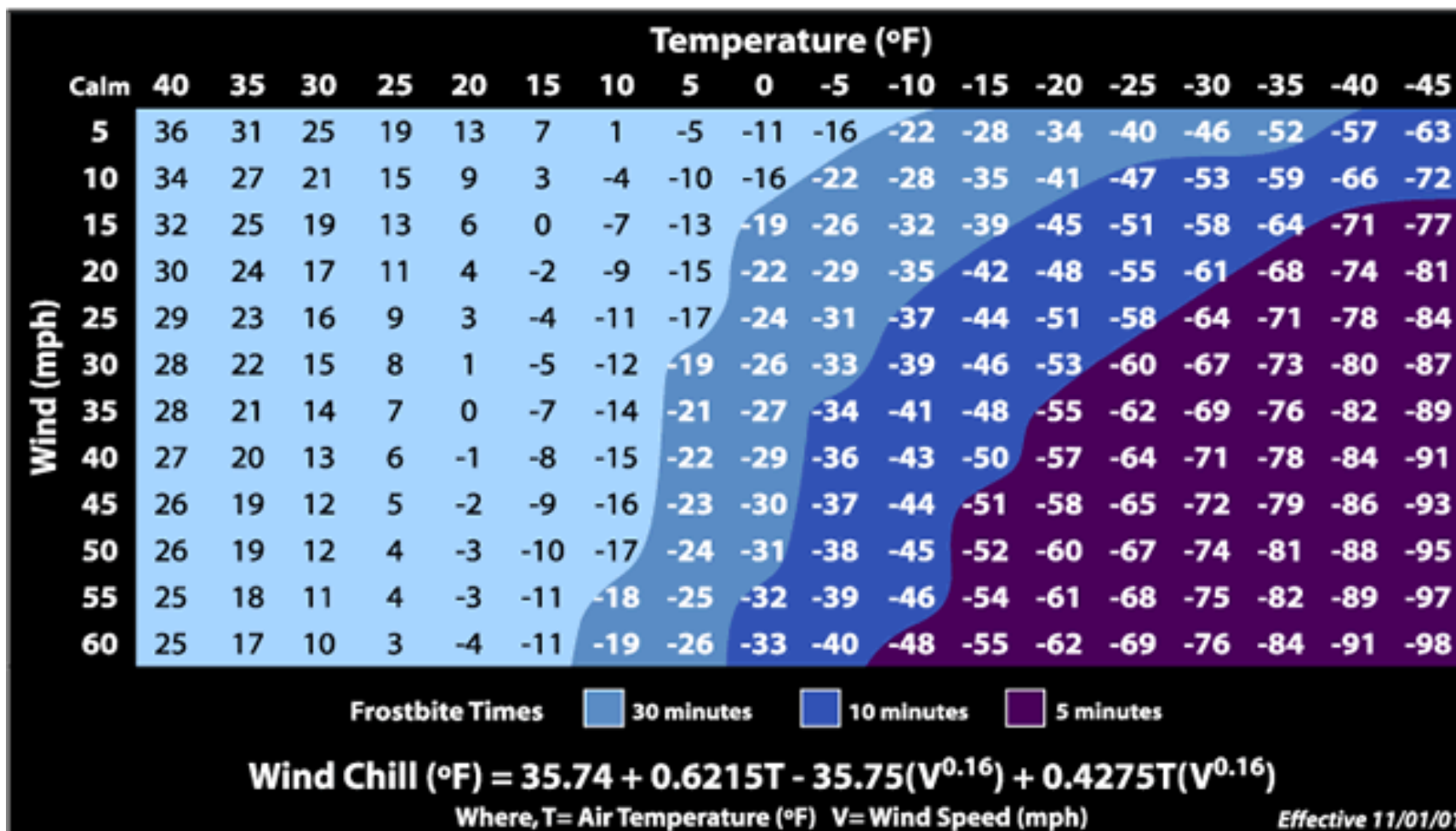
AHA - Fieldwork Oversight

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
17. IDW pickup oversight (concluded)	Foot injury from dropped objects	S	- Wear steel toed boots. - Pay attention to where you place your feet, especially when walking on uneven terrain.	S
	Back strain and other musculoskeletal disorders due to heavy lifting	S	- Good lifting techniques (lift with legs not back). - Use mechanical devices (e.g., hand truck, cart, forklift, etc.) to move drums. - Team lifting should be utilized if mechanical devices are not available. (mandatory for items over 50 lb).	L
	Slips/trips/falls	M	- Pay attention to where you place your feet. - Slow down and use extra caution around logs, rocks, and animal holes. - Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. - Clear area of trip hazards; mark or barricade those that cannot be moved. - Use caution when walking around excavated areas. - Stay back at least 5 feet from excavated areas. - Use caution when walking on or around loose soil. - Be aware of surroundings. Avoid muddy areas if possible.	L
18. Clean and clear work area	Housekeeping, slip/trip/fall	M	- Follow good housekeeping protocol. - Clear area of all tools, materials, and debris.	L
19. Return to office/home	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 076 (Mobilization/Demobilization and Site Preparation).	S

AHA - Fieldwork Oversight



Wind Chill Chart



AHA - General Biological Hazards

Activity / Task:	General Biological Hazards	Overall RAC for AHA (see "Methodology" Step 4):					M
Project Location:	Raleigh Office & All Project Locations	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Date of Analysis / Update:	07/08/20		AHA Revision No.:	4			
Prepared by:	Raleigh Office Safety Team	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: Any activity that may expose the employee to biological hazards. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
					L = Low Risk		
MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment.							
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☒ HAZARDOUS ATMOSPHERES/SUBSTANCES		
 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☐ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS			

AHA - General Biological Hazards

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Hand and skin protection to include work gloves, long-sleeves, long pants, and socks; foot protection Job Step-specific PPE (as required): Safety glasses, snake boots or thick leather boots and chaps, hat w/ mosquito netting if applicable, respiratory protection if applicable Other Required Equipment: Ivy-X, Ivy Block, Tecnu, insect repellent wipes	Competent / Qualified Personnel: ▪ NA Training Requirements: ▪ Respiratory Protection, if applicable ▪ Review SDS and label for insect repellent and poisonous plant barrier cream and/or cleanser used ▪ MyLP – US Field Safety (online) ▪ Bloodborn Pathogen Awareness (\$10 online) if applicable	▪ Inspect areas before beginning work. ▪ Inspect PPE before use. ▪ Inspect first aid kit before going out in the field. Replace any missing items.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	▪ Wear standard PPE at all times. ▪ Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. All work steps where contact with insects, spiders, snakes, animals and irritating plants could occur	Irritants (poison plants) Biters (snakes, spiders) Stingers (bees, wasps, ants) Vectors (ticks, bats) Pathogens (rabies, blood and other potentially infectious materials (OPIM))	S	▪ Identification, avoidance, and prevention are the key to protecting workers!	L
3. All work steps where contact with insects could occur	Mosquito and other insect bites, West Nile virus, Zika virus, etc.	S	▪ Wear work gloves, long-sleeves, long pants, and socks when outdoors. Ensure arms are covered and minimize possibility of insect travel between hand and arm coverings. ▪ Use an insect repellent that contains DEET, Picaridin, or an EPA-registered active ingredient on skin that is not covered by clothing. Always follow label precautions. ▪ Mosquitoes may bite through thin clothing, so spray clothes with repellent containing permethrin for added protection. If using permethrin, spray on clothing and gear only – not directly on skin ▪ After returning indoors and before eating, use soap and water to wash skin that has been treated with insect repellent. Reapply repellent when returning outdoors after eating. ▪ OSHA and NIOSH recommend that you talk to your supervisor(s) about any outdoor work assignment(s) or travel to Zika-affected areas if you are or may become pregnant, or for males, if your partner is or may become pregnant. Consult CDC information on Zika virus and pregnancy: www.cdc.gov/zika/ ▪ If traveling outside the continental US, find out if you are traveling to an area with risk of Zika. Wear hat with mosquito netting to protect face and neck.	L

AHA - General Biological Hazards

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
4. Dangerous animals	Bites, rabies	S	- Be aware of your surroundings. - Watch for dangerous animals, such as aggressive dogs, raccoons, snakes, etc. - Avoid confrontations with animals that may be infected with rabies (dogs, raccoons, cats, skunks, and bats). - Wear appropriate clothing and boots.	L
5. Fire ants, bee and wasp stings	Allergic reactions, painful stings	S	- Be alert to hives in brush. Watch for insects traveling in and out of one location. - If you or anyone you are working with is known to have allergic reactions to bee stings, tell co-workers and your lead. If you have been prescribed emergency medication for bee stings, make sure you carry it with you at all times. - Wear long sleeve shirts and trousers with shirt tucked in. Bright colors and metal objects may attract bees. - If you are stung, cold compresses may bring relief. - If a stinger is left behind, scrape it off the skin. Do not use a tweezers as this squeezes the venom sack, worsening the injury. - If the victim develops hives, asthmatic breathing, tissue swelling, or a drop in blood pressure, seek medical help immediately.	L
6. Poisonous spiders	Black Widow (pictured here), Brown Recluse 	S	- The Black Widow is the most dangerous spider in North America. - Brown Recluse venom can cause significant cutaneous injury with tissue loss and necrosis. - Bites by these poisonous spiders require immediate medical attention. - Wear gloves when handling wood, rock, and brush piles or while rummaging in out-of-the way places, garages, or attics.	L
7. Venomous snakes	Venomous bites (rattlesnakes, copperhead, water moccasin, coral) 	S	- Leave all snakes alone. Many people are bitten because they try to kill a snake or get a closer look at it. - Stay out of tall grass unless you wear thick leather boots and chaps. - Remain on paths as much as possible. - Keep hands and feet out of areas you can't see. - Don't pick up rocks or wood unless you are out of a snake's striking distance. - A snake can strike half its length. - Be cautious and alert when climbing rocks. - If you encounter a snake, stay at a safe distance (at least 6 feet away), call responsible site personnel immediately, and remain at the location to ensure the safety of others.	L

AHA - General Biological Hazards

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
8. Ticks and infected mosquitos	Lyme Disease, Rocky Mountain Spotted Fever, etc.	S	▪ Treat clothing and gear with products containing permethrin. Permethrin can be used to treat boots, clothing, and camping gear and remain protective through several washings. Review Permethrin SDS and label for handling, storage, and directions for use before using. ▪ Use EPA-registered insect repellents (https://www.epa.gov/insect-repellents) containing DEET, picaridin, IR3535, Oil of Lemon Eucalyptus, or 2-undecanone. EPA's helpful <i>Insect Repellents Search Tool</i> (https://www.epa.gov/insect-repellents/find-repellent-right-you) can help you find the product that best suits your needs. Always follow product instructions. Do not use products containing oil of lemon eucalyptus (OLE) or para-menthane-diol (PMD) on children under 3 years old. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Each outer garment should overlap the one above it. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails. ▪ Search the body on a regular basis, especially hair and clothing; ticks generally do not attach for the first couple of hours. ▪ Perform a tick check on outer clothing and exposed skin during hydration breaks. ▪ If a tick becomes attached, pull it by grasping it as close as possible to the point of attachment and pull straight out with gentle pressure. Wash skin and soap and water then cleanse with rubbing alcohol. Place the tick in an empty container for later identification if the victim should have a reaction. Record dates of exposure and removal. If you find an embedded tick, remove immediately and submit iSMS report at earliest convenience. ▪ Ticks can attach to any part of the human body but are often found in hard-to-see areas such as the groin, armpits, and scalp. In most cases, the tick must be attached for 36 to 48 hours or more before the Lyme Disease bacterium can be transmitted. For more information regarding Lyme disease, go to https://www.cdc.gov/lyme/ ▪ Rocky Mountain Spotted Fever (RMSF) can be deadly. RMSF symptoms include fever with headache, upset stomach, and rash (may occur later in illness). Call TriageNow immediately if you develop a fever after being bitten by a tick or after spending time in areas with ticks. For more information regarding RMSF, go to https://www.cdc.gov/rmsf/ ▪ Do not try to remove the tick by burning with a match or covering it with chemical agents. ▪ If you cannot remove the tick or the head detaches, seek prompt medical help. ▪ Watch for warning signs of illness: a large red spot on the bite area; fever, chills, headache, joint and muscle ache, significant fatigue, and facial paralysis are reactions that may appear within 2 weeks of the attack. Symptoms specific to Lyme Disease include confusion, short-term memory loss, and disorientation.	L

AHA - General Biological Hazards

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
9. Bird/mouse droppings	Histoplasmosis, cryptococcus, psittacosis, hantavirus, etc.	S	▪ If disturbance of the droppings cannot be avoided, control droppings from become airborne. - Wear safety goggles and rubber gloves. - Mist droppings with water. - If work activity or hazard control will result in contaminating outer clothing, wear disposable coveralls. - Bleach solution or household disinfectant can effectively deactivate Hantaviruses when cleaning rodent infestations. ▪ If cleanup is required in order to conduct work activities, wear safety goggles, rubber gloves, disposable coveralls, and a respirator equipped with a HEPA filter. [Note: Employees must be enrolled in Company's Respiratory Protection Program and be current with all program requirements before using required respiratory protection.]	L
10. Other animal feces	Hantavirus, Shiga toxin-producing E. coli (STEC), toxoplasmosis, raccoon roundworm, eosinophilic meningitis, anthrax, etc.	S	▪ If disturbance of the feces cannot be avoided, control feces from becoming airborne. - Wear safety goggles and rubber gloves. - Mist feces with water. - If work activity or hazard control will result in contaminating outer clothing, wear disposable coveralls. ▪ If cleanup is required in order to conduct work activities, wear safety goggles, rubber gloves, disposable coveralls, and a respirator equipped with a HEPA filter. [Note: Employees must be enrolled in Company's Respiratory Protection Program and be current with all program requirements before using required respiratory protection.]	L
11. Mold/mildew/fungi	Allergic reactions, localized skin infections, eye/skin/nose/throat irritation [Note: May trigger asthma.]	S	▪ If mold is observed or suspected, contact the HSE Manager or project management immediately. ▪ Learn to identify and avoid toxic plants, such as poison wood trees. ▪ Keep skin covered. If contact is made, avoid spreading the oil to other areas. ▪ Cool water and specialty soap should be used to clean skin as soon as possible after contact. Wash area three times followed by rubbing alcohol. ▪ Care should be taken when removing clothes that came into contact as well. ▪ If rash appears, apply approved lotion. Do not scratch affected area. ▪ See doctor if serious swelling occurs. ▪ Do NOT burn poisonous plants. ▪ Do NOT inhale smoke from the burning of poisonous plants.	L

AHA - General Biological Hazards

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
12. Poisonous plants	Poison Ivy 	S	- Grows everywhere in United States except Hawaii and Alaska. - In the East, Midwest, and the South, it grows as a vine. - In the Northern and Western United States, it grows as a shrub. - Each leaf has three leaflets. - Leaves are green in the summer and red in the fall. - In the late summer and fall, white berries may grow from the stems.	L
	Poison Oak 	S	- Oak-like fuzzy leaves in clusters of three. - It has two distinct kinds: - Eastern poison oak (New Jersey to Texas) grows as a low shrub. - Western poison oak (Pacific Coast) grows to 6-foot tall clumps or vines up to 30 feet long. - It may have clusters of yellow berries.	L
	Poison Sumac 	S	- Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. - Each leaf has clusters of 7 to 13 smooth-edged leaflets. - The plants can grow up to 15 feet tall. - The leaves are orange in spring, green in summer, and red and orange or yellow in fall. - There may be clumps of pale yellow or cream-colored berries.	L
	Skin rash	S	- Oil penetrates within minutes and binds with skin proteins. - Rash appears within 12-48 hours, 2-3 weeks to heal. - Point out the location of poison ivy/oak/sumac in the work area to your co-workers. - Do not work around poison ivy/oak/sumac unprotected. - Wash immediately (within 5 minutes) with cold running water (stream, lake, hose) after potential contact.	L
	Hand contact	S	- Apply Ivy-X (or similar product) to hands, forearms, and other potentially exposed parts of the body prior to starting work in the morning and again right after lunch. - Leather gloves must be worn at all times when digging, screening, or carrying field equipment. - Leather gloves should be of sufficient length to cover the entire wrist and cuff of the shirt. - Carefully remove gloves, without touching the exterior surface, when taking notes and prior to lunch or restroom breaks. - Gloves that become worn should be replaced immediately. - Do not scratch or rub the face or other exposed skin while wearing gloves. - Workers will apply Tecnu (or similar product) to the hands and forearms immediately after removing their gloves, prior to lunch, and again at the end of the day. Tecnu will help cleanse the urushiol oil from the skin before it can be absorbed. Sensitive individuals can also apply prior to showering in the evening.	L
(continued)				

AHA - General Biological Hazards

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
12. Poisonous plants (concluded)	Arm contact	S	▪ Apply Ivy-X (or similar product) to hands, forearms, and other potentially exposed parts of the body prior to starting work in the morning and again right after lunch. ▪ Wear light weight, long sleeved shirts as the sleeves will provide a physical barrier between the skin and any urushiol oil encountered. Disposable gauntlets may be worn over arms to keep oil from clothing as well. ▪ Have the sleeves pulled down to the base of the hand, covering the forearm and wrist (all exposed skin). ▪ Workers will apply Tecnu (or similar product) to the hands and forearms immediately after removing their gloves, prior to lunch, and again at the end of the day. Tecnu will help cleanse the urushiol oil from the skin before it can be absorbed. Sensitive individuals can also apply prior to showering in the evening.	L
	Leg contact	S	▪ Wear long pants. ▪ Assume boots are contaminated with the urushiol oil and only handle with gloved hands.	L
	Exposure from handling contaminated equipment	S	▪ Do not handle any field equipment that may have come in contact with poison ivy/oak/sumac without gloves. ▪ Decontaminate all equipment at the end of each workday with a solution of water and dish soap. ▪ Scrub all surfaces of the screens and shovels with a brush. ▪ Rinse with cool water using a portable garden sprayer.	L
	Exposure from handling contaminated clothing	S	▪ Wash clothing potentially contaminated with urushiol oil prior to wearing again. ▪ Handle contaminated clothing with gloves as the oil can remain on environmental surfaces for up to 5 years.	L
13. Bloodborne pathogens	Needlesticks, punctures, cuts and scrapes, HIV and HBV	S	▪ Universal precautions: All blood or other potentially infectious materials (OPIM) must be considered as potentially infectious. Wear standard PPE. ▪ Engineering and work practice controls such as sharps disposal containers and hand hygiene. ▪ Housekeeping, including decontamination procedures and removal of regulated waste.	L

AHA - General Cold Stress

Activity / Task:	General Cold Stress	Overall RAC for AHA (see "Methodology" Step 4):					L
Project Location:	Raleigh Office & Applicable Project Sites	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Date of Analysis / Update:	10/22/19		AHA Revision No.:	2			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: Working in cold temperatures This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
		Step 4: Annotate the overall highest RAC-Residual at the top of AHA.					L = Low Risk
		MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment.					
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☐ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS			

AHA - General Cold Stress

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): See Controls listed for Job Step 4 (Dress to reduce chance of Cold Stress) Job Step-specific PPE (as required): None Other Required Equipment: None	Competent / Qualified Personnel: - Cold Stress Monitor Training Requirements: - Access to first aid trained responders - First Aid/CPR MyLP - Cold Stress for All Industries (\$35 Online)	Inspect PPE before use.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Be alert of weather conditions and of personal factors	Cold stress	S	- Recognize the environmental and work place conditions that lead to potential cold – induced illnesses and injuries such as air temperature, wind chill factor, ice, sleet, snow, and location of job (inside or outside). - Older workers, workers with diseases such as diabetes, heart, vascular and thyroid problems, and personnel on some types of medications are at increased risk.	L
2. Use engineering controls to reduce Cold Stress	Cold stress	S	- If possible, use heaters in area of work. - Shield area from drafts or wind to reduce wind chill. - Use insulating materials on metal handles etc. - Have a place to warm up during breaks.	L
3. Use administrative controls to reduce Cold Stress	Cold stress	S	- Heavy work should be scheduled during warmest part of the day. - Work in pairs and keep an eye on each other, and watch for signs of Cold Stress. - Take breaks out of the cold and drink plenty of liquids. - Drink warm sweet beverages (sugar water, sports-type drinks). - Avoid drinks with caffeine (coffee, tea or hot chocolate) or alcohol.	L
4. Dress to reduce chance of Cold Stress	Cold stress	S	- Wear adequate clothing, at least three layers of clothing: - An outer layer to break the wind and allow some ventilation (like Gortex or Nylon). - A middle layer of down or wool to absorb sweat and to provide insulation even when wet. - Wear an inner layer of cotton or synthetic weave to allow ventilation. - Wear a hat, insulated boots, and other footwear. - Keep a dry change of clothes in case your clothes become wet. Wet clothing increases risk. - Do not wear tight clothing. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	L

AHA - General Cold Stress

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
5. Avoid frostbite	Frostbite	S	▪ Frostbite occurs when the skin tissue freezes, causing ice crystals to form between cells and draw water from them, which leads to cellular dehydration. Although this typically occurs at temperatures below 30°F (-1°C), wind chill effects can cause frostbite at above-freezing temperatures. ▪ Symptoms include uncomfortable sensations of coldness; tingling, stinging or aching feeling of the exposed area followed by numbness. ▪ Ears, fingers, toes, cheeks, and noses are primarily affected. ▪ Frostbitten areas appear white and cold to the touch. ▪ Deeper frostbite involves freezing of deeper tissues (muscles, tendons, etc.) causing exposed areas to become numb, painless, hard to the touch. ▪ Seek medical assistance immediately and treat existing hypothermia as best you can while awaiting medical assistance. ▪ Frostbitten parts should be covered with dry, sterile gauze or soft, clean cloth bandages. ▪ Do not massage frostbitten tissue because this sometimes causes greater injury. ▪ Severe cases may require hospitalization and even amputation of affected tissue. ▪ Take measures to prevent further cold injury. ▪ If formal medical treatment will be delayed, consult with a licensed health care professional (such as WorkCare) for information on rewarming techniques.	L

AHA - General Cold Stress

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
6. Avoid hypothermia	Hypothermia	S	▪ Hypothermia occurs when the temperature of the body falls to a level where normal muscular and cerebral functions are impaired. While hypothermia is generally associated with freezing temperatures, it may occur in any climate where the temperature of a person's body falls below normal. ▪ The first symptoms of hypothermia, shivering, an inability to do complex motor functions, lethargy, and mild confusion, occur as the core body temperature decreases to around 95°F (35°C). ▪ As body temperature continues to fall, hypothermia becomes more severe. The individual falls into a state of dazed consciousness, failing to complete even simple motor functions. The victim's speech becomes slurred and his or her behavior may become irrational. ▪ The most severe state of hypothermia occurs when body temperature falls below 90°F (32°C). As a result, the body moves into a state of hibernation, slowing the heart rate, blood flow, and breathing. Unconsciousness and full heart failure can occur in the severely hypothermic state. ▪ Treatment of hypothermia involves conserving the victim's remaining body heat and providing additional heat sources. ▪ Specific measures will vary depending upon the severity and setting (field or hospital). ▪ Handle hypothermic people very carefully because of the increased irritability of the cold heart. ▪ Seek medical assistance for persons suspected of being moderately or severely hypothermic. Contact WorkCare for guidance during first aid or initial treatment in the field. ▪ If the person is unresponsive and not shivering, assume he or she is suffering from severe hypothermia. ▪ Reduction of heat loss can be accomplished by various means: obtaining shelter, removal of wet clothing, adding layers of dry clothing, blankets, or using a pre-warmed sleeping bag. ▪ For mildly hypothermic cases or those more severe cases where medical treatment will be significantly delayed, external rewarming techniques may be applied. This rewarming includes body-to-body contact (e.g., placing the person in a prewarmed sleeping bag with a person of normal body temperature), chemical heat packs, or insulated hot water bottles. ▪ Mildly hypothermic people may be given warm fluids orally, but avoid alcoholic or caffeinated beverages.	L

AHA - General Ergonomics

Activity / Task:	General Ergonomics	Overall RAC for AHA (see "Methodology" Step 4):					L
Project Location:	Raleigh Office & Applicable Project Sites	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Date of Analysis / Update:	10/19/19		AHA Revision No.:	3			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: • Recognizing symptoms and preventing musculoskeletal disorders • Preventing injury when lifting, moving, and lowering loads This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
		Step 4: Annotate the overall highest RAC-Residual at the top of AHA.					L = Low Risk
		MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment.					
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☐ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS			

AHA - General Ergonomics

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Work clothes Job Step-specific PPE (as required): Eye protection, foot protection, hand protection (leather palm or cut-resistant) Other Required Equipment: None	Competent / Qualified Personnel: ▪ NA Training Requirements: ▪ MyLP – Office Ergonomics for All Industries (online \$35)	▪ Inspect the load before you lift.

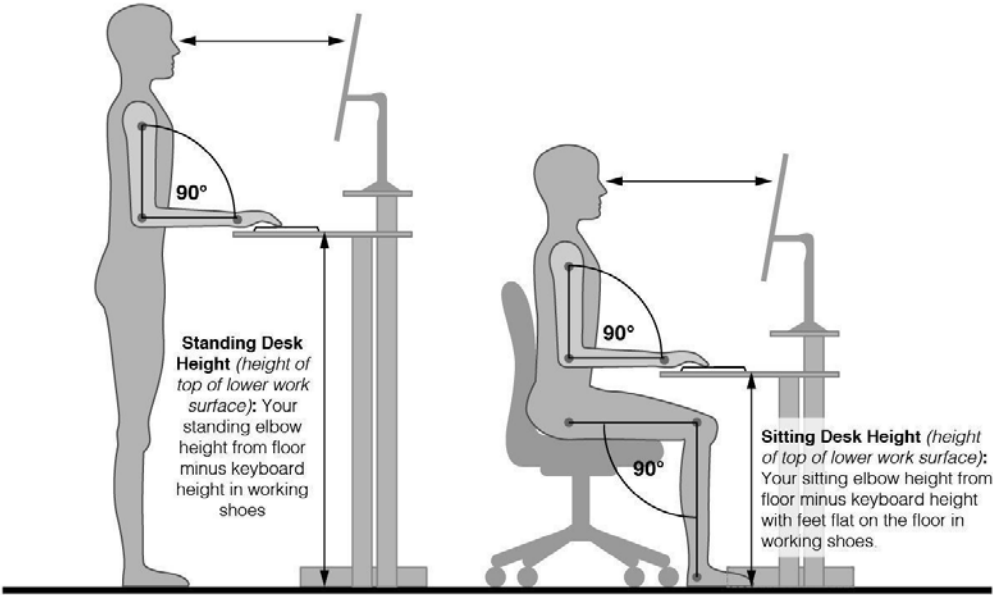
Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Recognition of the risk factors for musculoskeletal disorders (MSDs)	Developing MSDs	S	▪ Employees should be cognizant of the primary risk factors that can lead to the development of musculoskeletal disorders: - o Awkward postures - o Excessive force - o Excessive repetition - o Contact stress (hard edge/pressure) - o Heavy vibration	L
2. Recognize the signs of MSDs	Developing MSDs	S	▪ Employees should recognize the signs of musculoskeletal disorders: - o Decreased range of motion - o Deformity or swelling - o Decreased grip strength - o Loss of function (e.g. cannot close hand)	L
3. Recognize the symptoms of MSDs	Developing MSDs	S	▪ Employees should recognize the symptoms of musculoskeletal disorders: - o Persistent numbness - o Burning sensation - o Pain - o Tingling - o Cramping - o Stiffness	L
4. Steps to avoid MSDs and sprains / strains	Developing MSDs	S	▪ Alternate work patterns and tasks as much as possible throughout the day to allow rest for different muscle groups. ▪ Perform stretching exercises periodically throughout the workday to relieve stressed muscles. ▪ Keep your body in “neutral” positions, as much as possible. ▪ Always use good posture. ▪ Begin or continue a physical fitness program. ▪ Report MSD signs and symptoms through the normal incident reporting process.	L

AHA - General Ergonomics

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
5. Material handling	Developing MSDs	S	▪ When handling materials, use the following techniques if mechanical equipment is not available: - o Lifting ▪ Two people must be used to lift any load greater than 50 lb. ▪ Keep the load close to your body. ▪ Bend your knees and hips. ▪ Lift with your legs. ▪ Avoid twisting as you lift. ▪ Get help when needed. - o Bending ▪ Kneel on one knee. ▪ Bend knees and hips, not your back. ▪ When leaning forward, move your whole body, not just your arms. - o Repetitive motions ▪ Keep the load small. ▪ Turn your whole body instead of twisting. ▪ Get close to the load, do not reach and lift. ▪ Lift with your arms and legs, not your back. ▪ Change positions frequently. - o Reaching ▪ Reach only as high as is comfortable, do not stretch. ▪ Minimize any lifting while reaching. - o Pushing and pulling ▪ Stay close to the load, do not lean forward. ▪ Push the load rather than pulling. ▪ Use both arms. ▪ Get help when needed.	L
	Dropped objects, laceration to hands, eye hazards	S	▪ Wear safety glasses, safety shoes, and gloves when handling loads (leather palm or cut-resistant). ▪ Comply/review Raleigh Office AHA 077 (General PPE Use).	L
6. Traveling with the load	Slip/trip/fall on same level	S	▪ Review travel path to identify potential slip / trip / fall hazards on same level. ▪ Transport load to maintain visibility of travel path.	L
7. Lower the object	Back or knee sprain / strain.	S	▪ Just as important as lifting correctly is the ACT OF LOWERING CORRECTLY. You should lower objects in the same manner as you lifted them. This is essential.	L



AHA - General Ergonomics

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
8. Performing tasks at work station	Back strain and other musculoskeletal disorders	S	▪ When moving heavy or bulky items, remove contents, use correct lifting techniques, and get assistance with lifting anything over 50 pounds ▪ Head back, chin tucked, ears, shoulder and hips aligned. ▪ Eyes level with top 1/3 of screen. ▪ Place monitor directly in front of you at about an arm's length (about 18-24"). ▪ Keep neck aligned with shoulders and hips. Do not cradle phone between head and shoulder. ▪ Elbows at sides – slightly more than 90° bend. ▪ Adjust chair height so that your feet rest comfortably flat on the floor. A fully adjustable chair with lumbar support in small of the back is optimal. ▪ Center your body in front of your monitor and keyboard and sit up straight. ▪ Keyboard should be same height as elbow with wrists slightly bend. Keystroke gently. ▪ Place mouse and keyboard within easy reach, to prevent excessive stretching. The mouse should be adjacent to and at same height as keyboard. ▪ Use a wrist rest to minimize stress on your wrists and prevent awkward positions. ▪ Consider a stand-up desk. ▪ Take breaks every hour. 	L

AHA - General Groundwater Sampling

Activity / Task:	General Groundwater Sampling	Overall RAC for AHA (see "Methodology" Step 4):					S
Project Location:	Brighton, NY	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Effective / Issue Date:	03/05/21		AHA Revision No.:	1			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: - Conduct groundwater sampling. - Check additional Life Saving Actions that may apply to project. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
					L = Low Risk		
		MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment					
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☒ HAZARDOUS ATMOSPHERES/SUBSTANCES		
 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☒ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS			

AHA - General Groundwater Sampling

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Eye protection and foot protection Job Step-specific PPE (as required): Sleeved shirt, long pants, high visibility safety vest, hard hat, protective gloves according to HASP Other Required Equipment: Water, Liquinox, generator fuel, paper towels, spill kit, container for contaminated water if needed, sample coolers	Competent / Qualified Personnel: - See HASP for appropriate personnel Training Requirements: - HAZWOPER 40 hr w/annual refresher when required - Working on or Near Water.PPT - Go to: Catalog Listing - MyLP for additional training resources based on project specific hazards - Go to: Catalog Listing - MyLP for additional training resources based on project specific hazards - Hazard Communication (HAZCOM) Training - Personal Protective Equipment (PPE) - Introduction to Ground Disturbance - Chemical Handling - USA - Wildlife and Field Biological Hazards - Compressed Gas Cylinder Safety Awareness - Site-specific HASP Orientation with respective SDSs and contaminant profile - Generator Operations Manual (if applicable) - Toolbox safety meeting - Task kickoff meeting	- Inspect all PPE prior to use. - Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. - Inspect power cord sets prior to use. - Inspect generator according to manufacturer's operation manual.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	- Wear standard PPE at all times. - Standard PPE includes safety glasses and safety shoes. - In addition to standard PPE, wear sleeved shirt, long pants, high visibility safety vest, and hard hat during all field activities. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. Determine potential presence of biohazard(s). If biohazard(s) possible,	Identified potential biological hazards	S	Review/comply with Raleigh Office AHA 007 (General Biological Hazards).	L
3. All work steps that include lifting, bending, twisting, back/knee strain, etc. hazards	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 002 (General Ergonomics).	L

AHA - General Groundwater Sampling

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
4. Prepare for sampling event	Chemical exposure	S	Read HASP and determine air monitoring and PPE needs.	S
5. Is the use of a company vehicle necessary? If yes,	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 001 (General Vehicle Travel).	S
6. Are temperature extremes present during work? If yes,	Multiple (see specified AHAs)	S	- Review/comply with Raleigh Office AHA 003 (General Heat Stress) if applicable. - Review/comply with Raleigh Office AHA 004 (General Cold Stress) if applicable.	L
7. Does work occur in the field or wild? If yes,	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 008 (Working in the Wild or Field).	M
8. Carrying equipment to site location	Back or muscle strain and other musculoskeletal disorders	S	- Use proper lifting techniques when lifting pumps or generators. - Use mechanical aids if available. - Use 2-person lift for heavy items (above 50 lb).	L
9. Calibrate monitoring equipment	Exposure to calibration gases	S	- Review equipment manuals. - Calibrate in a clean, well ventilated area.	S
10. Opening the well cap, taking water level readings	Contact with poisonous plants or the oil from poisonous plants	S	- Look for signs of poisonous plants and avoid. - Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. - Wear PPE as described in the HASP. - Do not touch any part of your body/clothing. - Always wash gloves before removing them. - Discard PPE in accordance with the HASP. - Use commercially available products such as Ivy Block or Ivy Wash as appropriate.	L
	Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well	S	- Discuss the types of insects expected at the Site and be able to identify them. - Look for signs of insects in and around the well. - Wear Level of PPE as described in the HASP. - If necessary, wear protective netting over your head/face. - Avoid contact with the insects if possible. - Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. - Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.	L
	Chemical exposure: hazardous Inhalation and contact with hazardous	S	- Wear PPE as identified in HASP. - Review hazardous properties of site contaminants with workers before sampling operations begin.	S

AHA - General Groundwater Sampling

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
(continued)	substances (VOC contaminated groundwater/soil); liquid splash; flammable atmospheres		- Immediately monitor breathing zone after opening well to determine exposure and verify that level of PPE is adequate – see Action Levels in HASP. - Monitor headspace in well. After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before obtaining water level and before sampling. - When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.	
10. Opening the well cap, taking water level readings (concluded)	Back strain and other musculoskeletal disorders due to lifting bailers or pumps and from moving equipment to well locations	S	- Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. - Use proper lifting techniques.	L
	Foot injuries from dropped equipment	S	- Be aware when moving objects; ensure you have a good grip when lifting and carrying objects. - Do not carry more than you can handle safely.	S
11. Collecting water samples	Fire/explosion/contamination hazard from refueling generators	H	- Turn the generator off and let it cool down before refueling. - Segregate fuel and other hydrocarbons from samples to minimize contamination potential. - Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited.	L
	Electrocution	S	- A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. - Use only correctly grounded equipment. Never use three-pronged cords that have had the third (ground) prong broken off. - Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water. - Do not stand in wet areas while operating power equipment. - Always make sure all electrically powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. - When unplugging a cord, pull on the plug rather than the cord. - Never do repairs on electrical equipment unless you are both authorized and qualified to do so.	S
	Exposure to contaminants	S	- Stand up wind when sampling. - Monitor breathing zone with appropriate monitoring equipment if required (see HASP). - Wear chemical resistant PPE as identified in HASP. - Review/comply with Chemical Exposure hazard controls under Job Step 10.	S
	Infectious waterborne diseases	S	- Wear chemical resistant gloves and other PPE – as identified in HASP. - Prevent water from contacting skin. - Wash exposed skin with soap and water ASAP after sampling event. - Ensure that all equipment is adequately decontaminated using a 10% bleach solution.	L

AHA - General Groundwater Sampling

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
(continued)	Exposure to water preservatives	S	- Work in a well-ventilated area, upwind of samples. - Wear chemical resistant PPE as identified in HASP. - When preserving samples always add acid to water, avoid the opposite.	S
	Slips/trips/falls	S	- Ground can become wet/muddy, created by spilled water. - Place all purged water in container/drum for removal. - Wear good slip resistant footwear.	L
11. Collecting water samples (concluded)	Repetitive motion and other ergonomic issues	S	- Use mechanical means where possible to raise and lower equipment into well. - Alternate raising and lowering equipment between field sampling team members, and alternate bailing the well. - Use safe lifting techniques.	L
12. Sample processing	Contaminated water	S	- Wear appropriate PPE as identified in HASP. - Decontaminate outside of bottles. - Prevent water from contacting skin. - Work in well ventilated area – upwind of samples. - Waste will be returned to the operation office for storage and disposal.	L
13. Shipping samples	Freeze burns, back strain and other musculoskeletal disorders, hazardous chemical exposure, sample leakage	S	- Wear appropriate chemical resistant gloves as identified in HASP. - Wear leather or insulated gloves when handling dry ice if applicable. - Follow safe lifting techniques – get help lifting heavy coolers. - Samples that contain hazardous materials under the DOT definition, must be packaged, manifested and shipped by personnel that have the appropriate DOT HAZMAT training.	S
14. Clean and clear work area	Housekeeping, slip/trip/fall	M	- Follow good housekeeping protocol. - Clear area of all tools, materials, and debris.	L

AHA - General Heat Stress

Activity / Task:	General Heat Stress	Overall RAC for AHA (see "Methodology" Step 4):					L
Project Location:	Raleigh Office & Applicable Project Sites	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Date of Analysis / Update:	07/28/22		AHA Revision No.:	4			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: - Working in elevated temperatures. - Note: The heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15 °F. Also, strong winds, particularly with very hot, dry air can be extremely hazardous. For example, a heat index of 80 °F can be 90 °F in the sun. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
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		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
					L = Low Risk		
MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment.							
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
		 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☐ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS	

AHA - General Heat Stress

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Wear lightweight clothes that allow moisture to evaporate Job Step-specific PPE (as required): See Job Step #4 Other Required Equipment: Exhaust fans, AC, fans, shielding, and/or equipment that reduces physical demands if applicable	Competent / Qualified Personnel: - Heat Stress Monitor Training Requirements: - MyLP - Heat Stress Heat Illness Prevention (\$35 online) - Access to first aid trained responders - First Aid/CPR	None

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Be alert of weather conditions and or personal factors	Heat-related stress	S	- Address hazards (temperature, humidity, air movement, radiant heat, clothing, and physical activity) with engineering, administrative, and common-sense controls. - Monitor temperature and humidity conditions. Heat index may be determined using the National Weather Service Heat Index chart (see link below), and the OSHA and NIOSH Heat Safety Tool. The Heat Safety Tool categorizes heat stress risk from minimal to extreme and provides recommendations for controls. Visit https://www.osha.gov/SLTC/heatstress/index.html for more information. - Link to NOAA Heat Forecast Tools: https://www.weather.gov/safety/heat-index. See end of AHA for Heat Index Chart. - Download the NIOSH Heat Safety Tool smart phone app designated by this symbol:  - Older workers, obese workers, and personnel on some types of medications are at increased risk.	L
2. Use engineering controls to reduce heat illness	Heat-related illness	S	- A variety of engineering controls can reduce workers' exposure to heat: - Air conditioning (such as air-conditioned crane or construction equipment cabs, air conditioning in break rooms). - Increased general ventilation. - Cooling fans. - Local exhaust ventilation at points of high heat production or moisture (such as exhaust hoods in laundry rooms). - Reflective shields to redirect radiant heat. - Insulation of hot surfaces (such as furnace walls). - Elimination of steam leaks.	L

AHA - General Heat Stress

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
3. Use work practices to reduce chance of heat illness	Heat-related illness	S	- Have an emergency plan in place. - Plan ahead, ensure proper hydration the day before working outside in the heat. - New employees should be acclimatized to working conditions; refer to Acclimatization Schedule (see end of AHA). - Workers must have adequate potable water close to work area. - Wherever possible, distribute workload evenly over the day. - Water – Rest – Shade: incorporate work/rest cycles. - Schedule heavier work for cooler times of the day. - Rotate job functions among workers to minimize overexertion. - Watch out for each other for symptoms of heat-related illness. - Work in teams in extreme heat situations. - Download and use the NIOSH Heat Safety Tool smart phone app designated by this symbol to obtain local readings using a smart phone or tablet. - Check client requirements for Heat Illness Prevention. 	L
4. Don appropriate personal protective equipment (PPE)	Heat-related hazards	S	- Wear lightweight clothes that allow moisture to evaporate. Layers of PPE increase body temperature. Review/comply with Raleigh Office AHA 077 (General PPE Use). - Workers should be aware that use of certain personal protective equipment (e.g., certain types of respirators and impermeable clothing) can increase the risk of heat-related illness. - In some situations, special cooling devices can protect workers in hot environments: - In some workplaces, insulated gloves, insulated suits, reflective clothing, or infrared reflecting face shields may be needed. - Thermally conditioned clothing might be used for extremely hot conditions; for example: - A garment with a self-contained air conditioner in a backpack. - A garment with a compressed air source that feeds cool air through a vortex tube. - A plastic jacket whose pockets can be filled with dry ice or containers of ice.	L
5. Avoid heat rash (red bumpy, rash with severe itching)	Heat rash (prickly heat)	S	- Drink plenty of nonalcoholic and caffeine-free fluids. - Rest in a cool place and allow the skin to dry.	L
6. Avoid heat cramps (painful spasms of the muscles)	Heat cramps (onset of cramps may occur after work)	S	- Supplement water intake with electrolytes. - Tired muscles are most susceptible to cramps; get adequate rest and avoid overexertion. - Medical intervention using intravenous saline solution may be required for more severe cases.	L
7. Avoid heat syncope (fainting caused by reduced blood flow to head, skin will be cool and moist with weak pulse)	Fainting (heat syncope)	S	- Seek immediate medical attention. - Fainting (heat syncope) may be a problem for the worker unacclimatized to a hot environment who simply stands still in the heat. - Victims usually recover quickly after a brief period of lying down. - Moving around, rather than standing still, will usually reduce the possibility of fainting.	L

AHA - General Heat Stress

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
8. Avoid heat exhaustion (inadequate salt and water intake; sign of body's cooling system not working properly,)	Heat exhaustion (worker still sweats)	S	▪ Use a buddy system. Watch each other for signs and symptoms of heat stress. Remind each other to drink small quantities of cool water frequently. ▪ Symptoms include sweating heavily, weak pulse, blurred vision, extreme weakness or fatigue, giddiness, nausea, or headache. ▪ Skin is clammy and moist, the complexion pale or flushed, and body temperature normal or slightly higher. ▪ Rest in a cool place and drink an electrolyte solution. ▪ Seek immediate medical attention for severe cases involving victims who vomit or lose consciousness.	L
9. Avoid heat stroke (death from body's cooling system shutting down) Body temp rises but skin is not red and is dry, fast pulse, headache, dizziness, weak, confused loss of consciousness, and conclusions	Heat stroke / Death (failure of the body's internal mechanism to regulate its core temperature; worker stops sweating)	S	▪ Sweating stops and the body can no longer rid itself of excess heat. ▪ Mental confusion, delirium, convulsions, loss of consciousness, or coma may occur. ▪ The skin will be hot and dry and may be red, mottled, or bluish. ▪ A body temperature of 106°F or higher is present. ▪ Seek immediate medical attention. Victims of heat stroke will die unless treated promptly. ▪ Provide immediate first aid to reduce body temperature. Prompt first aid can prevent permanent injury to the brain and other vital organs. While awaiting medical help, the victim must be removed to a cool area and his or her clothing soaked with cool water. The victim should be fanned vigorously to increase cooling.	L

AHA - General Heat Stress

Heat Index Temperature Fahrenheit														
Humidity	80	82	84	86	88	90	92	94	96	98	100	102	104	106
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124
45	80	82	84	87	89	92	96	100	104	109	114	119	124	130
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137
55	81	84	86	89	93	97	101	106	112	117	124	130	137	145
60	82	84	88	91	95	100	105	110	116	123	129	137	145	153
65	82	85	89	93	98	103	108	114	121	128	136	144	153	162
70	83	86	90	95	100	106	112	119	126	134	143	152	161	172
75	84	88	92	97	103	109	116	124	132	141	150	160	171	182
80	84	89	94	100	106	113	121	129	138	148	158	169	181	193
85	85	90	96	102	110	117	126	135	145	155	167	179	191	204
90	86	91	98	105	113	122	131	141	152	164	176	189	202	216
95	86	93	100	108	117	127	137	148	160	172	185	199	214	229
100	87	95	103	112	121	132	143	155	168	181	195	210	226	243

Caution

Extreme Caution

Danger

Extreme Danger

Personal Protective Gear: Add 10° F (Rubber Sleeves, Rain Suit, Switching Suit, etc.)

Heat Index	Signs of Heat
Caution	Fatigue
Extreme Caution	Likely: Fatigue, Heat Rash and Heat Cramps Possible Heat Exhaustion
Danger	Likely: Fatigue, Heat Rash, Heat Cramps, Heat Exhaustion Possible: Heat Stroke
Extreme Danger	Likely: Heat Stroke

AHA - General Heat Stress

Acclimatization Schedule

Schedule of Re-acclimation after Different Periods Away from Heat Exposures		
Routine Absence	Illness	Percent (%) Exposure Time by Day
3 - 5 days	1 - 3 days	90% 1 st Day
6 - 12 days	4 - 5 days	50% 1 st Day 90% 2 nd Day
13 - 20 days	6 - 8 days	50% 1 st Day 75% 2 nd Day 90% 3 rd Day
>20 days	>8 days	50% 1 st Day 60% 2 nd Day 70% 3 rd Day 80% 4 th Day 90% 5 th Day

AHA - General PPE Use

Activity / Task:	General PPE Use	Overall RAC for AHA (see "Methodology" Step 4):					M
Project Location:	Raleigh Office & Applicable Project Sites	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Date of Analysis / Update:	11/14/19 AHA Revision No.: 2						
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: - Establishing general requirements for the use of personal protective equipment (PPE). - Check additional Life Saving Actions as applicable to project. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
					L = Low Risk		
MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment							
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
		 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☐ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS	

AHA - General PPE Use

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Depends on work activity Job Step-specific PPE (as required): Depends on work activity Other Required Equipment: Depends on work activity	Competent / Qualified Personnel: - Depends on work activity Training Requirements: - Depends on work activity MyLP - US Field Safety (online in-house) MyLP – Hand and Power Tools (\$35 ClickSafety) if applicable - Search MyLP Catalog Listing for current training topics	- Inspect all PPE prior to use. - Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. - Other inspection requirements depends on work activity.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. General requirements	Improper use, defective equipment	S	- Protective equipment including personal protective equipment for eyes, face, head, and extremities; protective clothing, hearing protection, and respiratory devices; and protective shields and barriers shall be provided and used whenever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact. - All PPE shall be maintained in a sanitary and reliable condition.	M
2. Hand protection	Skin absorption, cuts or lacerations, abrasions, punctures, chemical burns, thermal burns, and temperature extremes	S	- Gloves appropriate to the task shall be used to protect the hands and wrist area from exposure to heat, cold, water or steam, chemicals, sharp edges, abrasion, electrical contact, and other hazards as necessary. Gloves may also be used for protection against dirt and other nontoxic materials, as well as while operating machinery or handling materials. - Gloves must never be used while working near rotating machinery where the glove could get caught and pull the hand into the machine. Certain portable electric tools such as hand drills and hand-held abrasive grinders may be used while wearing gloves as long as both hands are used to hold the tool while it is working. - Gloves used for personal protection against electrical contact must be tested in accordance with requirements for the testing and use of dielectric rubber goods set by the manufacturer. - Consult with Health and Safety Technical Support or your site safety representative for assistance in selecting proper hand protection.	M
3. Head protection	Falling objects from overhead	S	- Head protection must be used whenever employees are exposed to injury due to falling objects. - Hardhats or helmets must meet or exceed acceptable standards such as ANSI Z89.1. - Hardhats must be worn in their proper orientation, usually brim forward, unless using a helmet or suspension specifically designed to accommodate a face shield for welding, cutting, or grinding purposes. - Where electrical hazards are present, hardhats must be completely nonconductive, including the suspension and any hat-mounted accessories. Hardhats used to provide protection from electrical hazards must meet the requirements for Class E (formerly Class B) high voltage (up to 20 kV) or Class G (formerly Class A) low voltage (up to 2000 V).	M

AHA - General PPE Use

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
4. Eye and face protection	Flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, light radiation	S	▪ Eye and face protection must comply with the ANSI Z87.1 standard. ▪ Minimum protection shall consist of safety glasses with side shields. Side shields must meet applicable standards for quality, durability and protective ability. ▪ Safety glasses with tinted lenses may only be used for outside work in bright environments. Individual business units may allow the indoor use of semi-mirrored lenses that have only a slight or minimal tinting. ▪ Prescription safety glasses with transition tinting that change from light to dark are allowed if a risk analysis indicates that no additional or unnecessary risk is added because the tinting does not change rapidly enough from dark to light to allow for safe movement from bright to dark environments. ▪ Prescription glasses that do not meet acceptable consensus standards may not be worn in areas where eye protection is required without at minimum over-glasses that meet these requirements. ▪ Goggles must be worn where a risk of chemical splash is present. Unvented goggles should be used where chemicals that are eye irritants and have high vapor pressures are used. Goggles may be worn over regular prescription glasses to provide protection equivalent to safety glasses with side shields. ▪ When face shields are used, safety glasses with side shields or equivalent must be worn beneath the face shield. ▪ Welders must use shaded eye protection appropriate for the type of welding or cutting being performed. A table with minimum shade requirements can be found in OSHA regulations at 29CFR1910.133(a)(5). ▪ Work with lasers above Class IIIa requires eye protection as determined by the Laser Safety Officer assigned to evaluate the work and shall be appropriate to the type of laser and energy of the beam being used. ▪ Eye and face protection shall be distinctly marked with the identity of the manufacturer. ▪ Contact lenses may be worn as long as additional appropriate eye protection is provided. Contact lenses may not be worn when exposure to eye irritants (chemical or mechanical) is likely. Examples include work in areas where airborne particulates such as flyash are present or where chemical vapors that are eye irritants such as chlorine are present. Contact lenses may be worn with full-face respiratory protection if allowed by the individual Business Unit.	M

AHA - General PPE Use

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
5. Foot protection	Falling or rolling objects or objects piercing the sole, static-discharge or electric-shock	S	▪ Office area - o In typical office conditions in which there is not a hazard of falling or rolling objects, no specific foot wear requirements are made. ▪ Normal working conditions - o Footwear with slip-resistant soles and substantial uppers made of leather or the equivalent that covers the entire foot and has no openings. ▪ Working outdoors - o Do a mental risk assessment and choose footwear appropriate for weather conditions. - o When working on uneven surfaces, sloped areas or areas with vegetation overgrowth, wear laced boots with a minimum 6" high upper and nonskid Vibram-type soles for ankle support and traction. ▪ Tasks with known hazards - o Specific footwear may be required such as safety shoes, chemical-resistant boots, ice cleats, dielectric boots, snake boots, shoes with a defined heel, lineman's boots, etc. ▪ Where danger of foot injury exists from falling and rolling objects or from objects that might pierce the foot - o Footwear must meet nationally recognized consensus standards such as ANSI Z41 or ASTM F2412 and have safety toe caps (metallic or composite) and steel shanks when protection against penetration is required. Clip-on protective toe caps may be worn over regular shoes. - o Where warranted by the hazards, footwear must be worn that also includes metatarsal protection. ▪ Step or touch potential and other electrical hazards including underground cable work - o Dielectric footwear that complies with ASTM F1117 must be worn in accordance with Power Delivery Safe Work Practices and Standard Procedures.	M
6. Body protection	Electrocution, laceration or burn	S	▪ Protective clothing shall be used whenever hazards that could cause injury to the body are present, including but not limited to arc flash; chemical exposure; protection against cold or heat; exposure to dirt, dust, or liquids whether toxic or not; or exposure to hazardous materials in an emergency response action. ▪ Work in short trousers is generally prohibited. Short trousers are defined as pants that do not cover the leg below the knee and may only be worn if a hazard analysis shows that there are no hazards to the lower legs that could be mitigated by the use of long trousers. ▪ Work in bare torsos is prohibited. Sleeveless shirts are prohibited where there are hazards to the arms that could be mitigated by the use of long sleeves. ▪ Protective clothing worn in laboratories must be suitable for the purpose and provide protection specific to the chemicals or materials being used. ▪ Turnout gear for fire fighters must comply with applicable NFPA standards and be cared for and maintained according to those standards. ▪ Clothing contaminated or potentially contaminated with toxic dusts or materials must remain on site and be disposed of or laundered per the requirements of the site owner and client.	M

AHA - General PPE Use

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
7. Hearing protection	Occupational noise exposure to include temporary hearing loss and/or permanent hearing loss	S	▪ When employees are subjected to sound exceeding an 8-hour time-weighted average of 85 decibels, administrative or engineering controls must be utilized. ▪ If administrative or engineering controls fail to reduce sound below the action level, hearing protection must be provided to the worker. ▪ The type of hearing protection depends on the level of noise. ▪ Employees shall be given the opportunity to select their hearing protection from a variety of suitable hearing protectors such as ear plugs or ear muffs. ▪ Check the noise rating for the equipment being used for the task to determine what type and what level of protection is required. ▪ Common points of reference measured in dBA or decibels: - o 65-95 dBA for power lawn mower - o 85 dBA for heavy traffic - o 95 dBA for electric drill - o 110 dBA for leaf blower - o 125 dBA for chain saw - o 130 dBA for jack hammer, power drill ▪ Use the general rule of thumb to determine if hearing protection is required: If you have to shout in order to be heard 3 feet away, then the noise is probably too loud and could be damaging to your hearing.	M
8. Respiratory protection	Inhalation hazard due to harmful dusts, fogs, fumes, mists, gasses, smokes, sprays, or vapors	S	▪ When effective engineering controls are not feasible or while they are being instituted, appropriate respirators shall be used. ▪ Where respiratory protection is needed, the site's written Respiratory Protection Plan must be followed as well as worksite/client specific procedures. ▪ All workers required to don a respirator shall receive training, fit testing, medical evaluations, and instructions on the care and maintenance, respirator selection and routine and emergency use prior to beginning work associated with wearing a respirator. ▪ Make sure respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. ▪ Voluntary respirator use is permitted when the user is trained in accordance with Appendix D of the Respiratory Protection Standard at 29 CFR 1910.134.	M
9. Fall protection	Personal injury or death	S	▪ Review and comply with Raleigh Office AHA 017 (General Fall Protection).	M

AHA - General Vehicle Travel

Activity / Task:	General Vehicle Travel (via car or truck)			Overall RAC for AHA (see "Methodology" Step 4):					S	
Project Location:	Brighton, NY			Risk Assessment Code (RAC) Matrix						
Contract Number:	NA			Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare	
Date of Analysis / Update:	11/10/22	AHA Revision No.:	3							
Prepared by:	Raleigh Office Safety Team			Catastrophic	H	H	S	S	M	
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager			Critical	H	S	S	M	L	
				Marginal	S	M	M	L	L	
				Negligible	M	L	L	L	L	
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: Establishing general measures for Vehicle Travel (via car or truck) while on Company business. This AHA applies to all WSP employees for whom operating a motor vehicle (personal, company-owned, leased, or rented) for Company business is a function of their position. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.				Methodology for RAC Designations						
				Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)						
				"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart	
				"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk	
				Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk	
				Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk	
Step 4: Annotate the overall highest RAC-Residual at the top of AHA.					L = Low Risk					
 MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment										
Check all Life Saving Actions that apply:			☐ WORK AROUND HEAVY MOBILE EQUIPMENT Plant/People Interface		☒ DRIVING		☐ SUSPENDED LOADS		☐ HAZARDOUS ATMOSPHERES/SUBSTANCES	
	☐ WORKING ON OR NEAR WATER		☐ LONE OR REMOTE WORK		☐ GROUND STABILITY		☐ ENERGY SOURCES		☐ WORKING AT HEIGHTS	
Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.			Training Requirements/Competent or Qualified Personnel Name(s)			Inspection Requirements				

AHA - General Vehicle Travel

Standard PPE (worn at all times): None Job Step-specific PPE (as required): None Other Required Equipment: None	Competent / Qualified Personnel: - Authorized Driver Training Requirements: MyLP – US Defensive Driving (online) - Fleet Safety: Contact your Fleet representative before driving a company vehicle. - Vehicles Safety and Incident Reporting SA 209	- Daily inspection of vehicle Vehicle Safety Checklist-209-01 (wspgroup.com) - Current vehicle annual inspection.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Prepare for travel	Distractions - loss of focus	L	- Ensure you have all materials with you necessary to conduct work effort. - Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current. - Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment). - Familiarize yourself with route to destination. - If non-routine, complete a Journey Management Risk Assessment WSP Journey Management Plan Form is used to document approved health and safety mitigation for non-routine / high risk travel, including various modes of travel. - Ensure that a copy of the current insurance certificates and incident reporting procedures/forms are available during travel.	L
	Vehicle defects	L	Refer to HSE-PRO-100316 Operation of Company Vehicles (current version), Attachment 3 - Vehicle Safety / Maintenance Checklist and inspect vehicle for defects such as: - Inadequate fluids (e.g., fuel, antifreeze, oil, windshield washer) - Worn/flat tires - Windshield wipers loose, worn, or torn - Oil puddles under vehicle - Headlights, brake lights, turn signals not working - Exterior or interior damage (e.g., scratches, dents)	L
	Insufficient emergency equipment, unsecured loads	L	- If first aid or a properly maintained first aid kit is not provided at the site, ensure vehicle has a first aid kit and that all medications are current. [Note: First aid is provided at this project site.] - If a fire extinguisher is carried in the vehicle, ensure that the fire extinguisher is operable and that all inspections are current. [Note: Properly maintained and inspected fire extinguishers are provided at this project site.] - Ensure vehicle is equipped with warning flashers and/or flares and that the warning flashers work. - Cell phones are recommended to call for help in the event of an emergency. - All tools/equipment must be properly secured.	L

AHA - General Vehicle Travel

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
			▪ Ensure parking cones are present, if applicable.	
2. Operating vehicles	Collisions, unsafe driving conditions	H	▪ Drive defensively! ▪ Do not use cruise control during inclement weather. ▪ Do not drive more than 500 miles per day or for extended distances from 11:00pm to 5:00am. ▪ Do not eat or use tobacco products in the vehicle. ▪ No unrestrained pets or nonwork riders (e.g., friends, family) are allowed in Company vehicles. [Note: <u>Only WSP employees</u> are allowed to drive/ride in Company vehicles for this project.] ▪ Seat belts must be used at all times when operating any vehicle on Company business. ▪ Drive at safe speed for road conditions. ▪ Maintain adequate following distance. ▪ Pull over and stop if you have to look at a map or use a cell phone. ▪ Try to park so that you don't have to back up to leave. ▪ If backing is required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary.	S
	Dusty, winding, narrow roads	H	▪ Go slow around corners, occasionally clearing the windshield.	S
	Rocky or one-lane roads	H	▪ Stay clear of gullies and trenches, drive slowly over rocks. ▪ Yield right-of-way to oncoming vehicles---find a safe place to pull over.	S
	Stormy weather	H	▪ Inquire about conditions before leaving the office. ▪ Be aware of oncoming storms.	S
	When angry or irritated	H	▪ Attitude adjustment; change the subject or work out the problem before driving the vehicle. Let someone else drive.	S
	Turning around on narrow roads	H	▪ Safely turn out with as much room as possible. ▪ Know what is ahead and behind the vehicle. ▪ Use a spotter if available.	S
	Sick or medicated	H	▪ Let others on the crew know you do not feel well. ▪ Let someone else drive.	S
	On wet or slick roads	H	▪ Drive slow and safe.	S
	Animals on road	H	▪ Drive slowly, watch for other animals nearby. ▪ Be alert for animals darting out of WSPed areas	S
	Vehicle accident	H	▪ Employees should follow Company vehicle operation policy and be aware of all stationary and mobile vehicles.	S

AHA - General Vehicle Travel

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
3. Parking at job site	Striking other vehicles, objects	M	- Choose parking spot that is away from other vehicles, if possible. - Choose a spot that will allow the driver to drive forward when leaving the site. - Back into parking spots, or pull through when parking in perpendicular parking spaces (drive forward into angle/herring bone type parking spots). - Place cones in front of and behind company-owned vehicles as applicable.	L
	Leaving parking spaces	M	- Walk around the vehicle before leaving and identify hazards (low lying objects, location of other vehicles or pedestrians, other vehicles with drivers that may be leaving at the same time, etc. - Collect cones (Company vehicles only) and secure them into their holder. - If backing is unavoidable, use a spotter if a second person is available; if no spotter available, back slowly, checking for other vehicles, pedestrians, etc. - Keep alert!	L
4. Driving back from the job site	See hazards listed for "Operating vehicles" Key Work Step	H	See safe work practices for "Operating vehicles" Key Work Step.	S
5. Parking at office	Striking other vehicles, objects	M	See safe work practices for "Striking other vehicles, objects" Hazard/Potential Hazard for "Parking at job site" Key Work Step.	L
6. End travel	Vehicle defects	L	- Inspect vehicle. - Repair or initiate repair of all vehicle deficiencies that occurred due to the trip.	L

AHA - Mobilization/Demobilization & Site Preparation

Activity / Task:	Mobilization/Demobilization & Site Preparation			Overall RAC for AHA (see "Methodology" Step 4):				S		
Project Location:	Brighton, NY			Risk Assessment Code (RAC) Matrix						
Contract Number:	NA			Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare	
Effective / Issue Date:	06/09/21	AHA Revision No.:	1							
Prepared by:	Carolina Ops Project & Safety Personnel			Catastrophic	H	H	S	S	M	
				Critical	H	S	S	M	L	
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager			Marginal	S	M	M	L	L	
				Negligible	M	L	L	L	L	
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: - Mobilization/demobilization and site preparation activities for applicable field projects. - Check additional Life Saving Actions as applicable to project. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.				Methodology for RAC Designations						
				Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)						
				"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart	
				"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk	
				Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk	
				Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk	
					Step 4: Annotate the overall highest RAC-Residual at the top of AHA.					L = Low Risk
MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment.										
Check all Life Saving Actions that apply:		 ☒ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE		 ☐ DRIVING		 ☐ SUSPENDED LOADS		 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
		 ☐ WORKING ON OR NEAR WATER		 ☐ LONE OR REMOTE WORK		 ☐ GROUND STABILITY		 ☐ ENERGY SOURCES		
 ☐ WORKING AT HEIGHTS										

AHA - Mobilization/Demobilization & Site Preparation

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Eye protection, safety glasses, hand protection, and foot protection Job Step-specific PPE (as required): Respiratory protection if required, reflective vest when required, DOT approved high visibility clothing when applicable night work is involved, hard hat if overhead hazards are present, PFD if necessary, hearing protection when required Other Required Equipment: Flags/stakes/banner tape to mark holes/depressions, hand truck, hand tools	Competent / Qualified Personnel: - See project HASP Training Requirements: - Site-Specific HASP Orientation - Daily Preshift Tailgate/Toolbox Safety Meeting MyLP – US Field Safety Training (in-house, online) - Check Catalog Listing - MyLP for training options relative to site specific hazards. - Applicable Tool Manufacturer's Operational Instructions for tools and/or equipment Driving on Company Business MyLP- Defensive Driving (In-house, online) - Journey Management Plan (E&E Health and Safety - HSE Risk Tools - All Documents (sharepoint.com)) - Severe Weather Policy	- Inspect all PPE prior to use. - Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	- Wear standard PPE at all times. - Standard PPE includes safety glasses, hand protection, and safety shoes. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. Prepare for site visit	None	NA	- Obtain and review HASP prior to site visit, if possible. - Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site. - Determine training and medical monitoring needs and ensure all required health and safety training and medical monitoring has been received and is current. - Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment). - If respiratory protection is required/potentially required, ensure that training and fit-testing has occurred within the past year. - Familiarize yourself with route to the site.	NA
3. Loading supplies into truck/trailer	Multiple (see specified AHA)	S	- Review/comply with Raleigh Office AHA 002 (General Ergonomics). - Review/comply with Raleigh Office AHA 040 (Operating a 2-Wheeled Hand Truck).	M
4. Driving to the site	Multiple (see specified AHA)	H	- Review/comply with Raleigh Office AHA 001 (General Vehicle Travel). - Prepare Journey management Plan if travel is nonroutine. - Review Journey Management Planning SWP.	S
5. Is the use of a trailer necessary? If yes,	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 005 (General Trailer Use).	S

AHA - Mobilization/Demobilization & Site Preparation

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
6. Gain permission to enter site	Hostile landowner, livestock, pets	S	- Talk to landowner; be courteous and diplomatic. - Ensure all animals have been secured away from work area.	
7. Is work in a noise hazard area? If yes,	High ambient noise	M	In conjunction with donned PPE, add hearing protection with a minimum noise reduction rating equal to or greater than maximum anticipated noise hazard level. Use applicable noise survey, equipment manufacturer noise level information, sound level meter, or cell phone app to determine maximum anticipated noise hazard level.	L
8. Does work occur in the field or wild? If yes,	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 008 (Working in the Wild or Field).	M
9. Determine potential presence of biohazard(s). If biohazard(s) possible,	Identified potential biological hazards	S	Review/comply with Raleigh Office AHA 007 (General Biological Hazards).	L
10. Are temperature extremes present during work? If yes,	Multiple (see specified AHAs)	S	- Review/comply with Raleigh Office AHA 003 (General Heat Stress) if applicable. - Review/comply with Raleigh Office AHA 004 (General Cold Stress) if applicable.	L
11. All work steps that include lifting, bending, twisting, back/knee strain, etc. hazards	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 002 (General Ergonomics).	L
12. Does a work step produce an environment where the voluntary use of a dust mask may be desired or an inhalation hazard is possible? If yes,	Dusty (comfort issue), possible inhalation hazard	M	- If possible, use wet suppression to minimize/eliminate dust generation. - A Qualified Person shall determine if respiratory protection is required and the type of respirator needed to address the inhalation hazard. - Only approved employees, with proper medical clearance and training, shall be allowed to don a mandatory respirator (i.e., required due to a potential inhalation hazard). - If respiratory protection is not required but the use of a dust mask is desired (voluntary use), documented respirator awareness training in the use of dust masks per 29 CFR 1910.134 Appendix D must be in place. - Mandatory and voluntary use of respirators shall comply with WSP Respiratory Protection Program P.2.1.9 (US). - Review and comply with Raleigh Office AHA 077 (General PPE Use), specifically Job Step 8, which addresses Respiratory Protection.	M
13. Mobilization/demobilization of equipment and supplies	Struck by heavy equipment/vehicles	H	- Be aware of heavy equipment operations. - Keep out of the swing radius of heavy equipment. - Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times - Employees shall wear a reflective vest at night. - Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone.	M

AHA - Mobilization/Demobilization & Site Preparation

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
			Ground personnel will not stand directly behind heavy equipment when it is in operation.	
	Struck by equipment/supplies	M	- Workers will maintain proper space around their work area, if someone enters it, stop work. - When entering another worker's workspace, give a verbal warning so they know you are there.	L
	Overexertion unloading/loading supplies	S	- Train workers on proper body mechanics; do not bend or twist at the waist while exerting force or lifting. - Tightly secure all loads to the truck bed to avoid load shifting while in transit.	M
	Caught in/on/between	S	Do not place yourself between two vehicles or between a vehicle and a fixed object.	M
	Slip/trip/fall	M	- Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. - Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. - Drivers will check surface before stepping, not jumping down.	L
	Vehicle accident	S	Employees should follow WSP Operation of Company Vehicles procedure and be aware of all stationary and mobile vehicles.	M
14. Site preparation	Slip/trip/fall	M	Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas	L
15. Installation of soil erosion and sediment controls	Overexertion	S	- Workers will be trained in the proper method of placing erosion controls. - Do not bend and twist at the waist while lifting or exerting force.	M
	Struck by equipment/supplies	M	- Workers will maintain proper space around their work area, if someone enters it, stop work. - When entering another worker's workspace, give a verbal warning so they know you are there.	L
16. Driving back from the jobsite	Multiple (see specified AHAs)	H	- Review/comply with Raleigh Office AHA 001 (General Vehicle Travel). - Review/comply with Raleigh Office AHA 005 (General Trailer Use) if applicable. - Review Journey Management Plan if applicable. - Driver fatigue is real: Employees may not drive after 14 duty hours. - If feeling fatigued and tired while driving, take turns driving or if alone, pull over in a safe, populated, well-lit area and take a break. - Maximum driving time between breaks is 4.5 hours followed by a 30-minute break.	S

AHA - Utility Clearance

Activity / Task:	Utility Clearance	Overall RAC for AHA (see "Methodology" Step 4):					S
Project Location:	Brighton, NY	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Effective / Issue Date:	07/05/23		AHA Revision No.:	2			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: - Establishing site specific safety measures for utility clearance. - Applying due diligence to locator company. - Evaluating locator results. - Verifying locator marks on site. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
					L = Low Risk		
		MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment					
Check all Life Saving Actions that apply:		 ☒ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
		 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☒ GROUND STABILITY	 ☒ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS	

AHA - Utility Clearance

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Eye protection, high visibility clothing, and foot protection Job Step-specific PPE (as required): See site-specific HASP, non-slip rubber boots if working on wet or slick surfaces Other Required Equipment: Two-way radios or cell phones, power cords if required, cones/signs/flags or other traffic control devices if applicable	Competent / Qualified Personnel: - Qualified PM or Qualified Person/Field Lead - Qualified Persons who are responsible for requesting or reviewing accuracy of underground utility locates Training Requirements: - SA 313 Overhead and Underground Utilities – E&E procedure - Ground Disturbance Plan Utility Locates Form - Concrete Asphalt Coring, Hydro-Vacuuming, and/or Utility Locate Technologies Toolkits as required. - Check Catalog Listing - MyLP for training options relative to site specific hazards. - HASP orientation - Tailgate safety meeting - Task kickoff meeting	- Inspect all PPE prior to use. - Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. - Inspect power cords prior to use.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	- Wear standard PPE at all times. - Standard PPE includes safety glasses, high visibility clothing, and safety shoes. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. Does work occur in the field or wild? If yes,	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 008 (Working in the Wild or Field).	M
3. Determine potential presence of biohazard(s). If biohazard(s) possible,	Identified potential biological hazards	S	Review/comply with Raleigh Office AHA 007 (General Biological Hazards).	L
4. All work steps that include lifting, bending, twisting, back/knee strain, etc. hazards	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 002 (General Ergonomics).	L
5. Are temperature extremes present during work? If yes,	Multiple (see specified AHAs)	S	- Review/comply with Raleigh Office AHA 003 (General Heat Stress) if applicable. - Review/comply with Raleigh Office AHA 004 (General Cold Stress) if applicable.	L
6. Is working alone necessary? If yes,	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 111 (Working Alone).	M

AHA - Utility Clearance

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
7. Preplanning (continued)	Becoming lost, electrocution	H	- Provide sufficient time and budget to ensure utilities have been adequately located and locate reports adequately evaluated, due diligence applied to locator company and applicable employee training and qualifications are met prior to the startup of work. - Plan for communications via two-way radios or cell phones. - Learn animal posturing including how to identify rabid animals. - Be prepared with a map/GPS and compass, as necessary.	S
7. Preplanning (continued)	Utilities not cleared, property damage, utility outage, worker injury or death	H	- Be aware of overhead and underground utilities. Ensure One-Call organization such as 811 and appropriate private locate company has been contacted. - Contact One-Call Utility identifier organization at least 6 days prior to the project start date. - Cite or have subcontractor cite a start date of at least 3 working days prior to actual planned start date (provides window to inspect locations prior to job start-up). - Verify via emails or phone that all utilities have visited the site and marked their respective utilities. - If subcontractor calls One-Call organization such as 811, require them to forward all e-mail responses from member utilities as they receive them. - If verification cannot be done remotely, send worker to site to inspect ground for markings (cheaper to identify issues prior to mobilization to the site). - Document all phone communications with driller about utility clearance issues and requests (e-mail the conversation highlights or document in a field notebook – it becomes part of the file record). - Call any member utilities that have not responded indicating they have cleared or marked-out utilities. Place the call morning of ticket start date (e.g., 3 days prior to actual start date). Document the phone conversations in notes or e-mails to the file. - If town services (e.g., sanitary sewer, storm sewer, water) are not listed as a One-Call member, contact the town office to schedule mark-out, obtain copies of utility networks, and identify the appropriate town contacts. - If town maps have lateral connections to private lots marked and /or if we are drilling along road right-of way opposite developed properties, identify the locations of the lateral connections. This may mean contacting abutters and asking to look in basements for location of pipes. If possible, do this during a site visit prior to field start. If not, it should occur during the first day of work so any issues can be identified and decisions made on the risk of proceeding. - Walk all planned locations with the subcontractor, prior to start of excavation/drilling to identify marked utilities and note any uncertainties. Field Lead should call PM and relay any issues. Document this inspection in the field book and note subcontractor's responses to any Wood concerns.	S
	Unknown utilities on private property, property damage, utility outage, worker injury or death	H	- Hire private utility locator company. Verify competency standards and performance criteria of locators. - Locate underground utilities by ground penetrating radar, electromagnetic, deep metal detector, pipe transmitter, vibracator, etc. - Review locations with property owner, member of operations and maintenance.	S

AHA - Utility Clearance

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
(continued)			- Check as built drawings when available. Be aware possible drawing error or construction drawings may not be representative of actual locations. - Use field clues such as manhole covers, repaved areas, depressions, disturbed areas, signs and postings, etc. as indications of access to utilities or recently installed/moved utilities.	
7. Preplanning (concluded)	Lack of reliable data on utility locations, property damage, utility outage, worker injury or death	H	- At a minimum, excavation with mechanical equipment shall not be used within 5 feet of a known or suspected utility. If a more conservative distance is specified by the utility owner/client, then the more conservative distance shall apply. - Hand digging or other non-destructive excavation technique shall be used within the 5 feet tolerance zone/hand exposure zone. - Plan for wood or fiberglass handled tools that do not have sharp points for hand digging if needed. Purchase proper PPE when using hand tools (hand augers, posthole diggers, shovels, steel rods, etc.).	S
	Lack of understanding locate results, property damage, utility outage, worker injury or death	H	- Review SA 313 Overhead and Underground Utilities – E&E procedure - Complete Ground Disturbance Plan Utility Locates Form.	S
	Working near live utilities, property damage, utility outage, worker injury or death	H	- If live utilities are known to be present near drilling/excavation location, if possible, move drilling/excavation to another location. Contact PM, Technical Lead, and/or Office Manager to decide to proceed or to move the location. - Lockout/Tagout utilities, if possible. - Use nondestructive means to drill/excavate within tolerance zone until safe to proceed. - When working with electrical equipment avoid wet surfaces and exposed connections.	S
8. Walking around site identifying utility clearances	Slips/trips/falls	M	- Keep work area free of excess material and debris. - Remove all trip hazards by keeping materials/objects organized and out of walkways. - Keep work surfaces dry when possible. - Wear non-slip rubber boots if working on wet or slick surfaces. - Install rough work surface covers where possible. - Stay aware of footing and do not run.	L
	Traffic (including pedestrian)	S	- Notify attendant or site owner/manager of work activities and location. - Use cones, signs, flags or other traffic control devices. - Inspect area behind vehicle prior to backing and use spotter.	S
	Back strain and other musculoskeletal disorders due to lifting, pulling or tugging equipment	S	- Use mechanical aids when possible, if mechanical aids are not available, use two-person lifts for heavy items. - Use proper lifting techniques.	L
	Working near live utilities, property damage, utility	H	If utility locates are no longer visible, do not start work. Call One-Call and private utility locate companies to remark.	S

AHA - Utility Clearance

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
	outage, worker injury or death		Share utility voltage of any nearby overhead powerlines with subcontractor and establish the appropriate safe limit of approach distance as identified by regulations.	

AHA - Working in the Wild or Field

Activity / Task:	Working in the Wild or Field	Overall RAC for AHA (see "Methodology" Step 4):					S
Project Location:	Brighton, NY	Risk Assessment Code (RAC) Matrix					
Contract Number:	NA	Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Effective / Issue Date:	03/29/21		AHA Revision No.:	3			
Prepared by:	Raleigh Office Project & Safety Personnel	Catastrophic	H	H	S	S	M
		Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager	Marginal	S	M	M	L	L
		Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: • Conducting activities in the wild or field. • Check all Life Saving Actions below, that apply to your project. This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.		Methodology for RAC Designations					
		Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
		"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					RAC Chart
		"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					H = High Risk
		Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					S = Substantial Risk
		Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					M = Moderate Risk
					L = Low Risk		
		MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment.					
Check all Life Saving Actions that apply:		 ☐ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE	 ☐ DRIVING	 ☐ SUSPENDED LOADS	 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES		
		 ☐ WORKING ON OR NEAR WATER	 ☐ LONE OR REMOTE WORK	 ☐ GROUND STABILITY	 ☐ ENERGY SOURCES	 ☐ WORKING AT HEIGHTS	

AHA - Working in the Wild or Field

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Eye protection, foot protection, work clothes Job Step-specific PPE (as required): Hard hat, work gloves, snake boots, high visibility safety vest, hearing protection, insect repellent wipes, cold/heat stress protection if necessary, sunblock, leather gloves Other Required Equipment: Communication device, hand/power tools as necessary, elevated work equipment as necessary	Competent / Qualified Personnel: - Working Alone authorization if applicable - Authorized Tool/Equipment Operator Training Requirements: - Use of required hand/power tools - Use of equipment for elevated work, if applicable - Applicable Tool Manufacturer's Operational Instructions for tools and/or equipment MyLP – US Field Safety (online) Catalog Listing - MyLP: - Working Alone - Heat Illness Prevention - Cold Injury and Illness Prevention - Asbestos Introduction - Energy Isolations, Lock Out - Electrical Hazards Training - Overhead Power Line Safety - Underground Utilities / Ground Disturbance VMyLP – Health and Safety Leadership for Supervisors and Managers (\$45 Online) - Site-specific HASP Orientation - Daily Pre-shift Tailgate/Toolbox Safety Meeting - Contact your local HSE Representative for project-specific training that may be required	- Inspect all PPE prior to use. - Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. - Inspect power cord sets prior to use. - Inspect elevated work equipment if applicable.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	- Wear standard PPE at all times. - Standard PPE includes safety glasses, work clothes, and safety shoes. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. Determine potential presence of biohazard(s). If biohazard(s) possible,	Identified potential biological hazards	S	- Review/comply with Raleigh Office AHA 007 (General Biological Hazards). - Wear snake boots if presence of poisonous snakes is expected.	L
3. All work steps that include lifting, bending, twisting, back/knee strain, etc. hazards	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 002 (General Ergonomics).	L
4. Working in the wild/field	Falling, twisted ankles and knees, poor footing	S	- Always watch your footing. - Slow down and use extra caution around logs, rocks, and animal holes.	L

AHA - Working in the Wild or Field

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
(continued)			Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route.	
	Overhead hazards and falling objects	S	- Wear hard hat. - All ground personnel must stay clear of suspended loads. - Confirm that all equipment is equipped with required guards, canopies, or grills to protect the operator from falling or flying objects. - Identify all overhead hazards prior to commencing work operations.	S
4. Working in the wild/field (continued)	Damage to eyes	S	- Watch where you walk, especially around trees and brush with limbs sticking out. - Exercise caution when clearing limbs from tree trunks. - Ultraviolet light from the sun can be damaging to the eyes. If bright sunlight conditions exist, use tinted safety glasses.	M
	Elevated work, if applicable	S	Review/comply with Raleigh Office AHA 009 (General Elevated Work).	S
	Hostile environment/locale, loss of communication ability	S	- Be aware of surroundings. - Use buddy system, when possible. - Keep doors locked. - Always know the locations of fellow crewmembers. - Carry a radio and spare batteries or cell phone.	L
	Angry or violent individuals	S	- If a person approaches you and looks angry or threatening use your phone. Even if you are in an area where you cannot transmit, you can give the impression that you are in phone contact. - Try to be intentional in your actions; you may feel intimidated, but act in control. - Keep cool. If the person you are speaking to is angry, listen - don't react. - Never get into a private vehicle. If stranded, phone for help; stay in your vehicle until help arrives. - If you meet individuals on isolated roads, stay in your vehicle; let them approach you.	L
	Cuts, abrasion, splinters, etc. injuries from damaged tool and equipment use	S	- Inspect all tools and equipment before use. Do not use damaged tools or equipment. Repair immediately or tag and take out of service until repaired. Notify supervisor. - Review/comply with Raleigh Office AHA 011 (General Use of Power Tools). - Review applicable Manufacturer's Operational Instruction for tool(s).	L
	Back strains and other musculoskeletal disorders	S	Use proper lifting techniques and pay close attention to body position to prevent injuries when lifting, moving, and lowering equipment and materials.	L
	Cut, abrasions, and punctures	S	Wear leather gloves while loading to avoid cuts and abrasions from sharp edges of tools and equipment.	M
	Noise	M	- Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA, time weighted average, during an 8-hour work shift. - All equipment will be equipped with manufacturer's required mufflers.	L

AHA - Working in the Wild or Field

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
(continued)			- Hearing protection (ear plugs or earmuffs) shall be worn by all personnel working in or near heavy equipment such as a drill rig. - Rule of thumb: if you can't talk to someone at arms-length away without shouting, you should be wearing hearing protection.	
	Vehicular Traffic	M	- Spotters will be used when backing up trucks and heavy equipment and when moving equipment. - High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads.	L
4. Working in the wild/field (continued)	Struck by vehicle/equipment	M	- Keep out of the swing radius of heavy equipment. - Ground personnel in the vicinity of heavy equipment operations must be within the view of the operator at all times and will wear high visibility vests. - Ground personnel must maintain an adequate buffer zone of the counterweight swing. - Ground personnel must not stand directly behind heavy equipment when it is in operation.	L
	Caught in/on/between and entanglement	S	- Workers must not position themselves between equipment and a stationary object. - Workers are required to securely fasten log hair (place in ponytail and tuck into shirt) to prevent it from getting caught in machinery. - Workers may not wear dangling jewelry or loose clothing if working with tools/machinery.	M
	Contact with electricity/lightning, multiple (see specified AHA)	S	- All electrical tools and equipment will be equipped with GFCI. - Electrical extension cords must be of the "Hard" or "Extra Hard" service type. - All extension cords shall have a three-blade grounding plug. - Personnel shall not use extension cords with damaged outer covers, exposed inner wires, or splices. - Electrical cords shall not be laid across roads where vehicular traffic may damage the cord without appropriate guarding. - All electrical work will be conducted by a licensed electrician. - All utilities will be marked prior to excavation activities. - All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV). This distance will increase by 4 inches for each 10 kV above 50 kV. Company policy states: Keep equipment 20 feet away from all overhead distribution powerlines and 50 feet from transmission powerlines. - The SHSO shall halt outdoor site operations whenever lightning is visible; outdoor work will not resume until 30 minutes after the last sighting of lightning. - Review/comply with Raleigh Office AHA 061 (General Electrical Work).	S
	Equipment failure	S	All equipment will be inspected before use. If any safety problems are noted, the equipment should be tagged and removed from service until repaired or replaced.	L

AHA - Working in the Wild or Field

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
(continued)	Hand & power tool usage, multiple (see specified AHA)	S	- Inspect before use. - Tag and remove broken or damaged tools from service. - Use the tool for its intended purpose. - Use in accordance with manufacturer's instructions. - Wear hearing protection if necessary. - Review and comply with Raleigh Office AHA 011 (General Use of Power Tools).	S
	Falling/breaking through ground surface	S	Do not stand, walk, sit or place materials or equipment on surfaces that are not designed or designated for these purposes or that appear inadequate to support loads.	S
4. Working in the wild/field (concluded)	Wind	S	- Avoid parking in old, defective timber, especially hardwoods, during periods of high winds due to snag hazards. - Wind chill greatly affects heat loss (see attached Wind Chill Index).	L
	Sunburn	S	Block out direct sun exposure on skin by using appropriate clothing and sunblock on exposed areas.	L
	Heat stress (if applicable)	S	- Review/comply with Raleigh Office AHA 003 (General Heat Stress). - Curtail or suspend physical work when conditions are extremely severe. - Use the OSHA-NIOSH Heat Index App to calculate the heat index (or compute using a Wet Bulb Globe Temperature Index) to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed).	L
	Cold stress (if applicable)	S	Review/comply with Raleigh Office AHA 004 (General Cold Stress).	L
	Thunderstorms	S	- Monitor weather channels to determine if electrical storms are forecasted. - Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) - Suspend all field work at the first sound of thunder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds. - Only return to work 30 minutes after the last strike or sound of thunder	M
5. If working in areas with potential muddy locations (e.g., outdoor surface water areas, wetlands, mud flats)	Poor footing - slip, suction, entrapment, or fall	M	- Use a walking stick or probe to check footing and potential deep holes prior to entering area. - Wear appropriate foot wear such as boots. Over shoe boots provide protection to foot wear as well as a layer to remove if foot gets stuck. - Be aware of surroundings. Avoid muddy areas if possible. - Use the buddy system and keep a safe distance between workers. - Be prepared with rope, plywood, shovel, pole to assist "rescue" from being stuck in the mud. - If walking in mud is required to reach work area: - Provide a walkway or elevated surface if possible. - Use of snow fencing on the surface or snow shoes to disperse your weight.	L

AHA - Working in the Wild or Field

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
			- Use a skating motion and keep moving until on location and stand on a platform at work location.	
6. Cell phone/electronic device use in the field	Distractions leading to innumerable hazards	S	▪ Designate a safe location/distance away from the work area and traffic patterns for cell phone use. ▪ All phone calls can wait until you have stopped work and moved to a safe location. ▪ Never use a cell phone in an Exclusion Zone unless first moving to a safe location. Use of radios are recommended instead of cell phone use. ▪ Remove chemically protective gloves before cell phone/electronic device handling. ▪ Stand still when using cell phones and electronic devices. ▪ Don't turn your back on traffic or heavy equipment movements. ▪ Operating mobile equipment requires both hands. No cell phone use is allowed while operating mobile equipment including hands free.	M
7. If working in the wild/field alone	a. Workers are at risk of violent attack because workplace is isolated from public view b. Injury or incident involving field members goes unnoticed	S	▪ Review/comply with Raleigh Office AHA 111 (Working Alone). ▪ Establish a check-in procedure and make sure to keep in regular communication with designated contact person (e.g., project manager, supervisor, etc.). For each day on site: - Confirm that cell phone is adequately charged before going to worksite. - Notify project manager or supervisor via cell phone upon arrival at worksite. - Keep cell phone on person at all times, unless site safety requirements dictate otherwise. - Maintain contact with other on-site personnel via two-way radio when cell phones not permitted. - Notify project manager or supervisor via cell phone at time of departure from the worksite. ▪ When traveling and working alone, the main contact person should know the following details: - Destination - Estimated time of arrival - Return time or date - Contact information - Mode of travel (public transit, car, plane, etc.) ▪ Alternate plans in the event of bad weather, traffic problems, etc.	M
8. Check and calibrate industrial hygiene and other field instruments and equipment as required and as recommended by the manufacturer	Exposure to calibration gases/chemicals - use of damaged instruments	M	▪ Verify proper operation of the instrument prior to calibration. ▪ Calibrate instruments in an area with adequate ventilation and follow the manufacturers' recommendations. ▪ Wear appropriate PPE to conduct calibrations as specified in the instrument manual.	L
	Exposure to site contaminants due to: ▪ Improper instrument calibration ▪ Misinterpretation of calibration results ▪ Improper instrument repair	S	▪ Calibrate the instrument in accordance with the manufacturer's recommendations (see instrument manual) using the applicable calibration standard and calibration procedure. ▪ Perform calibrations at a frequency recommended by the manufacturer. Be aware of the instrument's limitations (e.g., detection limit, maximum sensitivity) and the conditions (e.g., humidity) that may affect correct operation or accuracy of that equipment. Possible sources of error that may affect the correct calibration of the instrument. ▪ Use only calibration materials recommended by the manufacturer for calibration. Do not use substitutions. ▪ Confirm that the connections between the instrument and the calibration gas/material is leak-free.	M

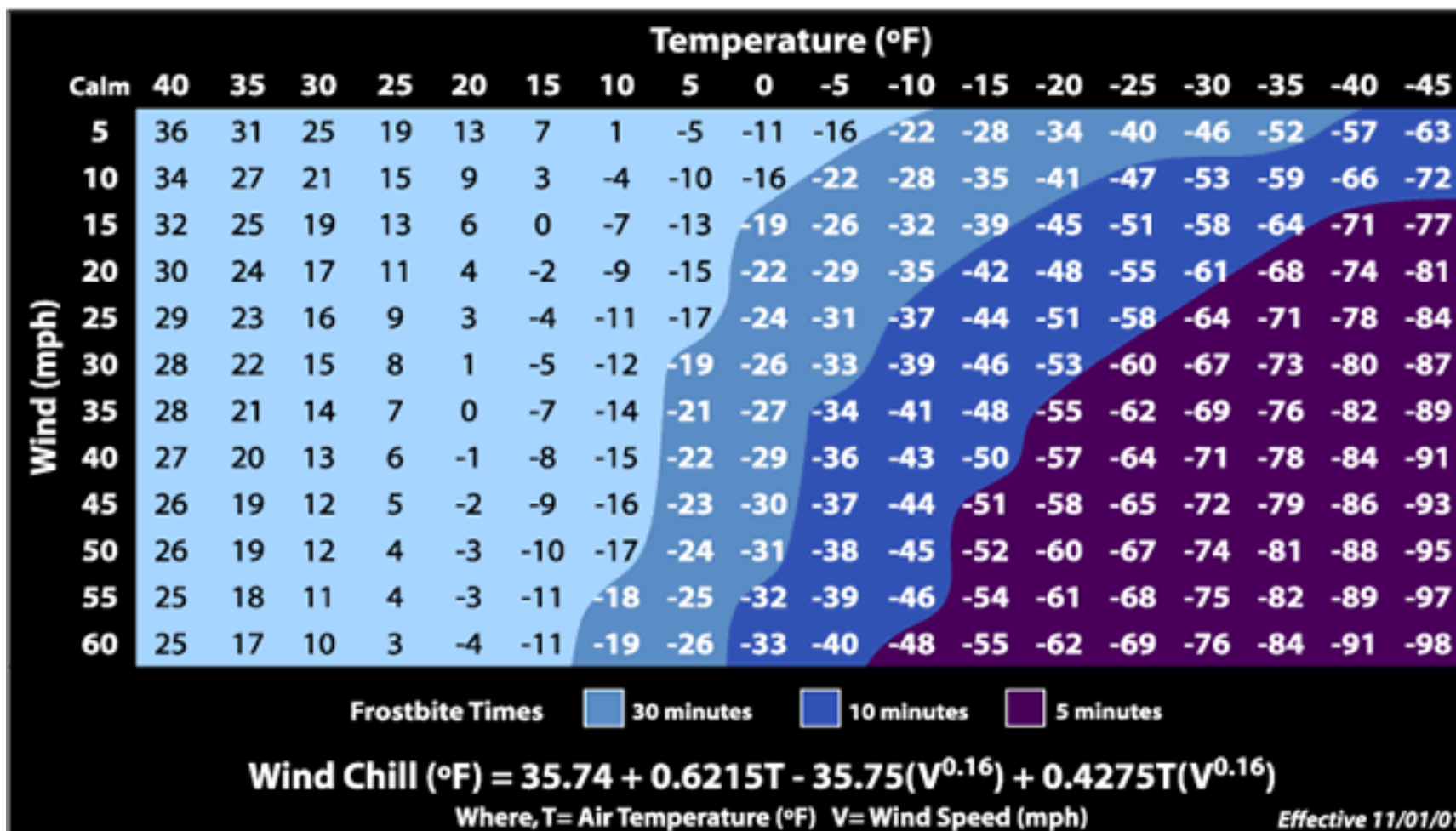
AHA - Working in the Wild or Field

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
	Improper use of instrument due to lack of training		- Record all instrument calibrations in the field logbook. Include the instrument ID (type/manufacture/serial number/lamp eV, etc.), calibration gas used (chemical and concentration), and instrument result. - Do not attempt to repair instrument. Return to the vendor for replacement. Report any damaged or malfunctioning instrument to the vendor. - All personnel must be familiar with operation of the instrument and understand: - Theroy of its operation including any alarms and their setpoints - Materials the instrument can and cannot detect - Instrument's limitations - The expected responses to calibration gases/materials - Interfering gases/chemicals and their affects on the instrument readings - When re-zeroing is appropriate	

AHA - Working in the Wild or Field



Wind Chill Chart



AHA - Drilling Operations Oversight (Enviro & Geotech)

Activity / Task:	Drilling Operations Oversight (Enviro & Geotech)			Overall RAC for AHA (see "Methodology" Step 4):					S
Project Location:	Brighton, NY			Risk Assessment Code (RAC) Matrix					
Contract Number:	NA			Probability Severity	Almost Certain	Likely	Possible	Unlikely	Rare
Effective / Issue Date:	08/31/22	AHA Revision No.:	0		Catastrophic	H	H	S	S
Prepared by:	Raleigh Office Project & Safety Personnel			Critical	H	S	S	M	L
Reviewed by: (Name, Title)	Michele Barnhart, HSE Manager			Marginal	S	M	M	L	L
				Negligible	M	L	L	L	L
Notes (Field Notes, Review Comments, etc.): This AHA involves the following: - Oversight of environmental/geotechnical drilling operations, collection of soil/core sampling, and utility clearance verification. - Check additional Life Saving Actions as applicable to project.				Methodology for RAC Designations					
				Step 1: Review each "Hazard" to identify Probability and Severity (Refer to Risk Register: Canada / US)					
				"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Almost Certain, Likely, Possible, Unlikely, or Rare.					
				"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.					
				Step 2: Identify the RAC-Inherent (before controls are applied) as H, S, M, or L for each "Hazard" on AHA.					
This AHA is not an exhaustive summary of all hazards associated with the Site. Refer to the project HASP or client information for additional requirements and emergency procedures. Workers to follow general site safety controls for hazard signage/PPE, housekeeping, slips/trips/falls, biological hazards, mobile equipment, confined spaces, fall hazards, electrical hazards, and any active operating equipment or construction activities.				Step 3: Identify the RAC-Residual (after controls are applied) as H, S, M, or L for each "Hazard" on AHA.					
				Step 4: Annotate the overall highest RAC-Residual at the top of AHA.					
 MANAGEMENT OF CHANGE: If there is a change or deviation from the planned activity, you must stop the job and re-evaluate the risk assessment and the precautions taken. Any changes to work described in this AHA shall require review by a Qualified Person. For new/additional tasks/activities not originally identified in HASP, use FLRA - Field Level Risk Assessment									
Check all Life Saving Actions that apply:		 ☒ WORK AROUND HEAVY MOBILE EQUIPMENT PLAN/PEOPLE INTERFACE		 ☒ DRIVING		 ☒ SUSPENDED LOADS		 ☐ HAZARDOUS ATMOSPHERES/SUBSTANCES	
 ☐ WORKING ON OR NEAR WATER		 ☐ LONE OR REMOTE WORK		 ☐ GROUND STABILITY		 ☒ ENERGY SOURCES		 ☐ WORKING AT HEIGHTS	

AHA - Drilling Operations Oversight (Enviro & Geotech)

Equipment to be Used Refer to Minimum PPE Requirements and specify as per risk assessment where required.	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Standard PPE (worn at all times): Foot protection, eye protection, and appropriate work gloves. Job Step-specific PPE (as required): Hearing protection, hard hat, high visibility safety vest, shin guards/snake chaps, and nitrile gloves. Other Required Equipment: Out of Service tags, fire extinguisher, and plastic sheeting and/or tarps, appropriate DOT reflective clothing may be required if working next to a road or railway. Note: Chemical protective clothing, goggles, and an air purifying respirator fitted with a dust filter requirements for all subcontractor personnel handling cement grout during grouting activities. Also, additional PPE and other safety-related equipment requirements for HAZWOPER, DOT, or FRA projects will be covered in the site-specific HASP.	Competent / Qualified Personnel: - Drilling Operations Oversight Authorization Training Requirements: - Project specific HASP orientation - Toolbox/Tailgate safety meeting - SA 313 Overhead and Underground Utilities E&E Procedure - SA 313 Ground Disturbance Plan Form MyLP - Control of Hazardous Energies (\$20 ClickSafety online) - Drilling Investigation AHA Training.pptx - Underground Utility Training (Generic PPT) - E&E Ground Disturbance Training (MyLP) - Drilling Operations Oversight AHA - Geotechnical Drilling from a Watercraft (as applicable)	- Inspect all PPE prior to use. - Daily inspection of equipment per manufacturer's instructions. Tag tools that are defective and remove from service. - Inspect power cord sets prior to use.

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
1. Use of PPE	Multiple (see specified AHA)	S	- Wear standard PPE at all times. - At a minimum, personnel shall always wear safety glasses, leather or Kevlar gloves, and safety shoes while conducting all job steps. While at the job site, personnel shall also always wear a hard hat and a high visibility vest. Additional job step-specific PPE includes hearing protection (ear plugs or muffs) and nitrile or leather gloves. - Review/comply with Raleigh Office AHA 077 (General PPE Use).	M
2. All work steps that include lifting, bending, twisting, back/knee strain, etc. hazards	Multiple (see specified AHA)	S	Review/comply with Raleigh Office AHA 002 (General Ergonomics).	L

AHA - Drilling Operations Oversight (Enviro & Geotech)

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
3. Project preparation prior to leaving for job site a. Obtain and review Subcontractor AHA/JSA(s) b. Review training and experience requirements of driller and helper with subcontractor and obtain copies of certificates c. Review drill rig driver qualifications with subcontractor and obtain copies of certificate	Malfunction of vehicle/equipment, defective PPE	L	- Drivers shall read and be familiar with all operator manuals plus be trained prior to operating equipment. - Drivers shall be DOT qualified. - Drivers shall perform a pre-operational check of equipment. - If repairs are required, tag the equipment as "Out of Service" and report to subcontractor immediately. - Operators shall not use defective/unsafe equipment.	L
	Environmental conditions at job site: heat, cold, severe weather	S	- Review/comply with Raleigh Office AHA 003 (General Heat Stress) if applicable. - Review/comply with Raleigh Office AHA 004 (General Cold Stress) if applicable. - Review/comply with Raleigh Office AHA 008 (Working in the Wild or Field). - Monitor local weather prior to mobilization. - Download weather and or lightening apps onto mobile device such as WeatherBug, My Lightening Tracker, and OSHA NIOSH Heat Index.	L
4. Is the use of a company vehicle necessary? If yes,	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 001 (General Vehicle Travel).	S
5. Determine potential presence of biohazard(s). If biohazard(s) possible,	Identified potential biological hazards	S	Review/comply with Raleigh Office AHA 007 (General Biological Hazards).	L
6. Clearing utilities prior to site work	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 080 (Utility Clearance).	S
7. Subcontractor drive drill rig/geoprobe onto site (continued)	Malfunction of vehicle/equipment	M	- Verify driver qualifications. - The subcontractor must: - Select a drill rig suitable for the expected site terrain (i.e., rig with low center of gravity for heavy uneven terrain). - WSP personnel in coordination with subcontractor personnel will confirm that a thorough inspection has been completed of the access routes to each sample location prior to moving the drill rig to those areas. The inspection will consider the terrain, environmental conditions (e.g., frozen or wet ground), predicted weather conditions, and the type of rig to be used. - Drivers shall perform a pre-operational check of equipment, read and be familiar with any operator's manual, and report all needed repairs promptly. - Operators shall not use defective/unsafe equipment.	L

AHA - Drilling Operations Oversight (Enviro & Geotech)

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
7. Subcontractor drive drill rig / geoprobe onto site (concluded)	Incident involving drill rig/geoprobe while being driven	M	▪ Verify all drivers are properly licensed. Supervisors shall verify that drivers are capable and qualified on each type of equipment before allowing the equipment to be used unsupervised. ▪ Site supervisor/field lead will communicate with subcontractor on appropriate equipment and contingency planning. ▪ Subcontractor must - Provide manufacturer's operating limits of equipment prior to mobilization. - Complete a visual inspection of the equipment prior to operation. Replace or repair equipment if necessary. Complete a checklist to document inspections and corrective actions required. - Check the loading materials stored on the rig to verify that they do not cause instability of the rig (e.g., uneven sand bag placement) during movement over the expected terrain. - Keep wind shields, windshield wipers, side mirrors and side windows clean. - Conduct a pre-operation vehicle safety check. - Minimize or eliminate the need for backing. Always check to the rear before backing and use an observer when available. If an observer is not available, the driver shall walk around the vehicle to make sure rear is clear prior to backing. - Use a spotter when backing. Never allow anyone between truck and trailer when backing to hook trailer. - Provide a second support vehicle and balance the load for stability. - Ensure seat belts are worn by driver and passengers when driving. - Choose the safest location possible to park equipment. Avoid parking in blind spots of other equipment. - When operating the unit on sloped surfaces, always position the unit parallel with the slope. This provides the greatest degree of stability and will limit shifting during probing or augering operations. Position a track-mounted machine with the control panel upslope whenever possible so the machine will roll away from the operator if it becomes unstable and moves unexpectedly. - Make sure tilt beds or ramps are secured before putting trailer in use. - Perform periodic checks of equipment on long trips to assure the load is secure. - Do not leave equipment unattended with the engine running. Shut off engine and set the parking brake when equipment is not in use. - The mast shall always be in a lowered position when moving the drill rig. ▪ All drivers shall adjust vehicle speed for load and weather. Tire chains should be utilized as dictated by weather conditions. ▪ Walk area first, before operating a vehicle off the roadway and look for possible hidden objects in the grass and unstable terrain. ▪ Do not leave equipment unattended with the engine running. Shut off engine and set the parking brake when equipment is not in use.	L

AHA - Drilling Operations Oversight (Enviro & Geotech)

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
8. Loading/unloading and site preparation	Crushing injuries, pinch points, entanglement	S	- Be aware of crushing and pinching hazards when loading, unloading, and fastening down equipment. - Make sure cargo is properly loaded and secured. - Get assistance from a co-worker or use mechanical means to move heavy sampling equipment (dolly, cart, etc.).	M
	Heavy lifting, twisting, bending, back strain, and other musculoskeletal disorders	M	- Size up the load, utilize help for heavy items, and split loads as necessary. - Use proper body mechanics and ergonomic techniques.	L
	Slip, trips, and falls	M	- Keep walking areas clear. - Store tools in their proper place when not in use. - Maintain proper housekeeping.	L
9. Is elevated work required? If yes,	Multiple (see specified AHA)	S	- Review/comply with Raleigh Office AHA 009 (General Elevated Work). - Verify subcontractors are qualified to work at height when required. - Ensure fall protection is worn when working >4 or 6 feet (site/project dependent) above ground level.	S
10. Rig operation by subcontractor	Vehicle movement/unstable, crushing injuries, pinch points, entanglement, and flying particles	M	- Subcontractor shall read and be familiar with owner's manual. - Keep body parts clear of probe foot. - Be familiar with Emergency kill switch and controls. Test prior to probing. - Use caution on soft or loose surface. Be aware of the weight of loaded vehicle. - Be aware of weather and windy conditions. Do not operate during lightning storm or high winds. - Heed all Caution, Warning, or Danger decals on machine. - Ensure everyone is clear of moving parts. - Designate only one experienced operator to avoid unexpected engagement. - Operate only from the control side. Do not reach across operating probe. - Avoid placing your hands on top of the tool string when raising/lowering the hammer or swinging/folding probe assembly. - DO not wear loose clothing. Tie back hair when operating equipment. - Before use, inspect cable, chain or wire for wear and replace if necessary. - Observe OSHA guidelines for use of cable clamps, safety latches, chains, and slings. - Know rated capacity of chain, cable or wire rope being used and never exceed the rating. - Avoid overloading and sudden jerks. - Check loads to be lifted for balance and have the rigging inspected to ensure a safe and balanced condition exists. - Do not allow employees to stand or work under suspended loads.	L
(continued)	(continued)			

AHA - Drilling Operations Oversight (Enviro & Geotech)

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
10. Rig operation by subcontractor (continued)	Vehicle movement/ unstable, crushing injuries, pinch points, entanglement, and flying particles (concluded)	M	- Awkward loads shall have taglines attached to control the load. - Review signals and operator communications with crew; only one person shall direct the operator. - Review the area for utility lines, tree limbs, and other overhead hazards. - Follow OSHA guidelines. - Personnel working tag lines shall review the area for slipping, tripping, and falling hazards. - Audit rig operator and helper against subcontractor AHA/JSA(s).	L
	Noise	S	- Wear hearing protection when operating and when working near / in the vicinity of a drill rig or other heavy equipment. - Download NIOSH Sound level meter to mobile device.	M
	Slips, trips, and falls	M	- Maintain an orderly and clean site. - Store tools in their proper place when not in use - Barricade or establish work zones to minimize unauthorized entry. - Provide adequate lighting.	L
	Material under stress, equipment limitations, rope or cable blocks, hydraulic leaks	M	- Know the capacities, equipment limitations and acceptable operating loads. Follow the equipment operator's manual and proper maintenance requirements. - Stand clear of potential release of energy. Keep body part clear of moving parts. - Use the correct tool for the job. - Limit the rate of the hammer lowering while advancing the tool string to avoid raising the probe foot more than 6 inches off the ground surface. - In the event problem or binding, the operator should release all control levers to neutral. - Inspect hydraulic lines. Repair or replace damaged hoses. - Use spill tarp under equipment in environmentally sensitive areas or if required by client. Refer to HASP. - Verify spill kit on rig.	L
	Utility lines	S	- Verify private locates and/or "one call" system has marked underground utilities. - Be aware of surroundings. Establish safe "dig" zones based on utility markings and maintain throughout the field effort. - Before moving onto a site, evaluate overhead height restrictions including utilities and vegetation. - Observe and stay clear (minimum of 10 feet for nominal system voltage, utility lines, rated 50kV and an additional 0.4 inch for each kV over 50kV or twice the length of the line insulator, but never less than 10 feet) of overhead utility lines. - Do not drive the machine with the mast extended. - Do not store materials or tools under overhead utility lines.	M
	Overhead loads	M	- Remain alert. Establish work zone to minimize workers under overhead loads. - Avoid sudden jerks or overloading.	L

AHA - Drilling Operations Oversight (Enviro & Geotech)

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
(continued)			Check load for balance and appropriate support prior to hoisting.	
10. Rig operation by subcontractor (concluded)	Lifting, back strain, and other musculoskeletal disorders	M	- Use mechanical means to lift heavy loads and removing rod. - Get assistance when lifting tools or materials >50 pounds.	L
	Chemical exposure	M	- Don appropriate PPE for chemicals of concern (see project HASP). Work from upwind. - Be aware of combustion fumes if equipment has auxiliary power. - Practice good hygiene by washing hands, and no eating/smoking within the exclusion zone.	L
11. Rig operation/ operational area and stabilizing rig with hydraulic jacks/pads	Uneven terrain	M	- Be aware of drop-offs, uneven ground (e.g., holes, frozen earth mounds) and potential hidden objects which may cause loss of control when maneuvering rigs or create unstable drill set-ups. - In heavily WSPed area, scout to locate hidden objects. Watch your footing and use care when walking.	L
	Environmental conditions	S	See Job Step #3.	L
	Fall while mounting and dismounting rig equipment	M	- When mounting and dismounting equipment, use steps and handhold. - Do not jump from vehicle.	L
	Contaminated soils, buried power or gas lines, landfills and containment of spills	M	- During drilling operations, always be aware of the possibility of encountering potentially hazardous materials, such as petroleum hydrocarbons, herbicides, pesticides, chemical manufacturing by-products or solid waste materials. - If any unknown or questionable materials are encountered, suspend drilling operations immediately and contact the Project Manager. - Do not handle any suspected contaminated materials unless trained to do so and proper protective methods are followed. - During drilling operations, always be aware of the possibility of striking an un-located or improperly located gas or power line. - In the event a buried utility line is struck, drilling operations are to be suspended immediately. - If the utility line is electric, keep personnel at least 10 feet from all metal surfaces connected with the drill rig. - If the utility is gas, then the area is to be evacuated and secured. Immediate notification to the utility company is MANDATORY. - In the event of a gas or oil spill, the proper authorities are to be contacted immediately so that containment operations can be implemented. - Work upwind of the sample location. - Minimize exposure using a shovel/spoon or tool to collect the sample. - Review and understand SDS for all chemicals being handled. - Be careful when handling acids and caustic substances. Wear appropriate PPE (see Project HASP) and wash hands after completion of task.	L
(continued)				

AHA - Drilling Operations Oversight (Enviro & Geotech)

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
11. Rig operation/ operational area and stabilizing rig with hydraulic jacks/pads (concluded)	Crushing injuries, slip, trip, fall hazards, struck by, line of fire, back strain and other musculoskeletal disorders, electrocution, electrical shock	M	- Complete a daily operations checklist. - Use proper lifting techniques. - Ensure jack is rated for weight/operation with safe limits. - Assure that area is clear of personnel and obstacles. - Place pads under jacks to prevent them from sinking into the ground. - Avoid contact with rotating equipment. - When cathead is in use, assure a safe travel path for the rope by using proper techniques. Avoid standing on the rope. - Observe and stay clear (minimum of 10 feet for nominal system voltage, utility lines, rated 50kV and an additional 0.4 inch for each kV over 50kV or twice the length of the line insulator, but never less than 10 feet) of overhead utility lines. - In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 ft for voltage less than 50kV and 10 feet for voltages over 50kV up to and including 345kV and 16 ft for voltages up to and including 750kV. - A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. - Employees on foot must use extreme caution to stay clear of operating equipment. Always establish eye contact with the operator before approaching the equipment. - Be aware of drop-offs, uneven ground and potential hidden objects which may cause loss of control when maneuvering drill rigs or create unstable drill set-ups. In heavily WSPed area, scout to locate hidden objects. - Drill rod stacking must not exceed a length of 1.5 times the height of the tower. - Be alert to conditions that can lead to slippery surfaces (e.g., high groundwater resulting in muddy soils brought to the surface by augers and the utilization of bentonite drilling fluid). - Inspect all cables and clamps prior to winching operation. Stand clear of winching operations. - Use proper lifting techniques. Get help or use lifting equipment. - Suspend drilling operations during electrical storms. - Be aware of overhead hazards that may contact the drill rig when moving or setting up equipment.	L
12. Subcontractor mixing grout on site and filling/placing in hole between the well pipe and bore hole wall	Chemical exposure	M	- Stand upwind of the operation. - If use of a dust mask is desired (voluntary use), documented respirator awareness training in the use of dust masks per 29 CFR 1910.134 Appendix D must be in place. - Voluntary use of respirators shall comply with WSP E&I Respiratory Protection Program P.2.1.9 (US).	L

AHA - Drilling Operations Oversight (Enviro & Geotech)

Job Steps	Hazards	RAC-Inherent	Controls	RAC-Residual
13. Subcontractor cutting soil acetate sleeve open to sample soil	Cutting hand with razor blade/utility knife	M	- WSP personnel must allow the subcontractor to cut the sample liners as they have the appropriate tools and have been trained in the methods to cut the liner. - Subcontractor must be aware of where hands are placed prior and during cutting with a knife or sharp hand tool. - Verify appropriate gloves donned for the task.	L
14. Collect soil sample(s)	Multiple (see specified AHA)	H	Review/comply with Raleigh Office AHA 025 (General Soil Sampling).	S
15. Decontamination of drill equipment using pressure washer	Contamination of personnel and environment	M	- See relative items in Job Step #11 regarding contamination. - Follow the HASP for PPE and level of protection. - Verify subcontractor is containerizing materials washed from contaminated equipment with proper containment materials. - Verify trained/authorized personnel to use pressure washer and assure area is clean of personnel prior to operation of pressure water device. - Stand upwind of the operation.	L
16. Driving drilling rig off site	Multiple (see Job Step #7)	M	See relevant items in Job Step #7.	L
17. Loading/unloading and site evacuation	Multiple (see Job Step #8)	S	- See relevant items in Job Step #8. - Walk the site to ensure all tools, materials, and debris have been removed.	M

Contaminant Fact Sheets

CONTAMINANT FACT SHEET

HEALTH HAZARD DATA						
 CONTAMINANT FACT SHEET Chemical Name: <u>1,1,1-Trichloroethane</u> CAS Number: <u>71-55-6</u> Synonyms: <u>Methyl chloroform; chloroethene</u> _____ _____ Color: <u>Colorless</u> Physical State: Solid _____ Liquid <u>X</u> Gas _____ Odor: <u>Chloroform-like</u> Odor Threshold: <u>100 ppm</u> Vapor Density: <u>5.5 g/L</u> Vapor Pressure: <u>100 mmHg</u> Ionization Potential (IP): <u>11.00 eV</u> IDLH: <u>700 ppm</u>	Carcinogen: OSHA _____ IARC _____ NTP _____ ACGIH _____ NIOSH _____ Skin absorbable: yes ___ no <u>X</u> Skin corrosive: yes <u>X</u> no ___ Signs/Symptoms of Acute Exposure: <u>Skin irritation, headaches, dizziness, nausea, vomiting, diarrhea</u> _____ _____					
Source OSHA PEL ACGIH TLVs NIOSH RELs	TWA (units) 350 ppm 350 ppm	STEL (units) 450 ppm	C (units) 350 ppm			
AIR MONITORING						
PERSONAL PROTECTIVE EQUIPMENT						
FIRE/REACTIVITY DATA						
Type	Brand/Model No.	Calibrations Method/Media	Response or Conversion Factor	Meter Specific Action Level	Recommended Protective Clothing Materials: Suits <u>Tychem, Teflon, Viton</u> _____ Gloves <u>Teflon, Viton, PE/EVAL</u> <u>Polyvinyl alcohol (Do not use in water)</u> Boots <u>Teflon, Viton</u> _____ _____ Service Limit Concentration (ppm): <u>1000</u> MUC 1/2 Mask APR=TWA x 10= <u>1000 ppm</u> MUC Full-Face APR=TWA x 10= <u>1000 ppm</u>	Flash Point: <u>NA</u> LEL/UEL: <u>7.5% / 12.5%</u> Fire Extinguishing Media: Dry Chemical <u>X</u> Foam <u>X</u> Water Spray _____ CO₂ <u>X</u> Incompatibilities: <u>Strong caustics; strong oxidizers; chemically active metals such as: zinc, aluminum, magnesium powders, sodium, and potassium; water</u>
PID	11.7eV	Isobutylene 100 ppm	1	175 ppm		
Checked by: Cindy Sundquist					Date: 3/16/23	

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Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

CONTAMINANT FACT SHEET

HEALTH HAZARD DATA								
 CONTAMINANT FACT SHEET Chemical Name: Cis -1,2-Dichloroethylene CAS Number: 540-59-0 Synonyms: Acetylene dichloride, cis -Acetylene dichloride, trans-Acetylene dichloride,	Color: <u>Colorless</u>	Carcinogen: OSHA _____ IARC _____ NTP _____ ACGIH _____ NIOSH _____	Source	TWA (units)	STEL (units)	C (units)		
	Physical State: Solid _____ Liquid <u>X</u> Gas _____	Skin absorbable: yes ____ no <u>X</u> Skin corrosive: yes ____ no <u>X</u>	OSHA PELs	200 ppm				
	Odor: <u>Chloroform-like</u>	Signs/Symptoms of Acute Exposure: Irritant to eyes and respiratory system, CNS, depression	ACGIH TLVs	200 ppm				
	Odor Threshold: <u>0.08-17 ppm</u>		NIOSH RELs	200 ppm				
Vapor Density: <u>3.35 g/L</u> Vapor Pressure: <u>201 mmHg</u> Ionization Potential (IP): <u>9.65 eV</u>	IDLH: <u>1000 ppm</u>							
AIR MONITORING					PERSONAL PROTECTIVE EQUIPMENT		FIRE/REACTIVITY DATA	
Type	Brand/Model No.	Calibrations Method/Media	Response or Conversion Factor	Meter Specific Action Level	Recommended Protective Clothing Materials: Suits <u>Teflon, Viton, PE/EVAL, Barricade, CPF3, Tychem Responder</u> Gloves <u>Viton, Teflon, Polyvinyl Alcohol (do not use in water)</u> Boots <u>Teflon, Viton</u>		Flash Point: <u>36-39 ° F</u> LEL/UEL: <u>5.6% / 12.8%</u> Fire Extinguishing Media: Dry Chemical <u>X</u> Foam <u>X</u> Water Spray <u>X</u> CO ₂ <u>X</u> Incompatibilities: <u>Strong oxidizers, strong alkalis, potassium hydroxide, copper</u> First Aid: Eye: Irrigate immediately wash Breathing: Respiratory support Swallow: Medical attention immediately	
PID	10.6 eV	Isobutylene 100 ppm	0.8	125 ppm	Service Limit Concentration (ppm): <u>1000</u> MUC 1/2 Mask APR = TWA x 10 = <u>416 ppm</u> *MUC Full-Face APR = TWA x 50 = <u>1000 ppm</u>			
Checked by: Cindy Sundquist					Date: 2/10/23		*Use if conducted quantitative fit testing (Portacount), otherwise use MUC for 1/2 respirator if did qualitative fit testing (Irritant smoke)	

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Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminant exists. Professional judgement and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

CONTAMINANT FACT SHEET

HEALTH HAZARD DATA								
CONTAMINANT FACT SHEET Chemical Name: Benzene CAS Number: 71-43-2 Synonyms: Phenyl hydride Benzol	Color: <u>Colorless</u>	Carcinogen: OSHA <u>X</u> IARC <u>X</u> NTP <u>X</u> ACGIH <u>X</u> NIOSH <u>X</u>	Source	TWA (units)	STEL (units)	C (units)		
	Physical State: Solid _____ Liquid <u>X</u> Gas _____	Skin absorbable: yes <u>X</u> no _____ Skin corrosive: yes <u>X</u> no _____	OSHA PELs	1.0 ppm	5.0 ppm			
	Odor: <u>Aromatic</u>	Signs/Symptoms of Acute Exposure: Irritant to eyes, skin, nose, headache nausea, staggered gait.	ACGIH TLVs	0.5 ppm	2.5 ppm			
	Odor Threshold: <u>34-119 ppm</u>		NIOSH RELs	0.1 ppm	1.0 ppm			
	Vapor Density: <u>2.7 g/L</u> Vapor Pressure: <u>75 mmHg</u> Ionization Potential (IP): <u>9.24 eV</u>							
	IDLH: <u>500 ppm</u> Routes of Entry: <u>Inh, Ing, Con, Abs</u>							
AIR MONITORING					PERSONAL PROTECTIVE EQUIPMENT		FIRE/REACTIVITY DATA	
Type	Brand/Model No.	Calibrations Method/Media	Response or Conversion Factor	Meter Specific Action Level	<u>Recommended Protective Clothing Materials:</u> Suits <u>Viton, Teflon, Barricade</u> <u>CPF3, Responder,</u> <u>Tychem</u> Gloves <u>Viton, Teflon, Polyvinyl</u> <u>Alcohol (PVA) (Do not</u> <u>use in water)</u> Boots <u>Teflon</u> Service Limit Concentration (ppm): <u>1000</u> MUC 1/2 Mask APR = TWA x 10 = <u>5 ppm</u> *MUC Full-Face APR = TWA x 50 = <u>25 ppm</u> *Only with quantitative fit testing		Flash Point: <u>12 ° F</u> LEL/UEL: <u>1.2 / 7.8%</u> <u>Fire Extinguishing Media:</u> Dry Chemical <u>X</u> Foam <u>X</u> Water Spray <u>X</u> CO ₂ <u>X</u> <u>Incompatibilities:</u> Strong oxidizers, fluorides, perchlorates, nitric acid <u>First Aid:</u> Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
PID	10.6eV	Isobutylene 100 ppm	0.53	0.5 ppm				
FID	OVA 128	Methane	1.5	0.15 ppm				
Checked by: Cindy Sundquist Date: 7/24/23								

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Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

NE = None Established
 NA = Not Applicable/Not Available

Abs = Skin Absorption
 Ing = Ingestion

Inh = Inhalation
 Con = Skin and/or Eye contact

DSEN = Dermal Sensitizer

CONTAMINANT FACT SHEET

HEALTH HAZARD DATA				
CONTAMINANT FACT SHEET Chemical Name: <u>Tetrachloroethene</u> CAS Number: 127-18-4 Synonyms: <u>tetrachloroethylene</u> <u>Perchloroethylene (Perc)</u>	Color: <u>colorless</u>	Physical State: Solid _____ Liquid <u>X</u> Gas _____	Odor: <u>chloroform-like</u>	Odor Threshold: <u>47 ppm</u>
	Vapor Density: <u>6.8 g/L</u>	Vapor Pressure: <u>14 mmHg</u>	Ionization Potential (IP): <u>9.32 eV</u>	IDLH: <u>150 ppm</u>
	Routes of Entry: <u>Inh, Ing, Con, Abs</u>			
	Carcinogen: OSHA _____ IARC <u>X</u> NTP <u>X</u> ACGIH _____ NIOSH <u>X</u> Skin absorbable: yes <u>X</u> no _____ Skin corrosive: yes _____ no <u>X</u>			
	Signs/Symptoms of Acute Exposure: <u>Irritation of eyes, nose, and throat;</u> <u>nausea; flushing of the face and neck;</u> <u>vertigo; dizziness; incoherence;</u> <u>headache; sleepiness, and skin irritation</u>			
	Source	TWA (units)	STEL (units)	C (units)
	OSHA PEL	100 ppm		200 ppm
	ACGIH TLVs	25 ppm	100 ppm	
	NIOSH RELs	Lowest Feasible		

AIR MONITORING					PERSONAL PROTECTIVE EQUIPMENT		FIRE/REACTIVITY DATA	
Type	Brand/Model No.	Calibrations Method/Media	Response or Conversion Factor	Meter Specific Action Level	Recommended Protective Clothing Materials:	Flash Point: <u>NA</u>	LEL/UEL: <u>NA / NA</u>	
PID	10.6 eV	Isobutylene 100 ppm	0.57	21.9 ppm	Suits <u>Teflon, Viton, CPF3, Barricade, Responder, Trelchem, Tychem</u>	<u>Fire Extinguishing Media:</u> Dry Chemical <u>X</u> Foam <u>X</u> Water Spray <u>X</u> CO ₂ <u>X</u> <u>Incompatibilities:</u> Strong oxidizers, chemically-active metals, caustic soda, sodium hydroxide, and potash <u>First Aid:</u> Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately		
Colormetric Tube		2 - 40 ppm		12.5 ppm	Gloves <u>Viton, Teflon, and Polyvinyl Alcohol (do not use in (water))</u>			
					Boots <u>Nitrile Rubber</u>			
					Service Limit Concentration (ppm): <u>1000</u>			
					MUC 1/2 Mask APR=TWA x 10= <u>219 ppm</u> *MUC Full-Face APR=TWA x 50= <u>1000 ppm</u> *Only with quantitative fit testing			

Checked by: **Cindy Sundquist**

Date: **7/24/23**

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Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

NE = None Established
NA = Not Applicable/Not Available

Abs = Skin Absorption
Ing = Ingestion

Inh = Inhalation
Con = Skin and/or Eye contact

DSEN = Dermal Sensitizer

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CONTAMINANT FACT SHEET Chemical Name: <u>Toluene</u> CAS Number: <u>108-88-3</u> Synonyms: <u>Methylbenzene, Methyl Benzol, Phenyl Methane</u> <u>Toluol</u>		HEALTH HAZARD DATA												
		Color: <u>Colorless</u>				Carcinogen: OSHA _____ IARC _____ NTP _____ ACGIH _____ NIOSH _____				Source	TWA (units)	STEL (units)	C (units)	
		Physical State: Solid _____ Liquid <u>X</u> Gas _____				Skin absorbable: yes <u>X</u> no _____ Skin corrosive: yes _____ no <u>X</u>				OSHA PELs	200 ppm		300 ppm	
		Odor: <u>Sweet Pungent</u>				Signs/Symptoms of Acute Exposure: Irritant to eyes and nose, dizziness, fatigue, confusion, weakness, headache dilated pupils, dermatitis, lacrimation nervousness				ACGIH TLVs	20 ppm			
		Odor Threshold: <u>0.16 - 37 ppm</u>								NIOSH RELs	100 ppm	150 ppm		
Vapor Density: <u>3.7 g/L</u>				Vapor Pressure: <u>21 mmHg</u>										
Ionization Potential (IP): <u>8.82 eV</u>														
IDLH: <u>500 ppm</u>														
Routes of Entry: <u>Inh, Ing, Con, Abs</u>														
AIR MONITORING					PERSONAL PROTECTIVE EQUIPMENT					FIRE/REACTIVITY DATA				
Type	Brand/Model No.	Calibrations Method/Media	Response or Conversion Factor	Meter Specific Action Level	<u>Recommended Protective Clothing Materials:</u> Suits <u>Teflon, Viton, CPF3, PE/EVAL,</u> <u>Barricade, Responder, Tychem</u> <u>Trellchem</u> Gloves <u>Viton, Teflon</u> <u>Polyvinyl alcohol</u> <u>(do not use in water)</u> Boots <u>Teflon, Viton</u> _____ _____					Flash Point: <u>40° F</u> LEL/UEL: <u>1.1% / 7.1%</u> <u>Fire Extinguishing Media:</u> Dry Chemical <u>X</u> Foam <u>X</u> Water Spray <u>X</u> CO ₂ <u>X</u>				
PID	10.6	Isobutylene 100 ppm	0.5	20 ppm	Service Limit Concentration (ppm): <u>1000</u> MUC 1/2 Mask APR = TWA x 10 = <u>200 ppm</u> *MUC Full-Face APR = TWA x 50 = <u>1000 ppm</u> *only with quantitative fit testing					<u>Incompatibilities:</u> Strong oxidizers _____ <u>First Aid:</u> Eye: Irrigate immediately _____ Skin: Soap wash immediately _____ Breathing: Respiratory support _____ Swallow: Medical attention immediately _____				
Checked by: Cindy Sundquist					Date: 7/24/23									

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Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

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NA = Not Applicable/Not Available

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Ing = Ingestion

Inh = Inhalation
Con = Skin and/or Eye contact

DSEN = Dermal Sensitizer

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET Chemical Name: Trichloroethene CAS Number: 79-01-6 Synonyms: Ethylene trichloride, TCE, Trichloroethylene, Trilene					HEALTH HAZARD DATA												
					Color: <u>Colorless</u> Physical State: Solid _____ Liquid <u> X </u> Gas _____ Odor: <u>Chloroform-like</u> Odor Threshold: <u>82 ppm</u> Vapor Density: <u>4.5 g/L</u> Vapor Pressure: <u>56 mmHg</u> Ionization Potential (IP): <u>9.45 eV</u> IDLH: <u>1000 ppm</u> Routes of Entry: <u>Inh, Ing, Con, Ab:</u>					Carcinogen: OSHA _____ IARC <u> X </u> NTP <u> X </u> ACGIH <u> X </u> NIOSH <u> X </u> Skin absorbable: yes _____ no <u> X </u> Skin corrosive: yes _____ no <u> X </u> Signs/Symptoms of Acute Exposure: <u>Irritant to eyes and skin, headache</u> <u>nausea, vomiting, dermatitis, vertigo,</u> <u>visual disturbance, fatigue, giddiness,</u> <u>sleepiness</u>					Source		TWA (units)
										OSHA PELs		100 ppm				200 ppm	
										ACGIH TLVs		10 ppm		25 ppm			
										NIOSH RELs		25 ppm					
AIR MONITORING					PERSONAL PROTECTIVE EQUIPMENT					FIRE/REACTIVITY DATA							
Type		Brand/Model No.	Calibrations Method/Media	Response or Conversion Factor	Meter Specific Action Level	<u>Recommended Protective Clothing Materials:</u> Suits <u>Viton, PE/EVAL, Tychem,</u> <u>Barricade, Trelchem,</u> <u>Teflon, Responder</u> Gloves <u>Viton, Teflon</u> <u>Polyvinyl alcohol (do not</u> <u>use in water)</u> _____ _____ _____ Service Limit Concentration (ppm): <u>450</u> MUC 1/2 Mask APR = TWA x 10 = <u>90 ppm</u> *MUC Full-Face APR = TWA x 50 = <u>450 ppm</u> *Only with quantitative fit testing					Flash Point: <u>Unknown</u> LEL/UEL: <u>8% / 10.5%</u> <u>Fire Extinguishing Media:</u> Alcohol resistant Dry Chemical <u> X </u> Foam <u> X </u> Water Spray <u> X </u> CO ₂ <u> X </u> _____ <u>sodium, magnesium, titanium, and beryllium)</u>						
PID		10.6eV	Isobutylene 100 ppm	0.54	9 ppm												
Detector Tube		Drager 6828541	2 - 50 ppm		5 ppm												
Checked by: Cindy Sundquist					Date: 7/24/23												

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Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

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NA = Not Applicable/Not Available

Abs = Skin Absorption
Ing = Ingestion

Inh = Inhalation
Con = Skin and/or Eye contact

DSEN = Dermal Sensitizer

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET Chemical Name: <u>Vinyl Chloride</u> CAS Number: <u>75-01-4</u> Synonyms: <u>Chloroethene, chloroethylene,</u> <u>ethylene monochloride, VC,</u> <u>monochloroethene</u>					HEALTH HAZARD DATA															
					Color: <u>Colorless</u> Physical State: Solid _____ Liquid <u>X</u> below 7° F Gas <u>X</u> Odor: <u>pleasant</u> Odor Threshold: <u>10-20 ppm</u> Vapor Density: <u>2.15 g/L</u> Vapor Pressure: <u>3.3 atm</u> Ionization Potential (IP): <u>9.99 eV</u> IDLH: <u>Not Determined</u> Routes of Entry: <u>Inh, Con</u>					Carcinogen: OSHA <u>X</u> IARC <u>X</u> NTP <u>X</u> ACGIH <u>X</u> NIOSH <u>X</u> Skin absorbable: yes ____ no <u>X</u> Skin corrosive: yes ____ no <u>X</u> Signs/Symptoms of Acute Exposure: <u>Weakness, abdominal pain, frostbite</u> <u>palleness or blueness of extremities</u> _____ _____					Source OSHA PELs ACGIH TLVs NIOSH RELs		TWA (units) 1.0 ppm 1.0 ppm Lowest Feasible		STEL (units) C (units) 5.0 ppm	
AIR MONITORING					PERSONAL PROTECTIVE EQUIPMENT					FIRE/REACTIVITY DATA										
Type		Brand/Model No.		Calibrations Method/Media		Response or Conversion Factor		Meter Specific Action Level		<u>Recommended Protective Clothing Materials:</u> Suits <u>Tychem, Teflon</u> _____ _____ Gloves <u>Teflon, Tychem</u> <u>Nitrile Rubber</u> _____ Boots <u>Nitrile Rubber, Teflon</u> _____ _____ _____ MUC 1/2 Mask APR = TWA x 10 = <u>N/A*</u> *MUC Full-Face APR = TWA x 50 = <u>N/A*</u> *Only with quantitative fit testing					Flash Point: <u>NA</u> LEL/UEL: <u>3.6% / 33%</u> <u>Fire Extinguishing Media:</u> Dry Chemical <u>X</u> Foam <u>X</u> Water Spray <u>X</u> CO ₂ <u>X</u> <u>Incompatibilities:</u> <u>Copper, oxidizers, aluminum,</u> <u>peroxides, iron, steel [Note: Polymerizes in air, sunlight,</u> <u>or heat unless stabilized by inhibitors such as phenol.</u> <u>Attacks iron & steel in presence of moisture.]</u> _____ <u>First Aid:</u> <u>Eye:Frostbite (Gas)</u> <u>Skin:Frostbite (Gas)</u> <u>Breathing:Respiratory support</u>					
PID		10.6eV		Isobutylene 100 ppm		2		0.5 ppm*												
Detector Tube		Drager 6728061		0.5 - 3 ppm				0.5 ppm*												
								*Level B only												
Checked by: Cindy Sundquist										Date: 7/24/23										

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Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

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 Con = Skin and/or Eye contact

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Safety Data Sheets (SDS)



SAFETY DATA SHEET

US OSHA Hazard Communication Standard (29 CFR 1910.1200) and Canada WHMIS 2015 which includes the amended Hazardous Products Act (HPA) and the Hazardous Products Regulation (HPR)

Issuing Date 15-Aug-2023

Revision Date 15-Aug-2023

Revision Number 1

1. Identification

Product identifier

Product Name Alconox

Other means of identification

Product Code(s) 1101, 1103, 1104, 1104-1, 1112, 1112-1, 1125, 1150

Synonyms None

Recommended use of the chemical and restrictions on use

Recommended use Cleaning agent; Detergent

Restrictions on use Do not mix with other detergents unless otherwise specified

Details of the supplier of the safety data sheet

Supplier Address

Alconox, LLC
30 Glenn St., Suite 309
White Plains, NY 10603 USA
914-948-4040

E-mail cleaning@alconox.com

Emergency telephone number

Emergency telephone ChemTel Inc.: North America: 1-888-255-3924
International: +1-813-248-0573

2. Hazard(s) identification

Classification

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A

Label elements

Warning

Hazard statements

Harmful if swallowed.
Causes skin irritation.
Causes serious eye irritation.

**Precautionary Statements - Prevention**

Wash face, hands and any exposed skin thoroughly after handling.

Do not eat, drink or smoke when using this product.

Wear protective gloves, eye protection and face protection.

Precautionary Statements - Response

Specific treatment (see information on this label).

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice and attention.

Skin

IF ON SKIN: Wash with plenty of water and soap.

If skin irritation occurs: Get medical advice and attention.

Take off contaminated clothing and wash it before reuse.

Ingestion

IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.

Rinse mouth.

Precautionary Statements - Disposal

Dispose of contents and container to an approved waste disposal plant.

Unknown acute toxicity**Other information**

May be harmful in contact with skin. Harmful to aquatic life with long lasting effects.

3. Composition/information on ingredients

Substance

Not applicable.

Mixture

Chemical name	CAS No.	Weight-%	Hazardous Material Information Review Act registry number (HMIRA registry #)	Date HMIRA filed and date exemption granted (if applicable)
Benzenesulfonic acid, mono-C10-16-alkyl derivs., sodium salts	68081-81-2	10-30	-	-
Sodium carbonate	497-19-8	7-13	-	-
Sodium Dodecyl Sulphate	151-21-3	0.5-1.5	-	-
Tetrasodium EDTA	64-02-8	0.1-1	-	-

*The exact percentage (concentration) of composition has been withheld as a trade secret.

4. First-aid measures

Description of first aid measures**General advice**

Show this safety data sheet to the doctor in attendance.

Inhalation

Remove to fresh air. Get medical attention immediately if symptoms occur.

Eye contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

(M)SDS Number UL-NOX-003

	Remove contact lenses, if present and easy to do. Continue rinsing. Keep eye wide open while rinsing. Do not rub affected area. Get medical attention if irritation develops and persists.
Skin contact	Wash off immediately with soap and plenty of water for at least 15 minutes. Get medical attention if irritation develops and persists.
Ingestion	Do NOT induce vomiting. Rinse mouth. Never give anything by mouth to an unconscious person. Call a physician.
Self-protection of the first aider	Avoid contact with skin, eyes or clothing. Wear personal protective clothing (see section 8).

Most important symptoms and effects, both acute and delayed

Symptoms	May cause redness and tearing of the eyes. Burning sensation.
Effects of Exposure	No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.

5. Fire-fighting measures

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	No information available.
Specific hazards arising from the chemical	No information available.
Hazardous combustion products	Sodium oxides, Carbon oxides, Sulfur oxides, Phosphorus oxides, Nitrogen oxides (NOx).
Explosion data	
Sensitivity to mechanical impact	None.
Sensitivity to static discharge	None.
Special protective equipment and precautions for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Personal precautions	Avoid contact with skin, eyes or clothing. Ensure adequate ventilation. Use personal protective equipment as required.
Other information	Refer to protective measures listed in Sections 7 and 8.

Methods and material for containment and cleaning up

Methods for containment	Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	Pick up and transfer to properly labeled containers.
Prevention of secondary hazards	Clean contaminated objects and areas thoroughly observing environmental regulations.

7. Handling and storage

Precautions for safe handling

Advice on safe handling	Avoid breathing dust. Handle in accordance with good industrial hygiene and safety

(M)SDS Number UL-NOX-003

practice. Avoid contact with skin, eyes or clothing. Do not eat, drink or smoke when using this product. Take off contaminated clothing and wash before reuse.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a dry, cool and well-ventilated place. Keep out of the reach of children.

8. Exposure controls/personal protection

Control parameters

Exposure Limits This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering controls Showers
Eyewash stations
Ventilation systems.

Individual protection measures, such as personal protective equipment

Eye/face protection If splashes are likely to occur, wear safety glasses with side-shields.

Hand protection Wear nitrile or rubber gloves. Wear suitable gloves. Impervious gloves.

Skin and body protection Wear suitable protective clothing. Long sleeved clothing.

Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

General hygiene considerations Avoid breathing dust. Wear suitable gloves and eye/face protection. Do not eat, drink or smoke when using this product. Avoid contact with skin, eyes or clothing.

9. Physical and chemical properties

Information on basic physical and chemical properties

Appearance	Off-white powder
Physical state	Solid
Color	Off-white
Odor	No information available
Odor threshold	No information available

<u>Property</u>	<u>Values</u>	<u>Remarks • Method</u>
pH	9.5 (1% Solution)	No data available
Melting point / freezing point		No data available
Initial boiling point and boiling range		No data available
Flash point		No data available
Evaporation rate		No data available
Flammability		No data available
Flammability Limit in Air		
Upper flammability or explosive limits		No data available
Lower flammability or explosive limits		No data available
Vapor pressure		No data available
Relative vapor density		No data available
Relative density		No data available
Water solubility		No data available

(M)SDS Number UL-NOX-003

Solubility(ies)	No data available
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Kinematic viscosity	No data available
Dynamic viscosity	No data available

Other information

Explosive properties	No information available.
Oxidizing properties	No information available.
Softening point	No information available
Molecular weight	No information available
VOC content	0 %
Liquid Density	No information available
Bulk density	No information available

10. Stability and reactivity

Reactivity	None under normal use conditions.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	None under normal processing.
Conditions to avoid	None known based on information supplied.
Incompatible materials	Strong acids, Strong bases, Strong oxidizing agents.
Hazardous decomposition products	None known based on information supplied.

11. Toxicological information

Information on likely routes of exposure

Product Information

Inhalation	Specific test data for the substance or mixture is not available. May cause irritation of respiratory tract.
Eye contact	Specific test data for the substance or mixture is not available. Causes serious eye irritation. (based on components). May cause redness, itching, and pain.
Skin contact	Specific test data for the substance or mixture is not available. Causes skin irritation. (based on components).
Ingestion	Specific test data for the substance or mixture is not available. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Harmful if swallowed. (based on components).

Symptoms related to the physical, chemical and toxicological characteristics

Symptoms	Redness. May cause redness and tearing of the eyes.

<u>Acute toxicity</u>	Harmful if swallowed.

Numerical measures of toxicity

The following values are calculated based on chapter 3.1 of the GHS document:

ATEmix (oral)	1,962.10 mg/kg
ATEmix (dermal)	2,660.40 mg/kg
ATEmix (inhalation-dust/mist)	6.95 mg/l

Unknown acute toxicity

(M)SDS Number UL-NOX-003

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Sodium carbonate	= 4090 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 2300 mg/m ³ (Rat) 2 h
Sodium Dodecyl Sulphate	= 1288 mg/kg (Rat)	= 200 mg/kg (Rabbit)	> 3900 mg/m ³ (Rat) 1 h
Tetrasodium EDTA	= 1658 mg/kg (Rat)	-	-

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation	Classification based on data available for ingredients. Causes skin irritation.
Serious eye damage/eye irritation	Classification based on data available for ingredients. Causes serious eye irritation.
Respiratory or skin sensitization	No information available.
Germ cell mutagenicity	No information available.
Carcinogenicity	No information available.
Reproductive toxicity	No information available.
STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	No information available.

12. Ecological information

Ecotoxicity	Harmful to aquatic life with long lasting effects.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Sodium carbonate 497-19-8	-	LC50: =300mg/L (96h, <i>Lepomis macrochirus</i>) LC50: 310 - 1220mg/L (96h, <i>Pimephales promelas</i>)	-	EC50: =265mg/L (48h, <i>Daphnia magna</i>)
Sodium Dodecyl Sulphate 151-21-3	EC50: =53mg/L (72h, <i>Desmodesmus subspicatus</i>) EC50: 30 - 100mg/L (96h, <i>Desmodesmus subspicatus</i>) EC50: =117mg/L (96h, <i>Pseudokirchneriella subcapitata</i>) EC50: 3.59 - 15.6mg/L (96h, <i>Pseudokirchneriella subcapitata</i>)	LC50: 15 - 18.9mg/L (96h, <i>Pimephales promelas</i>) LC50: 8 - 12.5mg/L (96h, <i>Pimephales promelas</i>) LC50: 22.1 - 22.8mg/L (96h, <i>Pimephales promelas</i>) LC50: 4.3 - 8.5mg/L (96h, <i>Oncorhynchus mykiss</i>) LC50: =4.62mg/L (96h, <i>Oncorhynchus mykiss</i>) LC50: =4.2mg/L (96h, <i>Oncorhynchus mykiss</i>) LC50: =7.97mg/L (96h, <i>Brachydanio rerio</i>) LC50: 9.9 - 20.1mg/L (96h, <i>Brachydanio rerio</i>) LC50: 4.06 - 5.75mg/L	-	EC50: =1.8mg/L (48h, <i>Daphnia magna</i>)

		(96h, Lepomis macrochirus) LC50: 4.2 - 4.8mg/L (96h, Lepomis macrochirus) LC50: =4.5mg/L (96h, Lepomis macrochirus) LC50: 5.8 - 7.5mg/L (96h, Pimephales promelas) LC50: 10.2 - 22.5mg/L (96h, Pimephales promelas) LC50: 6.2 - 9.6mg/L (96h, Pimephales promelas) LC50: 13.5 - 18.3mg/L (96h, Poecilia reticulata) LC50: 10.8 - 16.6mg/L (96h, Poecilia reticulata) LC50: =1.31mg/L (96h, Cyprinus carpio)		
Tetrasodium EDTA 64-02-8	-	LC50: =41mg/L (96h, Lepomis macrochirus) LC50: =59.8mg/L (96h, Pimephales promelas)	-	-

Persistence and degradability No information available.

Bioaccumulation

Component Information

Chemical name	Partition coefficient
Sodium Dodecyl Sulphate 151-21-3	1.6

Other adverse effects No information available.

13. Disposal considerations

Disposal methods

Waste from residues/unused products	Dispose of in accordance with local regulations, Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.
California waste information	This product contains one or more substances that are listed with the State of California as a hazardous waste.

14. Transport information

<u>DOT</u>	Not regulated
<u>TDG</u>	Not regulated
<u>IATA</u>	Not regulated
<u>IMDG</u>	Not regulated

15. Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

International Inventories

Contact supplier for inventory compliance status

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Chemical name	New Jersey	Massachusetts	Pennsylvania
Pentasodium Triphosphate 7758-29-4	-	X	X
Tetrasodium pyrophosphate 7722-88-5	X	X	X

U.S. EPA Label Information

EPA Pesticide Registration Number Not applicable

16. Other information

NFPA	Health hazards 2	Flammability 0	Instability 0	Special hazards -
HMIS	Health hazards 2	Flammability 0	Physical hazards 0	Personal protection X

(M)SDS Number UL-NOX-003

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend

SVHC: Substances of Very High Concern for Authorization:
PBT: Persistent, Bioaccumulative, and Toxic (PBT) Substances
vPvB: Very Persistent and very Bioaccumulative (vPvB) Substances
STOT: Specific Target Organ Toxicity
ATE: Acute Toxicity Estimate
LC50: 50% Lethal Concentration
LD50: 50% Lethal Dose

Legend Section 8: Exposure controls/personal protection

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	Sk*	Skin designation
+	Sensitizers		

Key literature references and sources for data used to compile the SDS

U.S. Environmental Protection Agency ChemView Database
European Food Safety Authority (EFSA)
Environmental Protection Agency
Acute Exposure Guideline Level(s) (AELG(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australia National Industrial Chemicals Notification and Assessment Scheme (NICNAS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
U.S. National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
World Health Organization

Issuing Date	15-Aug-2023
Revision Date	15-Aug-2023
Revision Note	Initial Release.

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 Safety Data Sheet

Safety Data Sheet

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Printing date: June 25, 2018

Revision: June 25, 2018

1 Identification

- **Product identifier**
- **Trade name:** Buffer Solution pH 7.00
- **Product code:** BU5007SS
- **Recommended use and restriction on use**
- **Recommended use:**
Laboratory chemicals
Industrial uses.
- **Restrictions on use:** No relevant information available.
- **Details of the supplier of the Safety Data Sheet**
- **Manufacturer/Supplier:**
AquaPhoenix Scientific, Inc.
860 Gitts Run Road
Hanover, PA 17331
Phone: (717)632-1291
Toll-Free: (866)632-1291
info@aquaphoenixsci.com
- **Emergency telephone number:**
ChemTel Inc.
(800)255-3924 (North America)
+1 (813)248-0585 (International)

2 Hazard(s) identification

- **Classification of the substance or mixture**
The product is not classified as hazardous according to the Globally Harmonized System (GHS).
- **Label elements**
The product is not classified as hazardous according to OSHA GHS regulations within the United States.
- **GHS label elements** This product does not have a classification according to the GHS regulation.
- **Hazard pictograms:** Not regulated.
- **Signal word:** Not regulated.
- **Hazard statements:** Not regulated.
- **Other hazards** There are no other hazards not otherwise classified that have been identified.

3 Composition/information on ingredients

- **Chemical characterization:** Mixtures

Components:

7732-18-5	Water	>99%
1310-73-2	Sodium hydroxide	<0.25%
	 Met. Corr. 1, H290; Skin Corr. 1A, H314; Eye Dam. 1, H318	
6359-83-7	Disodium 2-[[4,5-dihydro-3-methyl-5-oxo-1-(4-sulphonatophenyl)-1H-pyrazol-4-yl]azo]benzoate	<0.25%
52-51-7	bronopol (INN)	<0.25%
	 Acute Tox. 3, H331	
	 Eye Dam. 1, H318	

(Cont'd. on page 2)

Safety Data Sheet

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Printing date: June 25, 2018

Revision: June 25, 2018

Trade name: Buffer Solution pH 7.00

(Cont'd. of page 1)

⚠ Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; STOT SE 3, H335

· **Additional information:**

For the wording of the listed Hazard Statements, refer to section 16.

For the listed ingredient(s), the identity and/or exact percentage(s) are being withheld as a trade secret.

4 First-aid measures

· **Description of first aid measures**

· **After inhalation:** Supply fresh air; consult doctor in case of complaints.

· **After skin contact:**

Rinse with warm water.

If skin irritation is experienced, consult a doctor.

· **After eye contact:**

Remove contact lenses if worn, if possible.

Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

· **After swallowing:**

Rinse out mouth and then drink plenty of water.

Do not induce vomiting; immediately call for medical help.

· **Most important symptoms and effects, both acute and delayed:**

Nausea in case of ingestion.

Gastric or intestinal disorders when ingested.

· **Indication of any immediate medical attention and special treatment needed:**

No relevant information available.

5 Fire-fighting measures

· **Extinguishing media**

· **Suitable extinguishing agents:**

The product is not flammable.

Use fire fighting measures that suit the environment.

· **For safety reasons unsuitable extinguishing agents:** None.

· **Special hazards arising from the substance or mixture**

Formation of toxic gases is possible during heating or in case of fire.

· **Advice for firefighters**

· **Protective equipment:**

Wear self-contained respiratory protective device.

Wear fully protective suit.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures**

Ensure adequate ventilation.

Use personal protective equipment as required.

· **Environmental precautions**

Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

· **Methods and material for containment and cleaning up**

(Cont'd. on page 3)

Safety Data Sheet

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Printing date: June 25, 2018

Revision: June 25, 2018

Trade name: Buffer Solution pH 7.00

(Cont'd. of page 2)

Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

Send for recovery or disposal in suitable receptacles.

· **Reference to other sections**

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

7 Handling and storage

· **Handling**

· **Precautions for safe handling:**

Avoid splashes or spray in enclosed areas.

Use only in well ventilated areas.

· **Information about protection against explosions and fires:** No special measures required.

· **Conditions for safe storage, including any incompatibilities**

· **Requirements to be met by storerooms and receptacles:**

Use only receptacles specifically permitted for this substance/product.

Store in cool, dry conditions in well sealed receptacles.

· **Information about storage in one common storage facility:** Store away from foodstuffs.

· **Specific end use(s)** No relevant information available.

8 Exposure controls/personal protection

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**

1310-73-2 Sodium hydroxide

PEL (USA)	Long-term value: 2 mg/m ³
REL (USA)	Ceiling limit value: 2 mg/m ³
TLV (USA)	Ceiling limit value: 2 mg/m ³
EL (Canada)	Ceiling limit value: 2 mg/m ³
EV (Canada)	Ceiling limit value: 2 mg/m ³
LMPE (Mexico)	Ceiling limit value: 2 mg/m ³

· **Exposure controls**

· **General protective and hygienic measures:**

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Immediately remove all soiled and contaminated clothing.

Wash hands before breaks and at the end of work.

Avoid contact with the eyes and skin.

Avoid breathing mist, vapors, or spray.

· **Engineering controls:** Provide adequate ventilation.

· **Breathing equipment:**

Not required under normal conditions of use.

For spills, respiratory protection may be advisable.

· **Protection of hands:** Gloves are advised for repeated or prolonged contact.

(Cont'd. on page 4)

Safety Data Sheet

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Printing date: June 25, 2018

Revision: June 25, 2018

Trade name: Buffer Solution pH 7.00

(Cont'd. of page 3)

· Eye protection:



Safety glasses

Follow relevant national guidelines concerning the use of protective eyewear.

· **Body protection:** Protection may be required for spills.· **Limitation and supervision of exposure into the environment**

No relevant information available.

· **Risk management measures** No relevant information available.

9 Physical and chemical properties

· Information on basic physical and chemical properties

· Appearance:

Form: Liquid

Color: Red

· Odor: Odorless

· Odor threshold: Not determined.

· pH-value at 20 °C (68 °F): 7.00

· Melting point/Melting range: Not determined.

· Boiling point/Boiling range: 100-101 °C (212-213.8 °F)

· Flash point: Not applicable.

· Flammability (solid, gaseous): Not applicable.

· Auto-ignition temperature: Not determined.

· Decomposition temperature: Not determined.

· Danger of explosion: Product does not present an explosion hazard.

· Explosion limits

Lower: Not determined.

Upper: Not determined.

· Oxidizing properties: Non-oxidizing.

· Vapor pressure at 20 °C (68 °F): 23 hPa (17.3 mm Hg)

· Density:

Relative density: Not determined.

Vapor density: Not determined.

Evaporation rate: Not determined.

· Solubility in / Miscibility with

Water: Soluble.

· Partition coefficient (n-octanol/water): Not determined.

· Viscosity

Dynamic: Not determined.

Kinematic: Not determined.

(Cont'd. on page 5)

Safety Data Sheet

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Printing date: June 25, 2018

Revision: June 25, 2018

Trade name: Buffer Solution pH 7.00

(Cont'd. of page 4)

· **Other information**

No relevant information available.

10 Stability and reactivity

- **Reactivity:** No relevant information available.
- **Chemical stability:**
- **Thermal decomposition / conditions to be avoided:**
No decomposition if used and stored according to specifications.
- **Possibility of hazardous reactions**
Toxic fumes may be released if heated above the decomposition point.
- **Conditions to avoid** No relevant information available.
- **Incompatible materials** No relevant information available.
- **Hazardous decomposition products** Carbon monoxide and carbon dioxide

11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:** Based on available data, the classification criteria are not met.
- **LD/LC50 values that are relevant for classification:** None.
- **Primary irritant effect:**
- **On the skin:** Based on available data, the classification criteria are not met.
- **On the eye:** Based on available data, the classification criteria are not met.
- **Sensitization:** No sensitizing effects known.

· **IARC (International Agency for Research on Cancer):**

None of the ingredients are listed.

· **NTP (National Toxicology Program):**

None of the ingredients are listed.

· **OSHA-Ca (Occupational Safety & Health Administration):**

None of the ingredients are listed.

· **Probable route(s) of exposure:**

Ingestion.
Inhalation.
Eye contact.
Skin contact.

- **Germ cell mutagenicity:** Based on available data, the classification criteria are not met.
- **Carcinogenicity:** Based on available data, the classification criteria are not met.
- **Reproductive toxicity:** Based on available data, the classification criteria are not met.
- **STOT-single exposure:** Based on available data, the classification criteria are not met.
- **STOT-repeated exposure:** Based on available data, the classification criteria are not met.
- **Aspiration hazard:** Based on available data, the classification criteria are not met.

12 Ecological information

· **Toxicity**

(Cont'd. on page 6)

Safety Data Sheet

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Printing date: June 25, 2018

Revision: June 25, 2018

Trade name: Buffer Solution pH 7.00

(Cont'd. of page 5)

- **Aquatic toxicity** No relevant information available.
- **Persistence and degradability** No relevant information available.
- **Bioaccumulative potential:** No relevant information available.
- **Mobility in soil:** No relevant information available.
- **Additional ecological information**
- **General notes:**
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Other adverse effects** No relevant information available.

13 Disposal considerations

- **Waste treatment methods**
- **Recommendation:**
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.
- **Uncleaned packagings**
- **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· UN-Number	
· DOT, ADR, IMDG, IATA	Not regulated.
· UN proper shipping name	
· DOT, ADR, IMDG, IATA	Not regulated.
· Transport hazard class(es)	
· DOT, ADR, IMDG, IATA	
· Class	Not regulated.
· Packing group	
· DOT, ADR, IMDG, IATA	Not regulated.
· Environmental hazards	
· Marine pollutant:	No
· Special precautions for user	Not applicable.
· Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.

(Cont'd. on page 7)

Safety Data Sheet

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Printing date: June 25, 2018

Revision: June 25, 2018

Trade name: Buffer Solution pH 7.00

(Cont'd. of page 6)

15 Regulatory information

- **Safety, health and environmental regulations/legislation specific for the substance or mixture**
- **United States (USA)**
- **SARA**

· **Section 302 (extremely hazardous substances):**

None of the ingredients are listed.

· **Section 355 (extremely hazardous substances):**

None of the ingredients are listed.

· **Section 313 (Specific toxic chemical listings):**

None of the ingredients are listed.

· **TSCA (Toxic Substances Control Act)**

All ingredients are listed.

· **Proposition 65 (California)**

· **Chemicals known to cause cancer:**

None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity for females:**

None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity for males:**

None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity:**

None of the ingredients are listed.

· **EPA (Environmental Protection Agency):**

None of the ingredients are listed.

· **IARC (International Agency for Research on Cancer):**

None of the ingredients are listed.

· **Canadian Domestic Substances List (DSL) (Substances not listed.):**

All ingredients are listed.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Abbreviations and acronyms:**

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

CAS: Chemical Abstracts Service (division of the American Chemical Society)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

PBT: Persistent, Bio-accumulable, Toxic

vPvB: very Persistent and very Bioaccumulative

(Cont'd. on page 8)

Safety Data Sheet

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Printing date: June 25, 2018

Revision: June 25, 2018

Trade name: Buffer Solution pH 7.00

(Cont'd. of page 7)

OSHA: Occupational Safety & Health Administration

Met. Corr. 1: Corrosive to metals – Category 1

Acute Tox. 4: Acute toxicity – Category 4

Acute Tox. 3: Acute toxicity – Category 3

Skin Corr. 1A: Skin corrosion/irritation – Category 1A

Skin Irrit. 2: Skin corrosion/irritation – Category 2

Eye Dam. 1: Serious eye damage/eye irritation – Category 1

STOT SE 3: Specific target organ toxicity (single exposure) – Category 3

· Sources

Website, European Chemicals Agency (echa.europa.eu)

Website, US EPA Substance Registry Services (ofmpub.epa.gov/sor internet/registry/substreg/home/overview/home.do)

Website, Chemical Abstracts Registry, American Chemical Society (www.cas.org)

Patty's Industrial Hygiene, 6th ed., Rose, Vernon, ed. ISBN: 978-0-470-07488-6

Casarett and Doull's Toxicology: The Basic Science of Poisons, 8th Ed., Klaasen, Curtis D., ed., ISBN: 978-0-07-176923-5.

Safety Data Sheets, Individual Manufacturers

SDS Prepared by:

ChemTel Inc.

1305 North Florida Avenue

Tampa, Florida USA 33602-2902

Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573

Website: www.chemtelinc.com

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: February 11, 2021

1 Identification

- **Product identifier**
- **Trade name:** Buffer Solution pH 4.00
- **Product code:** BU5004SS
- **Recommended use and restriction on use**
- **Recommended use:** Laboratory chemicals
- **Restrictions on use:** No relevant information available.
- **Details of the supplier of the Safety Data Sheet**
- **Manufacturer/Supplier:**
AquaPhoenix Scientific, Inc.
860 Gitts Run Road
Hanover, PA 17331 USA
Tel +1 (717)632-1291
Toll-Free: (866)632-1291
info@aquaphoenixsci.com
- **Distributor:**
AquaPhoenix Scientific
860 Gitts Run Road,
Hanover, PA 17331
(717) 632-1291
- **Emergency telephone number:**
ChemTel Inc.
(800)255-3924 (North America)
+1 (813)248-0585 (International)

2 Hazard(s) identification

- **Classification of the substance or mixture**
The product is not classified as hazardous according to the Globally Harmonized System (GHS).
- **Label elements**
- **GHS label elements** Not regulated.
- **Hazard pictograms:** Not regulated.
- **Signal word:** Not regulated.
- **Hazard statements:** Not regulated.
- **Other hazards** There are no other hazards not otherwise classified that have been identified.

3 Composition/information on ingredients

- **Chemical characterization:** Mixtures

· Components:

7732-18-5	Water	>98%
877-24-7	potassium hydrogen phthalate	1.01%
110-44-1	hexa-2,4-dienoic acid	<0.1%
	⚠ Skin Irrit. 2, H315; Eye Irrit. 2A, H319; STOT SE 3, H335	
6625-46-3	2,7-Naphthalenedisulfonic acid, 5-(acetylamino)-4-hydroxy-3-[(2-methoxyphenyl)azo]-, disodium salt	<0.1%

(Cont'd. on page 2)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: February 11, 2021

Trade name: Buffer Solution pH 4.00

(Cont'd. of page 1)

· Additional information:

For the wording of the listed Hazard Statements, refer to section 16.

For the listed ingredient(s), the identity and/or exact percentage(s) are being withheld as a trade secret.

4 First-aid measures

· Description of first aid measures**· After inhalation:** Supply fresh air; consult doctor in case of complaints.**· After skin contact:**

Rinse with warm water.

If skin irritation is experienced, consult a doctor.

· After eye contact:

Remove contact lenses if worn, if possible.

Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

· After swallowing:

Rinse out mouth and then drink plenty of water.

Do not induce vomiting; immediately call for medical help.

· Most important symptoms and effects, both acute and delayed:

Nausea in case of ingestion.

Gastric or intestinal disorders when ingested.

· Danger: No relevant information available.**· Indication of any immediate medical attention and special treatment needed:**

No relevant information available.

5 Fire-fighting measures

· Extinguishing media**· Suitable extinguishing agents:**

The product is not flammable.

Use fire fighting measures that suit the environment.

· For safety reasons unsuitable extinguishing agents: None.**· Special hazards arising from the substance or mixture**

Formation of toxic gases is possible during heating or in case of fire.

· Advice for firefighters**· Protective equipment:**

Wear self-contained respiratory protective device.

Wear fully protective suit.

6 Accidental release measures

· Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation.

Use personal protective equipment as required.

· Environmental precautions

Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

· Methods and material for containment and cleaning up

(Cont'd. on page 3)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: February 11, 2021

Trade name: Buffer Solution pH 4.00

(Cont'd. of page 2)

Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

Send for recovery or disposal in suitable receptacles.

· **Reference to other sections**

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

7 Handling and storage

· **Handling**

· **Precautions for safe handling:**

Avoid splashes or spray in enclosed areas.

Use only in well ventilated areas.

· **Information about protection against explosions and fires:** No special measures required.

· **Conditions for safe storage, including any incompatibilities**

· **Requirements to be met by storerooms and receptacles:**

Store only in the original receptacle.

Unsuitable material for receptacle: aluminium.

Store in cool, dry conditions in well sealed receptacles.

· **Information about storage in one common storage facility:**

Store away from foodstuffs.

Store away from metals.

Store away from oxidizing agents.

Do not store together with alkalis (caustic solutions).

· **Specific end use(s)** No relevant information available.

8 Exposure controls/personal protection

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**

The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

· **Exposure controls**

· **General protective and hygienic measures:**

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Immediately remove all soiled and contaminated clothing.

Wash hands before breaks and at the end of work.

Avoid contact with the eyes and skin.

Avoid breathing mist, vapors, or spray.

· **Engineering controls:** Provide adequate ventilation.

· **Breathing equipment:**

Not required under normal conditions of use.

For spills, respiratory protection may be advisable.

· **Protection of hands:**

(Cont'd. on page 4)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: February 11, 2021

Trade name: Buffer Solution pH 4.00

(Cont'd. of page 3)



Protective gloves

· **Material of gloves**

- Butyl rubber, BR
- Fluorocarbon rubber (Viton)
- Laminated film gloves.
- Natural rubber, NR
- Neoprene gloves
- Sensibilization by the components in the glove materials is possible.

· **Eye protection:**



Safety glasses

Follow relevant national guidelines concerning the use of protective eyewear.

- **Body protection:** Protection may be required for spills.
- **Limitation and supervision of exposure into the environment**
No relevant information available.
- **Risk management measures** No relevant information available.

9 Physical and chemical properties

· **Information on basic physical and chemical properties**

· **Appearance:**

Form: Liquid

Color: Red

· **Odor:** Odorless

· **Odor threshold:** Not determined.

· **pH-value at 20 °C (68 °F):** 4.00

· **Melting point/Melting range:** Not determined.

· **Boiling point/Boiling range:** 100-101 °C (212-149.8 °F)

· **Flash point:** Not applicable.

· **Flammability (solid, gaseous):** Not applicable.

· **Auto-ignition temperature:** Not determined.

· **Decomposition temperature:** Not determined.

· **Danger of explosion:** Product does not present an explosion hazard.

· **Explosion limits**

Lower: Not determined.

Upper: Not determined.

· **Oxidizing properties:** Non-oxidizing.

· **Vapor pressure at 20 °C (68 °F):** 23 hPa (17.3 mm Hg)

· **Density:**

(Cont'd. on page 5)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: February 11, 2021

Trade name: Buffer Solution pH 4.00

(Cont'd. of page 4)

Relative density:	Not determined.
Vapor density:	Not determined.
Evaporation rate:	Not determined.

· Solubility in / Miscibility with Water:	Soluble.

· Partition coefficient (n-octanol/water):	Not determined.

· Viscosity	
Dynamic:	Not determined.
Kinematic:	Not determined.
· Other information	No relevant information available.

10 Stability and reactivity

- **Reactivity:** No relevant information available.
- **Chemical stability:**
- **Thermal decomposition / conditions to be avoided:**
No decomposition if used and stored according to specifications.
- **Possibility of hazardous reactions**
Toxic fumes may be released if heated above the decomposition point.
Reacts with alkali (lyes).
- **Conditions to avoid** Store away from oxidizing agents.
- **Incompatible materials** No relevant information available.
- **Hazardous decomposition products** Carbon monoxide and carbon dioxide

11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:** Based on available data, the classification criteria are not met.
- **LD/LC50 values that are relevant for classification:** None.
- **Primary irritant effect:**
- **On the skin:** Based on available data, the classification criteria are not met.
- **On the eye:** Based on available data, the classification criteria are not met.
- **Sensitization:** No sensitizing effects known.

· IARC (International Agency for Research on Cancer):

None of the ingredients are listed.

· NTP (National Toxicology Program):

None of the ingredients are listed.

· OSHA-Ca (Occupational Safety & Health Administration):

None of the ingredients are listed.

· Probable route(s) of exposure:

Ingestion.
Inhalation.
Eye contact.

(Cont'd. on page 6)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: February 11, 2021

Trade name: Buffer Solution pH 4.00

(Cont'd. of page 5)

Skin contact.

- **Germ cell mutagenicity:** Based on available data, the classification criteria are not met.
- **Carcinogenicity:** Based on available data, the classification criteria are not met.
- **Reproductive toxicity:** Based on available data, the classification criteria are not met.
- **STOT-single exposure:** Based on available data, the classification criteria are not met.
- **STOT-repeated exposure:** Based on available data, the classification criteria are not met.
- **Aspiration hazard:** Based on available data, the classification criteria are not met.

12 Ecological information

- **Toxicity**
- **Aquatic toxicity** No relevant information available.
- **Persistence and degradability** No relevant information available.
- **Bioaccumulative potential:** No relevant information available.
- **Mobility in soil:** No relevant information available.
- **Additional ecological information**
- **General notes:**
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
- **Other adverse effects** No relevant information available.

13 Disposal considerations

- **Waste treatment methods**
- **Recommendation:**
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.
- **Uncleaned packagings**
- **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· UN-Number	
· DOT, ADR/RID/ADN, IMDG, IATA	Not regulated.
· UN proper shipping name	
· DOT, ADR/RID/ADN, IMDG, IATA	Not regulated.
· Transport hazard class(es)	
· DOT, ADR/RID/ADN, IMDG, IATA	
· Class	Not regulated.
· Packing group	

(Cont'd. on page 7)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: February 11, 2021

Trade name: Buffer Solution pH 4.00

(Cont'd. of page 6)

· DOT, ADR/RID/ADN, IMDG, IATA	Not regulated.
· Environmental hazards	
· Marine pollutant:	No
· Special precautions for user	Not applicable.
· Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.

15 Regulatory information

- Safety, health and environmental regulations/legislation specific for the substance or mixture
- United States (USA)
- SARA

· Section 302 (extremely hazardous substances):

None of the ingredients are listed.

· Section 313 (Specific toxic chemical listings):

None of the ingredients are listed.

· TSCA (Toxic Substances Control Act)

877-24-7 potassium hydrogen phthalate

110-44-1 hexa-2,4-dienoic acid

6625-46-3 2,7-Naphthalenedisulfonic acid, 5-(acetylamino)-4-hydroxy-3-[(2-methoxyphenyl)azo]-, disodium salt

7732-18-5 Water

· Proposition 65 (California)

· Chemicals known to cause cancer:

None of the ingredients are listed.

· Chemicals known to cause developmental toxicity for females:

None of the ingredients are listed.

· Chemicals known to cause developmental toxicity for males:

None of the ingredients are listed.

· Chemicals known to cause developmental toxicity:

None of the ingredients are listed.

· EPA (Environmental Protection Agency):

None of the ingredients are listed.

· IARC (International Agency for Research on Cancer):

None of the ingredients are listed.

· Canadian Domestic Substances List (DSL):

None of the ingredients are listed.

(Cont'd. on page 8)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: February 11, 2021

Trade name: Buffer Solution pH 4.00

(Cont'd. of page 7)

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· Abbreviations and acronyms:

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

CAS: Chemical Abstracts Service (division of the American Chemical Society)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

OSHA: Occupational Safety & Health Administration

Skin Irrit. 2: Skin corrosion/irritation – Category 2

Eye Irrit. 2A: Serious eye damage/eye irritation – Category 2A

STOT SE 3: Specific target organ toxicity (single exposure) – Category 3

· Sources

Website, European Chemicals Agency (echa.europa.eu)

Website, US EPA Substance Registry Services (ofmpub.epa.gov/sorinternet/registry/substreg/home/overview/home.do)

Website, Chemical Abstracts Registry, American Chemical Society (www.cas.org)

Patty's Industrial Hygiene, 6th ed., Rose, Vernon, ed. ISBN: 978-0-470-07488-6

Casarett and Doull's Toxicology: The Basic Science of Poisons, 8th Ed., Klaassen, Curtis D., ed., ISBN: 978-0-07-176923-5.

Safety Data Sheets, Individual Manufacturers

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: June 05, 2020

1 Identification

- **Product identifier**
- **Trade name:** Conductivity Standard, 1413 µS/cm
- **Product code:** CS1413SS
- **Recommended use and restriction on use**
- **Recommended use:** Laboratory chemicals
- **Restrictions on use:** No relevant information available.
- **Details of the supplier of the Safety Data Sheet**
- **Manufacturer/Supplier:**
AquaPhoenix Scientific, Inc.
860 Gitts Run Road
Hanover, PA 17331 USA
Tel +1 (717)632-1291
Toll-Free: (866)632-1291
info@aquaphoenixsci.com
- **Distributor:**
AquaPhoenix Scientific
860 Gitts Run Road,
Hanover, PA 17331
(717) 632-1291
- **Emergency telephone number:**
ChemTel Inc.
(800)255-3924 (North America)
+1 (813)248-0585 (International)

2 Hazard(s) identification

- **Classification of the substance or mixture**
The product is not classified as hazardous according to the Globally Harmonized System (GHS).
- **Label elements**
- **GHS label elements:** Not regulated.
- **Hazard pictograms:** Not regulated.
- **Signal word:** Not regulated.
- **Hazard statements:** Not regulated.
- **Precautionary statements:** Not regulated.
- **Other hazards:** There are no other hazards not otherwise classified that have been identified.

3 Composition/information on ingredients

- **Chemical characterization:** Mixtures

- **Components:**

7732-18-5	Water		>99%
7447-40-7	Potassium chloride	Eye Irrit. 2B, H320	<1%

- **Additional information:**

For the listed ingredient(s), the identity and/or exact percentage(s) are being withheld as a trade secret.
For the wording of the listed Hazard Statements, refer to section 16.

(Cont'd. on page 2)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: June 05, 2020

Trade name: Conductivity Standard, 1413 µS/cm

(Cont'd. of page 1)

4 First-aid measures

- **Description of first aid measures**
- **General information:** No special measures required.
- **After inhalation:** Supply fresh air; consult doctor in case of complaints.
- **After skin contact:**
Rinse with warm water.
If skin irritation is experienced, consult a doctor.
- **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
- **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; immediately call for medical help.
- **Most important symptoms and effects, both acute and delayed:**
Gastric or intestinal disorders when ingested.
- **Danger:** No relevant information available.
- **Indication of any immediate medical attention and special treatment needed:**
No relevant information available.

5 Fire-fighting measures

- **Extinguishing media**
- **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
- **For safety reasons unsuitable extinguishing agents:** No relevant information available.
- **Special hazards arising from the substance or mixture**
Formation of toxic gases is possible during heating or in case of fire.
- **Advice for firefighters**
- **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.

6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures**
Ensure adequate ventilation.
- **Environmental precautions**
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
- **Methods and material for containment and cleaning up**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Clean the affected area carefully; suitable cleaners are:
Warm water
Dispose of the collected material according to regulations.
- **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.

(Cont'd. on page 3)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: June 05, 2020

Trade name: Conductivity Standard, 1413 µS/cm

See Section 13 for disposal information.

(Cont'd. of page 2)

7 Handling and storage

- **Handling**
- **Precautions for safe handling:** No special measures required.
- **Information about protection against explosions and fires:** No special measures required.
- **Conditions for safe storage, including any incompatibilities**
- **Requirements to be met by storerooms and receptacles:** No special requirements.
- **Information about storage in one common storage facility:** No relevant information available.
- **Further information about storage conditions:**
Keep containers tightly sealed.
Store in cool, dry conditions in well sealed receptacles.
- **Specific end use(s)** No relevant information available.

8 Exposure controls/personal protection

- **Control parameters**
 - **Components with limit values that require monitoring at the workplace:**
The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.
 - **Exposure controls**
 - **General protective and hygienic measures:**
The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
 - **Engineering controls:** Provide adequate ventilation.
 - **Breathing equipment:** Not required under normal conditions of use.
 - **Protection of hands:** Gloves not required under normal conditions of use.
 - **Material of gloves**
Butyl rubber, BR
Fluorocarbon rubber (Viton)
Neoprene gloves
Nitrile rubber, NBR
 - **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
 - **Eye protection:**
- 

Safety glasses
- Follow relevant national guidelines concerning the use of protective eyewear.
- **Body protection:** Protective work clothing
 - **Limitation and supervision of exposure into the environment** No special requirements.
 - **Risk management measures** No special requirements.

(Cont'd. on page 4)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: June 05, 2020

Trade name: Conductivity Standard, 1413 $\mu\text{S}/\text{cm}$

(Cont'd. of page 3)

9 Physical and chemical properties

· Information on basic physical and chemical properties

· Appearance:

Form: Liquid

Color: Clear

· Odor: Odorless

· Odor threshold: Not determined.

· pH-value: Not determined.

· Melting point/Melting range: Not determined.

· Boiling point/Boiling range: 105-110 °C (221-166 °F)

· Flash point: The product is not flammable.

· Flammability (solid, gaseous): Not applicable.

· Auto-ignition temperature: Not determined.

· Decomposition temperature: Not determined.

· Danger of explosion: Product does not present an explosion hazard.

· Explosion limits

Lower: Not determined.

Upper: Not determined.

· Oxidizing properties: Not determined.

· Vapor pressure at 20 °C (68 °F): 23 hPa (17.3 mm Hg)

· Density at 20 °C (68 °F): >1.01 g/cm³ (>8.43 lbs/gal)

· Relative density: Not determined.

· Vapor density: Not determined.

· Evaporation rate: Not determined.

· Solubility in / Miscibility with

Water: Fully miscible.

· Partition coefficient (n-octanol/water): Not determined.

· Viscosity

Dynamic: Not determined.

Kinematic: Not determined.

· Other information: No relevant information available.

10 Stability and reactivity

· **Reactivity:** No relevant information available.

· **Chemical stability:** Stable under normal temperatures and pressures.

· **Thermal decomposition / conditions to be avoided:**

No decomposition if used and stored according to specifications.

· **Possibility of hazardous reactions** No dangerous reactions known.

· **Conditions to avoid** Light, excess heat, dust generation, incompatible materials.

· **Incompatible materials** No relevant information available.

(Cont'd. on page 5)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: June 05, 2020

Trade name: Conductivity Standard, 1413 µS/cm

(Cont'd. of page 4)

· **Hazardous decomposition products**

Under fire conditions only:
Chlorine compounds

11 Toxicological information

· **Information on toxicological effects**

· **Acute toxicity:**

· **LD/LC50 values that are relevant for classification:** None.

· **Primary irritant effect:**

· **On the skin:** Based on available data, the classification criteria are not met.

· **On the eye:** Based on available data, the classification criteria are not met.

· **Sensitization:** Based on available data, the classification criteria are not met.

· **IARC (International Agency for Research on Cancer):**

None of the ingredients are listed.

· **NTP (National Toxicology Program):**

None of the ingredients are listed.

· **OSHA-Ca (Occupational Safety & Health Administration):**

None of the ingredients are listed.

· **Probable route(s) of exposure:**

Ingestion.

Inhalation.

Eye contact.

Skin contact.

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

· **Carcinogenicity:** Based on available data, the classification criteria are not met.

· **Reproductive toxicity:** Based on available data, the classification criteria are not met.

· **STOT-single exposure:** Based on available data, the classification criteria are not met.

· **STOT-repeated exposure:** Based on available data, the classification criteria are not met.

· **Aspiration hazard:** Based on available data, the classification criteria are not met.

12 Ecological information

· **Toxicity**

· **Aquatic toxicity** No relevant information available.

· **Persistence and degradability** No relevant information available.

· **Bioaccumulative potential:** No relevant information available.

· **Mobility in soil:** No relevant information available.

· **Additional ecological information**

· **General notes:** Generally not hazardous for water.

· **Other adverse effects** No relevant information available.

13 Disposal considerations

· **Waste treatment methods**

(Cont'd. on page 6)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: June 05, 2020

Trade name: Conductivity Standard, 1413 µS/cm

(Cont'd. of page 5)

· **Recommendation:**

Smaller quantities can be disposed of with household waste.

Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.

The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.

· **Uncleaned packagings**

· **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· **UN-Number**

· DOT, ADR/RID/ADN, IMDG, IATA

Not regulated.

· **UN proper shipping name**

· DOT, ADR/RID/ADN, IMDG, IATA

Not regulated.

· **Transport hazard class(es)**

· DOT, ADR/RID/ADN, IMDG, IATA

· Class

Not regulated.

· **Packing group**

· DOT, ADR/RID/ADN, IMDG, IATA

Not regulated.

· **Environmental hazards**

Not applicable.

· **Special precautions for user**

Not applicable.

· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**

Not applicable.

15 Regulatory information

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **United States (USA)**

· **SARA**

· **Section 302 (extremely hazardous substances):**

None of the ingredients are listed.

· **Section 313 (Specific toxic chemical listings):**

None of the ingredients are listed.

· **TSCA (Toxic Substances Control Act)**

7447-40-7 Potassium chloride

71-23-8 propan-1-ol

7732-18-5 Water

(Cont'd. on page 7)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: June 05, 2020

Trade name: Conductivity Standard, 1413 µS/cm

(Cont'd. of page 6)

· **Proposition 65 (California)**

· **Chemicals known to cause cancer:**

None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity for females:**

None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity for males:**

None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity:**

None of the ingredients are listed.

· **EPA (Environmental Protection Agency):**

None of the ingredients are listed.

· **IARC (International Agency for Research on Cancer):**

None of the ingredients are listed.

· **Canadian Domestic Substances List (DSL):**

None of the ingredients are listed.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Abbreviations and acronyms:**

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

CAS: Chemical Abstracts Service (division of the American Chemical Society)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

OSHA: Occupational Safety & Health Administration

Eye Irrit. 2B: Serious eye damage/eye irritation – Category 2B

· **Sources**

Website, European Chemicals Agency (echa.europa.eu)

Website, US EPA Substance Registry Services (ofmpub.epa.gov/sor internet/registry/substreg/home/overview/home.do)

Website, Chemical Abstracts Registry, American Chemical Society (www.cas.org)

Patty's Industrial Hygiene, 6th ed., Rose, Vernon, ed. ISBN: 978-0-470-07488-6

Casarett and Doull's Toxicology: The Basic Science of Poisons, 8th Ed., Klaassen, Curtis D., ed., ISBN: 978-0-07-176923-5.

Safety Data Sheets, Individual Manufacturers

SDS Prepared by:

ChemTel

1305 North Florida Avenue

Tampa, Florida USA 33602-2902

Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573

Website: www.chemtel.com

SAFETY DATA SHEET
EDS Substrate Shuttle™



Issue Date: 01/09/2026
Version 1.1
SDS # 34A

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name: EDS Substrate Shuttle™

Synonyms: Isopropanol, Isopropyl Alcohol, 2-Propanol, sec-propyl alcohol, dimethylcarbinol, Rubbing alcohol, IPA

Other means of identification: CAS# 67-63-0
EINECS# 200-661-7

Product Form: Liquid

1.2 Recommended use of the chemical and restrictions on use

Recommended Use: General use organic solvent; remediation of contaminated groundwater and soils.
Restrictions on Use: Use as recommended by the label

1.3 Details of the supplier and of the safety data sheet

Supplier: Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)
+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Hazard/Emergency Overview

Highly Flammable in the Liquid and Vapor Phase. Can Cause Severe Eye Irritation!

2.2 OSHA Hazards

Flammable Liquid, Target organ effect, Irritant

2.3 Target Organs

Cardiovascular system, gastrointestinal tract, kidney, liver, nerves

2.4 GHS label elements (including precautionary statements)



2.5 Signal Word**DANGER!****2.6 Hazard Statement(s)**

H225 Highly flammable liquid and vapor
 H319 Causes serious eye irritation
 H336 May cause drowsiness or dizziness

2.7 Precautionary Statement(s)

P261 Avoid breathing dust/fumes/gas/mist/vapors
 P312 Call a POISON CENTER or doctor/physician if you feel unwell
 P501 Dispose of contents and container to an approved waste disposal plant
 P240 Ground/bond container and receiving equipment
 P337 + P313 If eye irritation persists: Get medical attention
 P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
 P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
 P303 + P361 + P353 IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water.
 P370 + P378 In case of fire: Use dry sand, dry chemical, or alcohol-resistant foam for extinction.
 P210 Keep away from heat, sparks, open flames and hot surfaces. No smoking.
 P233 Keep container tightly closed
 P102 Keep out of reach of children
 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
 P243 Take precautionary measures against static discharge
 P241 Use explosion-proof electrical, ventilating and lighting equipment
 P242 Use only non-sparking tools
 P271 Use only outdoors or in a well-ventilated area
 P264 Wash hands thoroughly after handling
 P280 Wear protective gloves and eye and face protection

2.8 GHS Classification(s)

Eye Irritation (Category 2)
 Flammable Liquids (Category 2)
 Specific Target Organ Toxicity Single Exposure (Category 3)

2.8.1 Other hazards which do not**result in classification: Potential****2.9 Health Effects:**

Organ	Effect
Eyes	Can cause irritation to the eyes
Ingestion	Can be harmful if ingested
Inhalation	Can be harmful if inhaled. Can cause respiratory tract irritation. Vapors may cause drowsiness and dizziness.
Skin	Can cause irritation if absorbed through skin

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical Identity: Isopropyl Alcohol

3.1.1 CAS #: 67-63-0

3.1.2 EINECS #: 200-661-7

3.1.3 ICSC #: 0554

3.1.4 RTECS #: NT8050000

3.1.5 UN #: 1219

3.1.6 EC #: 603-117-00-0

GHS02-GHS07

% Weight	Material	CAS
75 to 100	Isopropyl Alcohol	67-63-0

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

4. FIRST AID MEASURES

4.1 General Information

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.

4.2 Eye Contact

Thoroughly flush the eyes with large amounts of clean low-pressure water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Seek medical attention. Remove contact lenses if worn.

4.3 Inhalation

Rescuers should put on appropriate protective gear. Remove person to fresh air. If signs/symptoms continue, get medical attention. Give oxygen or artificial respiration as needed. Keep victim warm.

4.4 Ingestion

NEVER give anything by mouth to an unconscious person. If vomiting does occur, have victim lean forward to prevent aspiration. Rinse mouth with water. Immediately have victim drink several glasses of water to dilute. Seek medical attention. To prevent aspiration, keep head below knee.

4.5 Skin Contact

Remove all contaminated clothing. Wash skin with soap and water. Get medical attention. Wash clothes and shoes before reuse.

4.6 Indication of any immediate medical attention and special treatment needed

If exposed or concerned, get medical advice and attention.

5. FIRE-FIGHTING MEASURES

5.1 Suitable Extinguishing Media

CO₂, Dry Chemical, Alcohol-resistant Foam, and/or H₂O (water fog)

5.2 Specific Hazards

Carbon oxides, Combustible. Pay attention to flashback. Vapors are

**Arising from the Chemicals,
or Chemical Mixtures**

heavier than air and may spread along floors. Development of hazardous combustion gases or vapors possible in the event of fire. Forms explosive mixtures with air at ambient temperatures.

**5.3.1 Special Protective
Equipment and Precautions
for Fire Fighters**

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Keep unopened containers cool by spraying with water. Use with caution and be aware that water runoff can lead to environmental damage. Dike and collect the water used to fight the fire. Avoid use of solid water streams.

**5.3.2 Unusual Fire and
Explosion Hazards**

Vapors may travel to source of ignition and flash back. For container storage and ignition specifics, do not pressurize, cut, weld, braze, solder, drill, grind, or expose containers to heat, flames, static, or any other potential forms of ignition.

5.3.3 Flammable Properties

Classification	OSHA/NFPA Class IB Flammable Liquid
Flash Point	12° C (53°F) – closed cup
Autoignition temp.	399° C (750°F)

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions

Do not inhale vapors, mist, or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas (make sure said safe areas are upwind of the spill). Beware of vapors accumulating to form explosive concentrations. Do not touch or walk through spilled material. Ventilate spill area. Stay upwind of spill.

Vapors can accumulate in low areas. A vapor suppressing foam may be brought in to help with this potential accumulation. However, this should only be done if the vapor has ignited (otherwise use water fog spray).

**6.2 Environmental
Precautions**

Stop leak. Contain spill if possible and safe to do so. Prevent product from entering drains.

**6.3 Methods for
Containment and Clean Up**

Contain spill, then collect with an electrically protected vacuum cleaner, by wet-brushing, or by using an inert material (like dry sand or earth) and put material into a chemical waste disposal container. Keep chemical waste container closed. Recover by pumping.

7. HANDLING AND STORAGE

7.1 Figures Regarding Safe Handling and Storage

There is to be no smoking, eating, or drinking with in the same location as where the containers are to be stored.

7.2 Precautions for Safe Handling

Do not get on skin or in eyes. Do not inhale vapors or mist. Keep away from sources of ignition-no smoking. Take measures to prevent the buildup of electrostatic charge. Use only in well-ventilated area.

7.3 Handling

Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Follow all MSDS/label precaution even after containers are emptied because they may retain product residues.

7.3 Hygiene Measures

Handle in accordance with good industrial hygiene and safety procedures. Use good personal hygiene practices.

7.4 Conditions for Safe Storage, Including Any Incompatibilities

Keep container firmly closed in a cool, dry and well-ventilated place (this will prevent excess pressure from building up). However, when opening these containers, make sure to open them to slowly, allowing all excess air and gas pressure to be released before the container is opened entirely. Keep away from direct sunlight. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control parameters**8.1.1 Occupational Exposure Limits**

Component	Source	Type	Value	Note
Isopropyl Alcohol	US (OSHA)	TWA	400 ppm	N/A
Isopropyl Alcohol	US (ACGIH)	TWA	200 ppm	N/A
Isopropyl Alcohol	US (ACGIH)	STEL	400 ppm	N/A
Isopropyl Alcohol	US (OSHA)	Ceiling	N.D.	N/A

8.2 Exposure Control**8.2.1 Protective equipment****8.2.2 Appropriate engineering controls**

General room or local exhaust ventilation is usually required to meet exposure limit(s). Electrical equipment should be grounded and conform to applicable electrical code. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

8.2.3 Eye/face 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.

8.2.4 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).
- 8.2.5 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.
- 8.2.6 Other 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.
- 8.2.7 Hygiene measures** Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance (<i>physical state, color, etc.</i>)	Liquid. Colorless.
Odor	Specific data not available
Odor threshold	Specific data not available
pH	Specific data not available
Freezing point	Specific data not available
Boiling Range	83°C (181°F)
Flash point	12°C (54 (53.6)°F) – Closed cup
Evaporation rate	2.88 (n-Bu acetate = 1)
Flammability (solid, gas)	Specific data not available
Upper / Lower flammability or explosive limits	13.4% (V) / 2.0%(V)
Vapor pressure	43 hPa at 20°C (68°F)
Vapor density	2.08 where air = 1 at 20°C (68°F)
Relative density	0.790 g/cm ³ at 25°C (77°F)
Solubility(ies)	Miscible
Partition coefficient n-octanol/water(ies)	Log Pow: 0.05
Auto-ignition temperature	425°C (797°F)
Decomposition temperature	Distillable in an undecomposed state at a normal
Formula (ISOPROPYL ALCOHOL)	C ₃ H ₈ O
Molecular weight (ISOPROPYL ALCOHOL)	60.1 g/mol

10. STABILITY AND REACTIVITY

10.1 Chemical Stability

10.2 Possibility of Hazardous Reactions

Vapors may form explosive mixture with air

10.3 Conditions to avoid (e.g., static)

Heat, flames, and spark. Extreme temperatures

10.4 Incompatible materials

Caustics, inorganic acids, chlorinated

10.5 Hazardous decomposition products

Carbon oxides are expected to be, under fire conditions, the primary hazardous decomposition

11. TOXICOLOGICAL INFORMATION

11.1 Product Summary

Long term exposure (2 years) to Isopropyl Alcohol via inhalation at concentrations up to 5000 ppm caused to exposure related increases in tumors in animals. No data available for the teratogenicity, mutagenicity, or reproductive toxicity of this product. No data available to designate the product as causing specific target organ toxicity through repeated exposure. No data available to designate product as an aspiration hazard.

11.2 Acute Toxicity

LC50 Inhalation	Rat	25 mg/l	4 hours
LD50 Dermal	Rabbit	13,900 mg/kg	
LD50 Oral	Rat	5,840 mg/kg	Behavioral abnormalities observed such as altered sleep time and decreased activity

11.3 Irritation

11.3.1 Eyes

Rabbit - Irritating to eyes 24 hours

11.3.2 Eyes (ISOPROPANOL)

Mildly irritating to the eye at an airborne concentration of 400 ppm, unpleasant at 800 ppm

11.3.3 Respiratory or Skin Sensitization

No data available

11.3.4 Skin

Rabbit - mild skin irritation

11.3.5 Specific Target Organ Toxicity. Single Exposure (Globally Harmonized System)

Inhalation - May cause drowsiness or dizziness - central nervous system

11.4 Carcinogenicity

11.4.1 IARC: Group 3: Not classifiable as to its carcinogenicity to humans.

11.4.2 ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

11.4.3 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.

11.4.4 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.

11.5 Other Hazards

Exposure	Description
11.5.1 Eyes	Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.
11.5.2 Ingestion	May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea.
11.5.3 Inhalation (or Lungs)	Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness. May cause narcotic effects in high concentration. Causes upper respiratory tract irritation. Inhalation of vapors may cause drowsiness and dizziness.
11.5.4 Skin	May cause irritation with pain and stinging, especially if the skin is abraded. Isopropanol has a low potential to cause allergic skin reactions; however, rare cases of allergic contact dermatitis have been reported. May be absorbed through intact skin. Dermal absorption has been considered toxicologically insignificant.

12. ECOLOGICAL INFORMATION**12.1 Ecotoxicity (aquatic and terrestrial, where available)****12.1.1 Acute Fish Toxicity**

LD50 / 96 hours Pimephales promelas: 9,640 mg/L

12.1.2 Toxic to Daphnia and Other Aquatic Invertebrates

EC50 - Daphnia magna (Water flea) - 13,299 mg/l - 48 h Remarks: (IUCLID)

12.1.3 Toxicity to Algae

IC50 - Desmodesmus subspicatus (green algae) - > 1,000 mg/l - 72 h

Remarks: (IUCLID)

12.1.4 Persistence and degradability

aerobic - Exposure time 5 d

Result: 53 % - Readily biodegradable.

(Directive 67/548/EEC, Annex V, C.6)

12.1.5 Bioaccumulative potential

No bioaccumulation is to be expected (log Pow <= 4).

12.1.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste Disposal Methods**

Dispose according to federal, state, and local laws. Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Authority. Waste is suitable for incineration. For other information, please see section 6.3 methods for containments and clean up.

14. TRANSPORTATION INFORMATION**14.1 U.S. (D.O.T.)**

Proper Shipping Name:	Isopropanol
Hazard Class:	Class 3
Packing Group:	II
UN/NA:	1219
Labels:	Flammable Liquid

14.2 IMDG

Proper Shipping Name:	ISOPROPANOL
Hazard Class:	Class 3
Packing Group:	II
UN/NA:	1219
EMS-No:	F-E, S-D
Marine pollutant:	No

14.3 IATA

Proper Shipping Name:	Isopropanol
Hazard Class:	Class 3
Packing Group:	II
UN/NA:	1219

15. REGULATORY INFORMATION**15.1 OSHA Hazards**

Flammable liquid, Target Organ Effect, 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

15.2 SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

15.3 SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313: ISOPROPYL ALCOHOL (CAS# 67-63-0) Revision date: 1987-01-01

15.4 SARA 311/312 Hazards Acute Health Hazard

Chronic Health Hazard, Fire Hazard, Acute Health Hazard

15.5 CERCLA

No chemicals in this material with known CAS numbers are subject to the reporting requirements of CERCLA

15.6 Massachusetts Right to Know Components

Isopropyl Alcohol CAS-No. 67-63-0 Revision Date 1987-01-01

15.7 Pennsylvania Right to Know Components

The following non-hazardous ingredients are present in the product at greater than 3%.

NO PA right-To-Know components exist in this product.

15.8 California Prop 65 Components

This product does contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

15.9 New Jersey Right to Know Components

The following materials are non-hazardous but are among the top five components in this product. No TSCA components exist in this product.

15.10 Toxic Substance Control Act

This product contains the following chemical substance subject to the reporting requirements of TSCA 12(B) if exported from the United States:

NO TSCA components exist in this product.

15.11 Candian Whims

This SDS has been prepared in compliance with Controlled Product Regulations except for the use of the 16 headings.

16. OTHER INFORMATION**16.1 HMIS Rating**

Health	2
Flammability	3
Reactivity	0
Personal Protection	x

16.2 NFPA**Disclaimer:**

The information provided in this Safety Data Sheet (SDS) is believed to be accurate and reliable as of the issue date. However, Tersus Environmental, LLC makes no warranties, express or implied, regarding the completeness or accuracy of the data or any recommendations. It is the responsibility of each recipient to review this SDS thoroughly and consult appropriate technical or regulatory resources as needed to understand the hazards and ensure safe handling and use of the product.

Regulations may vary by location and are subject to change. Users are responsible for compliance with all applicable federal, state, provincial, and local laws and regulations. Because the conditions of use, handling, and application are beyond our control, Tersus Environmental, LLC assumes no liability for any loss or damage resulting from the use of this product. It is the user's responsibility to determine

the suitability and safety of the product for its intended use, and to ensure that such use does not infringe upon any intellectual property rights.

This SDS applies only to the product in its original form as shipped. Recommendations provided—whether verbal, written, or inferred from test data—are based on current knowledge at the time of issuance and may be revised as new information becomes available. However, circumstances beyond our control may affect the validity of such recommendations. Users must independently verify the product's suitability for their specific process or application.

Only SDSs issued directly by Tersus Environmental, LLC should be considered current and valid. If you have received an SDS from another source or are unsure of its version, please contact us to obtain the most up-to-date document.



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End of Safety Data Sheet

SAFETY DATA SHEET

EDS-Activator™



Issue Date: 01/21/2026
Version 1.2
SDS # 34C

PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name: EDS-Activator™

Synonyms: Electron Donor Solution – Activator, Methanolic solution

Product Form: Solution

1.2 Recommended use of the chemical and restrictions on use

Recommended Use: Remediation of contaminated groundwater and soils. Chemical for synthesis.

Restrictions on Use: Use as recommended by the label.

1.3 Details of the supplier and of the safety data sheet

Supplier: Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)

+1-919-638-7892 (Tersus Outside office hours)

+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

1. HAZARD IDENTIFICATION

2.1 EMERGENCY OVERVIEW: Highly flammable liquid and vapor. Toxic if inhaled. Causes serious eye damage. Harmful if swallowed. Toxic in contact with skin.

2.2 GHS Classification

Acute Tox. 3 Dermal, Acute Tox. 3 Inhalation, Eye Dam. 1, Flam. Liq. 2, Skin Irrit. 2, STOT SE 1

2.3 GHS-Labeling

Hazard pictograms



2.4 Signal Word **DANGER!**

2.5 Hazard Statements

Flammable Liquid, category 2	H225	Highly flammable liquid and vapor.
Acute Toxicity, Oral, category 4	H301	Toxic if swallowed.
Acute Toxicity, Dermal, category 3	H311	Toxic in contact with skin.
Skin Irritation, category 2	H314	Causes severe skin burns and eye damage.
Serious Eye Damage, category 1	H318	Causes serious eye damage.
Acute Toxicity, Inhalation, category 3	H331	Toxic if inhaled.
STOT, single exposure, category 1	H370	Causes damage to organs.

2.6 Precautionary Statements

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/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink, or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician if you feel unwell.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P302+P352	IF ON SKIN: Wash with plenty of water
P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
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+P311	IF exposed or concerned: Call a POISON CENTER/doctor/physician
P310	Immediately call a POISON CENTER/doctor
P321	Specific treatment (see first aid section on this label).
P330	Rinse mouth.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P361+P364	Take off immediately all contaminated clothing and wash it before reuse.
P370+P378	In case of fire: Use appropriate method 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 in accordance with local/regional/national/international regulations.

2.7 Other hazards

Reacts with H₂O (water)

2. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical Formula Mixture

3.2 Hazardous components

Chemical Name	Concentration (%)	CAS Number
Methanol	Exact percentages are being withheld as a trade secret.	67-56-1
Potassium hydroxide	See row above.	1310-58-3

In accordance with paragraph (i) of §1910.1200, some information has been withheld as a trade secret.

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

3. FIRST AID MEASURES

4.1 General Information

First aider needs to protect himself. Remove affected person from source of contamination.

4.1.1 Eye Contact

After eye contact: rinse out with plenty of water. Immediately call-in ophthalmologist. Remove contact lenses.

4.1.2 Skin Contact

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

4.1.3 Inhalation

Rescues / Retrievers of the victim should make sure to put on the proper protective equipment before helping. After inhalation: get fresh air as soon as possible. Immediately call a physician. If breathing stops: immediately apply artificial respiration, if necessary, also oxygen. Get prompt medical attention, while doing so keep the victim calm and in a warm environment.

4.1.4 Ingestion

After getting fresh air. Make victim drink ethanol (e.g., 1 drinking glass of a 40% alcoholic beverage). Call a doctor immediately (mention methanol ingestion). Only in exceptional cases, if no medical care is available within one hour or by the instruction of a medical professional, induce vomiting (only in fully conscious persons) and make victim drink ethanol again (approx. 0.3 ml of a 40% alcoholic beverage/kg body weight/hour). Risk of perforation! Do not attempt to neutralize.

Never give anything by mouth to an unconscious person.

4.2 Important symptoms and effects(acute and delayed)

Irritation and corrosion, Cough, Shortness of breath, Dizziness, narcosis, agitation, spasms, inebriation, Nausea, Vomiting, Headache, Impairment of vision, Coma

Irritation and corrosion, Cough, Shortness of breath
Risk of blindness!

4.3 Indication of any immediate medical attention and special treatment needed

No information available.

4. FIRE-FIGHTING MEASURES**5.1 Suitable Extinguishing Media**CO₂, and dry powder**5.2 Unsuitable Extinguishing Media**H₂O, and foam**5.3 Specific Hazards Arising from the chemical or mixture**

Combustible.
May not get in touch with: Water
Vapors are heavier than air and may spread along floors. Vapor can also travel to a source of ignition and then flash back.
Forms explosive mixtures with air at elevated temperatures.
Development of hazardous combustion gases or vapors possible in the event of fire.

5.4 Special Fire Fighting Procedures

As in any fire, special protective equipment needs to be used by the fire-fighters.

Stay in danger area only with self-contained breathing apparatus.
Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4.1 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system by placing down dykes or by other preventative measures.

5. ACCIDENTAL RELEASE MEASURES**6.1 Personal Precautions**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, and consult an expert.

Advice for emergency responders: Protective equipment see section 8!

6.2 Environmental Precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods for Containment and Clean Up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material. Dispose of properly. Clean up affected area. Lastly, follow said clean up by putting down a liberal amount of sodium carbonate that will then be washed away with a water spray.

6. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Work under hood. Do not inhale substance/mixture. Avoid generation of vapors/aerosols.

Keep workplace dry and well-ventilated. Do not allow product to encounter water. Observe label precautions.

Work under hood. Do not inhale substance/mixture. Avoid generation of vapors/aerosols. Keep workplace dry. Do not allow product to encounter water.

7.1.1 Advice on protection against fire and explosion

Keep away from open flames, hot surfaces, and sources of ignition. Take precautionary measures against static electricity discharge.

7.2 Hygiene measures

Handle in accordance with good industrial hygiene and safety procedures. Use good personal hygiene practices.

7.3 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Store below +30°C (+86°F).

7. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control parameters

Exposure guidelines, ingredients with workplace control parameters.

Exposure limit(s) <i>Ingredients</i> <i>Basis</i> <i>methanol 67-56-1</i>	Value	Threshold limits	Remarks
8.1.1 ACGIH	Time Weighted Average (TWA):	200 ppm	
	Short Term Exposure Limit (STEL):	200 ppm	
	Skin designation:		Can be absorbed through the skin.
8.1.2 NIOSH/GUIDE	Recommended exposure limit (REL):	200 ppm 260 mg/m ³	
	Skin designation:		Can be absorbed through the skin.
8.1.3 OSHA_TRANS	PEL:	200 ppm 260 mg/m ³	
8.1.4 Z1A	Time Weighted Average (TWA):	200 ppm 260 mg/m ³	
	Skin designation (Final Rule Limit applies):		Can be absorbed through the skin.
	Short Term Exposure Limit (STEL):	250 ppm 325 mg/m ³	

8.2 Engineering measures

Technical measures and appropriate working operations should be given priority over the use of personal protective equipment.

8.3 Individual protection measures

Protective clothing should be selected specifically for the workplace, depending on concentration and quantity of the hazardous substances handled. The chemical resistance of the protective equipment should be inquired at the respective supplier.

8.3.1 Hygiene measures

Immediately change contaminated clothing. Apply skin- protective barrier cream.

Wash hands and face after working with substance.

8.3.2 Eye/face protection

Tightly fitting safety goggles (see categorizations below):

Hand protection

full contact:

Glove material:	butyl-rubber
Glove thickness:	0.7 mm
Break through time:	> 480 min

splash contact:

Glove material:	Viton®
Glove thickness:	0.70 mm
Break through time:	> 120 min

8.4 Exposure Control

Protective equipment



8.4.1 Appropriate engineering controls

Provide adequate general and local exhaust ventilation to maintain worker exposure below exposure limits. Ground/bond the container receiving equipment during transfer or on-site mixing. Performing mixing outside so that you have adequate ventilation. Maintain eye wash fountain and quick-drench shower in work area. Observe any occupational exposure limits for the product or ingredients. Do not allow uncontrolled discharge of product into the environment.

If used indoors, a system of local and / or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended

Practices, most recent edition, for details. Use explosion-proof equipment.

In addition to the information in this SDS, Methanol Institute has published the following guidelines on Drum Handling and Liquid Transfer. Please read through it to understand these guidelines properly.

To move a full drum, it is necessary to use a mechanical means such as a barrel hoist or forklift. If no mechanical means is available, then individual drums can be moved by tipping the drum on its side and rolling it to a designated curbed storage area.

If it is necessary to remove a measured quantity of methanol from the drum without using mechanical means such as low pressure inerting, or a siphon, then it is possible to lay the drum on its side and roll the drum into a slanted position with some form of a prop such as a short section of board under the bunged end of the drum. Position the drum with the small bung in a 12 o'clock position and verify that the drum is chocked in a stable position. The drum and the receiving container must be bonded and grounded.

In the 12 o'clock position, the small bung is now in the vapor space of the drum. Replace the bung with a threaded, alcohol compatible hose. Be careful not to breathe the escaping vapors, which are toxic, and may be flammable. Methanol can be removed from the drum in a controlled manner by carefully rolling the drum to the side so the small bung is in the 1 o'clock position, slightly below the liquid level within the drum. Methanol will now flow out of the drum in a controlled manner. Flow can be terminated by returning the drum to the 12 o'clock position. Replace the transfer hose with the bung and return the drum to an upright position. Extreme care must be taken to not drop or otherwise damage totes, drums, cans, and 1-gallon containers during handling.

Methanol is toxic, especially when breathed or ingested. Siphon transfer of methanol must never be started by mouth-suction. Do not breathe the vapor, ingest the liquid, or allow bare skin to contact the liquid.

8.4.2 Eye/face protection	The following protection should be worn: Chemical splash goggles.
8.4.3 Respiratory protection	If the exposure limit is exceeded, and engineering controls are not feasible, 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. Use a positive-pressure air-supplied respirator if there is an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.
8.4.4 Hand protection	Butyl-rubber, Viton® (see table in section 8.3.2 above)
8.4.5 Other skin and body protection	Wear appropriate clothing to prevent any possibility of skin contact. Flame retardant antistatic protective clothing.
8.4.6 Hygiene measures	Wash promptly if skin becomes contaminated. Wash hands at the end of each work shift and before eating, smoking, and using the toilet. When

using do not eat, drink, or smoke.

8. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Color	Colorless
Odor	Methanolic
Odor Threshold	No information available.
pH	ca. 11
Melting point	< -4 °F (< -20 °C)
Boiling point/boiling range	200.3 °F (93.5 °C) at 1,013 hPa
Flash point	51F (29.7 °C)
Evaporation rate	No information available.
Flammability (solid, gas)	No information available.
Lower explosion limit	5.5 %(V) Methanol
Upper explosion limit	36.5 %(V) Methanol
Vapor pressure	180 hPa at 122 °F (50 °C) 36 hPa at 68 °F (20 °C)
Relative vapor density	No information available.
Density	0.849 g/cm ³ (7.085 lbs./gallon) at 77 °F (25 °C)
Relative density	No information available.
Water solubility	at 68 °F (20 °C) (decomposition)
Partition coefficient: n octanol/water	log Pow: -0.74 (20 °C)
Autoignition temperature	Methanol Bioaccumulation is not expected.
Decomposition temperature	No information available.
Viscosity, dynamic	18 mPa.s at 68 °F (20 °C)
Explosive properties	Not classified as explosive.
Oxidizing properties	none
Ignition temperature	779 °F (415 °C) DIN 51794

9. STABILITY AND REACTIVITY

10.1 Reactivity

Hydrolyzes
Vapor/air-mixtures are explosive at intense warming.

10.2 Chemical stability

Sensitive to moisture

10.3 Possibility of hazardous reactions

Violent reactions possible with oxidizing agents, acids, water
Possible decomposition products in case of hydrolysis are corrosive base, methanol

10.4 Conditions to avoid

Heat, impact, friction, sparks, or other forms of ignition

10.5 Incompatible materials

Avoid contact with hydrogen peroxide, chromic anhydride, nitric acid, mixed nitric/sulfuric acid, nitrosyl perchlorate, permonosulfuric acids, potassium tert-butoxide, sodium hypobromite, and chlorinated melamine

10.6 Hazardous decomposition products

Toxic fumes and gases are given off during burning or thermal decomposition. During combustion, carbon monoxide, carbon dioxide, formaldehyde, or formic acid may be formed.

10. TOXICOLOGICAL INFORMATION**11.1 Likely route of exposure**

Inhalation, Eye contact, Skin contact

11.2 Target Organs

Eyes

Skin

Respiratory system

Central nervous system

Gastrointestinal tract

11.3 Acute oral toxicity

Symptoms: Nausea, Vomiting, If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Acute toxicity estimate: 142.86 mg/kg Calculation method

11.4 Acute inhalation toxicity

Symptoms: mucosal irritations, Cough, Shortness of breath,

Possible damages: damage of respiratory tract

11.5 Absorption

Acute toxicity estimate: 4.29 mg/l; 4 h; vapor Calculation method

Symptoms: mucosal irritations, Cough, Shortness of breath

Possible damages: damage of respiratory tract

11.6 Acute dermal toxicity

Acute toxicity estimate: 428.57 mg/kg Calculation method

11.7 Skin irritation

Mixture causes burns.

11.8 Eye irritation

Mixture causes serious eye damage. Risk of blindness!

11.9 Specific target organ systemic toxicity - Single exposure

Causes damage to organs.

Target Organs: Eyes

11.10 Specific target organ systemic toxicity - Repeated exposure

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

11.11 Aspiration hazard

Regarding the available data the classification criteria are not fulfilled.

11.12 Carcinogenicity

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

- 11.12.2 OSHA** No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.
- 11.12.3 NTP** No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
- 11.12.4 ACGIH** No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

11.13 Further information

11.13.1 After absorption:

Headache, Dizziness, inebriation, Impairment of vision

11.13.2 Systemic effects:

Acidosis, drop in blood pressure, agitation, spasms, narcosis, Coma, Irreversible damage of the optical nerve.

Symptoms may be delayed.

Handle in accordance with good industrial hygiene and safety practice.

Other dangerous properties cannot be excluded.

11.4 Ingredients

11.4.1 Methanol

Acute oral toxicity

LDLO human: 143 mg/kg (RTECS)

Acute toxicity estimate: 100.1 mg/kg Expert judgment

Acute inhalation toxicity

LC50 Rat: 131.25 mg/l; 4 h; vapor (ECHA)

Acute dermal toxicity

LD50 Rabbit: ca. 17,100 mg/kg (External MSDS)

Acute toxicity estimate: 300.1 mg/kg Expert judgment

Skin irritation

Rabbit

Result: No skin irritation (ECHA)

Eye irritation

Rabbit

Result: No eye irritation (ECHA)

Sensitization

Sensitization test: Guinea pig Result: negative

Method: OECD Test Guideline 406

Repeated dose toxicity

Rat

male and female

Inhalation

vapor 28 d

daily

NOAEL: 6.66 mg/l

OECD Test Guideline 412

Subacute toxicity

Rat
male and female
Inhalation
365 d
daily
NOAEL: 0.13 mg/l
LOAEL: 1.3 mg/l
OECD Test Guideline 453

Germ cell mutagenicity

Genotoxicity in vivo
Micronucleus test
Mouse
Result: negative
Method: OECD Test Guideline 474

Genotoxicity in vitro

Ames test
Salmonella typhimurium
Result: negative
Method: OECD Test Guideline 471
In vitro mammalian cell gene mutation test Chinese hamster lung cells
Result: negative
Method: OECD Test Guideline 476

11.4.2 Potassium hydroxide

No information available.

11. ECOLOGICAL INFORMATION**12.1 Ecotoxicity**

No information available.

12.2 Persistence and degradability

No information available.

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water
log Pow: -0.74 (20 °C)
Methanol Bioaccumulation is not expected.

12.4 Mobility in soil

No information available.

12.5 Additional ecological information

Harmful effect due to pH shift. Forms toxic and corrosive mixtures with water even if diluted. Discharge into the environment must be avoided.

12.5.1 Ingredient methanol*Toxicity to fish*

Flow-through test LC50 *Lepomis macrochirus* (Bluegill sunfish): 15,400 mg/l; 96 h US-EPA

Toxicity to daphnia and other aquatic invertebrates

Static test EC50 *Daphnia magna* (Water flea): > 10,000 mg/l; 48 h DIN 38412

Toxicity to algae

Static test EC50 *Pseudokirchneriella subcapitata* (green algae): ca. 22,000 mg/l; 96 h OECD Test Guideline 201

Toxicity to bacteria

Static test IC50 activated sludge: > 1,000 mg/l; 3 h
Analytical monitoring: yes OECD Test Guideline 209

Toxicity to fish (Chronic toxicity)

NOEC *Oryzias latipes* (Orange-red killifish): 7,900 mg/l; 200 h (External MSDS)

Biodegradability

99 %; 30 d
OECD Test Guideline 301D Readily biodegradable.

Biochemical Oxygen Demand (BOD)

600 - 1,120 mg/g (5 d)
(IUCLID)

Chemical Oxygen Demand (COD)

1,420 mg/g
(IUCLID)

Theoretical oxygen demand (ThOD)

1,500 mg/g
(Lit.)

Ratio BOD/ThBOD

BOD5 76 %
Closed Bottle test

Partition coefficient: n-octanol/water

log Pow: -0.77
(experimental)
(Lit.) Bioaccumulation is not expected.

Substance does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.

Stability in water

2.2 year
reaction with hydroxyl radicals (IUCLID)

12.5.2 Ingredient potassium hydroxide

No information available.

12. DISPOSAL CONSIDERATIONS

13.1 Waste Disposal Methods

The information presented only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification

and disposal methods in compliance with applicable regulations.
Disposal should be in accordance with applicable regional,
national, and local laws and regulations.

13. TRANSPORTATION INFORMATION

14.1 U.S. (D.O.T.) Land transport

Proper Shipping Name:	Flammable Liquids, Corrosive, n.o.s. (Methanol, Potassium Hydroxide)
Hazard Class:	3 (8)
UN/NA:	UN 2924
Packing group:	II
Hazardous Subclass (Level)	Unknown
Resp. Guide Page:	132

14. REGULATORY INFORMATION

15.1 United States of America

15.1.1 SARA 313

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

Methanol	67-56-1	70 %

15.1.2 SARA 302

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

15.1.3 Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. Clean Water Act, Section 311, Table 116.4A.

This product does not contain any Hazardous Chemicals listed under the U.S. Clean Water Act, Section 311, Table 117.3.

This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

15.1.4 DEA List I

Not listed

15.1.5 DEA List II

Not listed

15.2 US State Regulations

15.2.1 Massachusetts Right to Know

Ingredients methanol

15.2.2 Pennsylvania Right to Know

Ingredients methanol

The following non-hazardous ingredients are present in the product at greater than 3%.

Chemical Name	CAS-No.
Water	7732-18-5

15.2.3 New Jersey Right to Know

Ingredients methanol

The following materials are non-hazardous but are among the top five components in this product.

Chemical Name

CAS-No.

Water

7732-18-5

15.2.4 California Prop 65 Components

WARNING: This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

Ingredients methanol

15.3 Notification status

15.3.1 TSCA: All components of the product are listed in the TSCA-inventory.

15.3.2 DSL: This product contains one or several components listed in the Canadian NDSL.

15. OTHER INFORMATION**16.1 Training Advice**

Provide adequate information, instruction, and training for operators.

16.2 HMIS Ratings

Health	3
Flammability	3
Reactivity	1
Personal Protection	X

16.3 Volatile Organic Compounds, gr/ltr: 742

DISCLAIMER: THE VOLATILE ORGANIC COMPOUND (VOC) CONTENT REPORTED HEREIN, IF ANY, IS BASED ON A MATERIAL VOC CALCULATION. NOTE THAT SEVERAL METHODS ARE USED FOR CALCULATING VOC CONTENT AND THAT STANDARDS/REQUIREMENTS REGARDING VOC CONTENT VARY BY LOCATION/JURISDICTION. ACCORDINGLY, TERSUS ENVIRONMENTAL MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, REGARDING THIS MATERIAL'S COMPLIANCE WITH VOC STANDARDS/REQUIREMENTS APPLICABLE IN LOCATIONS/JURISDICTIONS WHERE THIS MATERIAL MAY BE SOLD OR USED.

16.4 Full text of H-Statements referred to under sections 2 and 3.

H225 Flammable liquid and vapor.
H301 Toxic if swallowed.
H311 Toxic in contact with skin.
H314 Causes severe skin burns and eye damage.
H318 Causes serious eye damage.
H331 Toxic if inhaled.
H370 Causes damage to organs.

16.5 Icons for GHS Pictograms shown in Section 3 describing each ingredient:

GHS02



GHS05



GHS06



GHS07



GHS08



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All recommendations for the use of our products, whether given by us, orally or to be implied from data or lab tests results by us, are based on the current state of our knowledge at the time those recommendations are made. When additional information is obtained, these recommendations may be updated. They may also be influenced by circumstances outside our control. Notwithstanding, such recommendation the user is responsible that the product as supplied by us is suitable to the process or purpose he/she intends to use it.

Due to the proliferation of sources for information such as manufacturer specific SDSs, we are not and cannot be responsible for SDSs obtained from any source other than ourselves. If you have obtained an SDS from another source or if you are not sure that the SDS you have is current, please contact us for the most current version.



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End of Safety Data Sheet

SAFETY DATA SHEET

EDS-ER™



Issue Date: 01/21/2026
Version 1.2
SDS # 01A

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name: EDS-ER™

Synonyms: Electron Donor Solution – Extended Release

Product Form: Mixture

1.2 Recommended use of the chemical and restrictions on use

Recommended Use: Remediation of contaminated groundwater and soils.

Restrictions on Use: Use as recommended by the label.

1.3 Details of the supplier and of the safety data sheet

Supplier: Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)

+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Relevant identified uses of the substance or mixture

No applicable GHS categories. This product is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Other hazards None known.

2.2 Label element The product does not require a hazard warning label in accordance with GHS. The normal safety precautions for the handling of chemicals must be observed.

Hazard statement Non-Regulated Material

Precautionary statement

Prevention	No GHS prevention statements
Response	No GHS response statements
Storage	No GHS storage statements
Disposal	No GHS disposal statements

2.3 Classification system

NFPA Ratings (scale 0-4)
Health = 0
Fire = 1
Reactivity = 0

HMIS Ratings (scale 0-4)
Health = 0 Flammability = 1 Reactivity = 0

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical Formula Mixture

3.2 Hazardous components

Chemical Name	Concentration (%)	CAS Number
None	None	None

3.3 Nonhazardous components

Chemical Name	Concentration (%)	CAS Number
Soybean Oil	90 to 93	8001-22-7
Emulsifiers	7 to 10	Proprietary

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.

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

4. FIRST AID MEASURES

4.1 General Information

Check the vital functions. If unconscious place in recovery position and seek medical advice. In case of respiratory arrest, administer artificial respiration. Cardiac arrest, perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Take the victim to a doctor if irritation persists.

Remove affected person from source of contamination.

Eye Contact

Promptly wash eye with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes and get medical attention. Do not apply (chemical) neutralizing agents. In case of eye irritation consult an ophthalmologist. Remove any contact lenses and open eyelids wide apart.

Skin Contact

Wash off promptly and flush contaminated skin with water. Promptly remove clothing of soaked through and flush skin with water. Get medical attention if irritation persists after washing. Do not apply (chemical) neutralizing agents.

Inhalation

Move the exposed person to fresh air at once. When breathing is difficult, properly trained personnel may assist affected person by administering oxygen. Perform artificial respiration if breathing has stopped. Keep the affected person warm and at rest. Get prompt medical attention.

Ingestion

Drink plenty of water. DO NOT induce vomiting. Get medical attention

immediately. Never give anything by mouth to an unconscious person.
Keep the affected person warm and at rest.

**4.2 Important
symptoms and effects
(acute and delayed)**

Symptoms/injuries after skin contact: Causes skin irritation.
Symptoms/injuries after eye contact: Eye damage / irritation.

5. FIRE-FIGHTING MEASURES

**5.1 Suitable Extinguishing
Media**

Alcohol resistant foam. Carbon dioxide (CO₂). Dry chemicals, sand, dolomite, etc. Water spray

**5.2 Specific Hazards
Arising from the chemical
or mixture**

Fire hazard: high.
Explosion hazard: Not known.
Oxides of the following substances: Carbon, Sulfurous gases (SO_x)

**5.3 Special Fire Fighting
Procedures**

Cool containers exposed to flames with water until well after the fire is out. Use water spray to reduce vapors. If the risk of water pollution occurs, notify appropriate authorities. Avoid water in straight hose stream; will scatter and spread fire. Keep upwind. Do not inhale explosions and combustion gases. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Cool containers exposed to flames with water until well after the fire is out. Use water spray to reduce vapor. If the risk of water pollution occurs, notify appropriate authorities. Avoid water in straight hose stream; will scatter and spread fire. Wear positive-pressure, self-contained breathing apparatus (SCBA) and chemical protective clothing.

**5.4 Unusual Fire and
Explosion Hazards**

Rags containing this material may heat and burn spontaneously. If a material with a large surface area, like rags, filters etc., is saturated with vegetable oils spontaneous combustion has been known to happen

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions

Wear protective clothing as described in Section 8 of this safety data sheet. Do not smoke or use open fire or other sources of ignition. Contact with walking surface may result in formation of slippery film/falling hazard.

6.2 First Aid

In case of contact with skin, wash with soap and water. If symptoms occur, seek medical attention. In case of contact with eyes, rinse with plenty of water for at least 15 minutes and see an eye specialist if irritation persists. In case of inhalation, remove to fresh air. In case of ingestion, drink water. If symptoms occur, seek medical assistance. Do not discharge into drains, sewers, or watercourses or onto the ground. Inform the relevant authorities if this occurs.

**6.3 Environmental
Precautions**

**6.4 Methods for
Containment and Clean Up**

Spilled product should be removed immediately. Provide enough ventilation. Recover product for reuse if possible. Avoid contamination of waterways and (if large quantity) vegetation. Absorb in non-combustible material, vermiculite, dry sand or earth and place into containers. If in mist form and levels are above 12mg/m³(total), an air

purifying respirator (APR) and goggles are recommended. Avoid runoff into storm sewers and ditches which lead to waterway.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Contain with applicable regulations. Avoid contact with eyes. Avoid inhalation of vapors and spray/mist. Remove contaminated clothing immediately. Clean contaminated objects and areas thoroughly observing environmental regulations. Keep away from sources of ignition – No smoking. Handle in accordance with good industrial hygiene and safety procedures. Discharge into the environment must be avoided. Keep container tightly closed. Either local exhaust or general room ventilation is usually required.

7.2 Hygiene measures

Handle in accordance with good industrial hygiene and safety procedures. Use good personal hygiene practices.

7.3 Conditions for safe storage (with incompatibilities)

Technical measures: Clean bulk tanks periodically to prevent accumulation of bacteria

Storage conditions: Store in tightly closed, original container in a well-ventilated place. Protect against frost. Protect against direct sunlight.

Storage temperature: See technical datasheet. Above 10°C (50°F) and away from heat or flame.

Storage area: Store in a dry area. Comply with applicable regulations. Collect spillage.

Packaging materials: Stainless steel. Plastic.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control parameters

Exposure guidelines, ingredients with workplace control parameters.

Components with occupational exposure limits

Soybean Oil (8001-22-7)

TWA Short-term value: 5 mg/m³

Long-term value: 15 mg/m³

8.2 Exposure Control



Appropriate engineering controls

Provide adequate general and local exhaust ventilation. Observe any occupational exposure limits for the product or ingredients. Do not allow uncontrolled discharge of product into the environment.

Eye/face protection

The following protection should be worn: Chemical splash goggles.

Respiratory protection

An approved NIOSH respirator must be worn if exposed to excessive oil vapors

Hand protection	Neoprene. Vinyl, Rubber (natural, latex), Butyl rubber. Wear protective gloves made of the following material: Chemical-resistant, impervious gloves complying with an approved standard should be worn if a risk assessment indicates skin contact is possible. Polyvinyl chloride (PVC). Manufactured/tested in accordance with EN 374, Avoid the following conditions: Polyvinyl alcohol (PVA).
Other skin and body protection	Wear appropriate clothing to prevent any possibility of skin contact. If using hot oil, insulated gloves may be required
Hygiene measures	Wash promptly if skin becomes contaminated. Wash hands at the end of each work shift and before eating, smoking, and using the toilet. When using do not eat, drink, or smoke.
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.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Clear yellow to clear brown, amber
Odor	Light Vegetable Oil
Odor threshold	Not determined.
pH	Not determined. Natural when diluted with water.
Melting point /Freezing Point	-2°C
Initial Boiling point and boiling point range	Not determined.
Flash Point	282°C (540°F)
Evaporation rate	Not determined.
Flammability (solid; gas)	Not determined.
Upper/lower flammability or explosive limits	Not determined.
Vapor pressure	Not determined.
Vapor density	Not determined.
Relative density	0.925 g/cm ³ (7.719 lbs/gal)
Solubility (ies)	Dispersible
Partition coefficient: n-octanol/water	Not determined.
Initial Boiling point and boiling point range	Not determined.
Auto-ignition temperature	Unknown
Decomposition temperature	Unknown
Viscosity	80 cP at 24°C; 35 cSt at 40°C

10. STABILITY AND REACTIVITY

10.1 Reactivity No further relevant information available.

10.2 Chemical stability Stable under normal conditions and use.

10.3 Possibility of hazardous reactions

No dangerous reactions known.

10.4 Conditions to avoid

No further relevant information available.

10.5 Incompatible materials

No further relevant information available.

10.6 Hazardous decomposition productsOxides of carbon (CO_x).**10.7 Hazardous Polymerization**

Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION**11.1 Acute Toxicity**

Acute toxicity (oral)

LD50

Species: Rat (male/female)

Dose: >2.000 mg/kg

Method: OECD 423

Skin

Acute toxicity estimate: 3,571 mg/kg

Method: Calculation method

Serious Eye

Not classified

Damage/Irritation

Respiratory or Skin

Not classified

Sensitization

Ingestion

Not classified

Germ Cell Mutagenicity

Not classified

Carcinogenicity

Not classified

Reproductive Toxicity

Not classified

Specific Target Organ

Not classified

Toxicity (Single Exposure)

Specific Organ Toxicity

Not classified

(Repeated Exposure)

Aspiration Hazard

Not classified

General Remarks

Not classified

Repeated does toxicity

> 5000 mg/Kg bw/day [OECD 422, CAS# 8001-30-7]

Reproductive toxicity

> 2000 mg/Kg bw/day [OECD 422, CAS# 8001-30-7]

11.2 Additional Toxicological Information

When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us. The substance is not subject to classification.

11.3 Carcinogenic Categories

11.3.1 IRAC (International Agency for Research on Cancer): 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.

11.3.2 ACGIH (American Conference of Governmental Industrial Hygienists): 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 ACGIH.

11.3.3 NTP (National Toxicology Program): 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 NTP.

11.3.4 OSHA (Occupational Safety & Health Administration): No component of this product

present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

12. ECOLOGICAL INFORMATION

12.1 Chemical Fate Information

Product is readily biodegradable in wastewater treatment systems.

12.2 Biodegradability

Slow, not readily degradable Method: OECD 301 D

Chemical Oxygen Demand: 2.324 mg/g DIN 38409 T.31

12.3 Toxicity

Acute toxicity to fish- LC0: >100 mg/L 96h (no data, OCED 203, s-s)

Acute toxicity to aquatic invertebrates: No data

Toxicity to aquatic algae: No data

Toxicity to microorganisms- EC50: >100 mg/L 3 h (a.s. bacteria, OCED 209, s)

12.4 Bioaccumulative potential

No data available

12.5 Aquatotoxicity, invertebrates

Species: *Daphnia magna*

Exposure duration: 48 h

EC50: > 100 mg/l

Method: OECD 202

12.6 Aquatotoxicity, algae / aquatic plants

Species: *Scenedesmus subspicatus*

Exposure duration: 72 h

EbC50: 341 mg/l

Method: OECD 201

12.7 Mobility in soil

Adsorption coefficient in soil (log Koc): no data

12.8 Results of PBT and vPvB assessment

The substance is not PBT or vPvB

12.9 Other adverse effects

No information available

13. DISPOSAL CONSIDERATIONS

13.1 Waste Disposal Methods

Dispose according to federal, state, and local laws. Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Authority. Waste is suitable for incineration.

14. TRANSPORTATION INFORMATION**14.1 U.S. (D.O.T.)**

Proper Shipping Name: Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.2 Canada (T.D.G.)

Proper Shipping Name: Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.3 IMDG

Proper Shipping Name: Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.4 IATA

Proper Shipping Name: Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.5 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

N/A for product as supplied.

15. REGULATORY INFORMATION**15.1 EPCRA - Emergency Planning and Community Right-to-Know Act****CERCLA Reportable Quantity**

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

15.2 SARA 311/312 Hazards No SARA Hazards

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

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

15.3 California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

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

CH INV: On the inventory, or in compliance with the inventory
DSL: All components of this product are on the Canadian DSL
AICS: On the inventory, or in compliance with the inventory
NZIoC: On the inventory, or in compliance with the inventory

ENCS:	On the inventory, or in compliance with the inventory
KECI:	Not in compliance with the inventory
PICCS:	On the inventory, or in compliance with the inventory
IECSC:	On the inventory, or in compliance with the inventory
TCSI:	On the inventory, or in compliance with the inventory
TSCA:	On the inventory, or in compliance with the inventory

16. OTHER INFORMATION

16.1 Abbreviation/acronyms used

UVCB (substance)- Chemical substances of Unknown or Variable Composition, complex reaction products and biological materials

CAS (number)- Chemical Abstracts Service

EC (number)- Ref. EINECS/ELINCS number

R.E.A.Ch.- Registration, Evaluation, Authorisation and Restriction of Chemicals

TARIC - Tariffa Integrata della Comunità (Integrated Community Tariff code)

GHS - Globally Harmonised System of Classification and Labelling of Chemicals

CLP - Classification, Labelling and Packaging regulation

n/a - not applicable

PPE - Personal Protection Equipment

(Q)SAR - (Quantitative) Structure-Activity Relationship

bw – body weight

NOAEL - No Observed Adverse Effect Levels

STOT - Specific Target Organ Toxicity

BCF - Bioconcentration Factor

PBT (substance) - Persistent Bioaccumulative Toxic

vPvB (substance) - very Persistent, Very Bioaccumulative

SVHC (substance) - Substances of Very High Concern

Components not precisely identified are proprietary or non-hazardous.

Mixture classified as not dangerous according to Regulation (EC) 1272/2008.

Observe employment restrictions for people.

Product is not listed with IARC, NTP, ACGIH or OSHA as a carcinogen.

Disclaimer:

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our control may affect the validity of such recommendations. Users must independently verify the product's suitability for their specific process or application.

Only SDSs issued directly by Tersus Environmental, LLC should be considered current and valid. If you have received an SDS from another source or are unsure of its version, please contact us to obtain the most up-to-date document.



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End of Safety Data Sheet

SAFETY DATA SHEET

Creation Date 24-Aug-2009

Revision Date 18-Dec-2025

Revision Number 9

This safety data sheet was created pursuant to the requirements of: US OSHA Hazard Communication Standard 2024 (29 CFR 1910.1200)

1. Identification

Product Name Hydrochloric acid

Cat No. : A481-212; A481-212LC; S71942SC; S71943; S71943ND; S80036; S80038; SA49

CAS No 7647-01-0
Synonyms Muriatic acid; Hydrogen chloride; HCl (Technical/Certified ACS Plus/Optima/NF/FCC)

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous according to [US] OSHA (29 CFR 1910.1200, 2024)

Corrosive to metals	Category 1
Skin Corrosion/Irritation	Category 1 B
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements

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 only in original packaging

Response

Immediately call a POISON CENTER or doctor

Inhalation

IF INHALED: Remove person to fresh air and keep comfortable for breathing

Skin

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower
Take off contaminated clothing and wash before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Ingestion

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

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

Hazards classified under paragraph (d)(1)(ii) of 1910.1200

No information available

3. Composition/information on Ingredients

Component	CAS No	Weight %
Water	7732-18-5	62-65
Hydrochloric acid	7647-01-0	35-38

4. First-aid measures

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. Immediate medical

	attention is required.
Inhalation	Remove to fresh air. 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. Immediate medical attention is required.
Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
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

Corrosive material. Causes burns by all exposure routes. Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products

Hydrogen chloride gas.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
3

Flammability
0

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Do not get in eyes, on skin, or on clothing.
Environmental Precautions	Should not be released into the environment. 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.

7. Handling and Storage

Handling	Wear personal protective equipment/face protection. Do not breathe mist/vapors/spray. Do not get in eyes, on skin, or on clothing. Do not ingest. If swallowed then seek immediate medical assistance.

Storage.

Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area. Incompatible Materials. Metals. Strong oxidizing agents. Bases. sodium hypochlorite. Amines. Fluorine. Cyanides. Alkaline.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Hydrochloric acid	Ceiling: 2 ppm	Ceiling: 5 ppm Ceiling: 7 mg/m ³ (Vacated) Ceiling: 5 ppm (Vacated) Ceiling: 7 mg/m ³	IDLH: 50 ppm Ceiling: 5 ppm Ceiling: 7 mg/m ³	Ceiling: 2 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH: NIOSH - National Institute for Occupational Safety and 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

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.

Recommended Filter type:

Particulates filter conforming to EN 143. or. Acid gases filter: Type E, Yellow.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance**Physical State**

Liquid

Color

Colorless

Odor

pungent

Odor Threshold

No information available

PropertyValuesRemarks• Method**Melting Point/Range**

-35 °C / -31 °F

Softening Point

No data available

Boiling Point/Range

57 °C / 135 °F

Flash Point

No information available

Flammability (liquid)

No data available

Flammability (solid,gas)

Not applicable

Explosion Limits

No data available

@ 760 mmHg

Method - No information available

Liquid

Autoignition Temperature

No data available

Decomposition Temperature

No data available

pH	< 1	
Viscosity	1.8 mPa.s @ 15°C	
Water Solubility	Miscible	
Solubility in other solvents	No information available	
Partition Coefficient (n-octanol/water)		
Vapor Pressure	125 mbar @ 20 °C	
Density / Specific Gravity	1.18	
Bulk Density	Not applicable	Liquid
Vapor Density	1.27	(Air = 1.0)
Particle characteristics	Not applicable (liquid)	
Other Information		
Molecular Formula	HCl	
Molecular Weight	55.55	

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat.
Incompatible Materials	Metals, Strong oxidizing agents, Bases, sodium hypochlorite, Amines, Fluorine, Cyanides, Alkaline
Hazardous Decomposition Products	Hydrogen chloride gas
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	Contact with metals may evolve flammable hydrogen gas.

11. Toxicological information

Information on expected route of exposure

Inhalation	Not an expected route of exposure.
Ingestion	May be harmful if swallowed.
Eyes	Avoid contact with eyes. Corrosive to the eyes and may cause severe damage including blindness.
Skin	Avoid contact with skin. Causes burns. Skin Corrosion/Irritation.

Toxicology data for the components

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	-	-
Hydrochloric acid	238 - 277 mg/kg (Rat)	> 5010 mg/kg (Rabbit)	1.68 mg/L (Rat) 1 h

Toxicologically Synergistic Products	No information available

(b) skin corrosion/irritation; Category 1 B

(c) serious eye damage/irritation; Category 1

(d) respiratory or skin sensitization;

**Respiratory
Skin**

Based on available data, the classification criteria are not met
Based on available data, the classification criteria are not met

(e) germ cell mutagenicity;

Based on available data, the classification criteria are not met

(f) carcinogenicity;

The table below indicates whether each agency has listed any ingredient as a carcinogen

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Hydrochloric acid	7647-01-0	Not listed	Not listed	Not listed	Not listed	Not listed

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

(g) reproductive toxicity;

Based on available data, the classification criteria are not met

(h) STOT-single exposure;

Category 3

Results / Target organs

Respiratory system.

(i) STOT-repeated exposure;

Based on available data, the classification criteria are not met

Target Organs

No information available.

(j) aspiration hazard;

No data available

Symptoms / effects, both acute and delayed

Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Other Adverse Effects

The toxicological properties have not been fully investigated.

Endocrine Disrupting Properties

This product does not contain any known or suspected endocrine disruptors.

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
Hydrochloric acid	-	282 mg/L LC50 96 h Gambusia affinis mg/L LC50 48 h Leuciscus idus	-	56mg/L EC50 72h Daphnia

Persistence and Degradability

Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation

No information available.

Mobility

Will likely be mobile in the environment due to its 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 UN1789
 Proper Shipping Name HYDROCHLORIC ACID
 Hazard Class 8
 Packing Group II

TDG

UN-No UN1789
 Proper Shipping Name HYDROCHLORIC ACID
 Hazard Class 8
 Packing Group II

IATA

UN-No UN1789
 Proper Shipping Name Hydrochloric acid
 Hazard Class 8
 Packing Group II

IMDG/IMO

UN-No UN1789
 Proper Shipping Name Hydrochloric acid
 Hazard Class 8
 Packing Group II

15. Regulatory Information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Water	7732-18-5	X	ACTIVE	-
Hydrochloric acid	7647-01-0	X	ACTIVE	-

Legend:

TSCA - US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

- - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT)

Not applicable

TSCA 12(b) - Notices of Export

Not applicable

International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Water	7732-18-5	X	-	231-791-2	X	X		X	X	KE-35400
Hydrochloric acid	7647-01-0	X	-	231-595-7	X	X	X	X	X	KE-20189

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Component	CAS No	Weight %	SARA 313 - Threshold	SARA 313 - Reporting

			Values %	thresholds
Hydrochloric acid	7647-01-0	35-38	1.0 %	-

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Hydrochloric acid	X	5000 lb	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depleters	Class 2 Ozone Depleters
Hydrochloric acid	X		-

OSHA - Occupational Safety and Health Administration Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Hydrochloric acid	-	TQ: 5000 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) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355).

Component	Hazardous Substances RQs	CERCLA Extremely Hazardous Substances RQs	SARA Reportable Quantity (RQ)
Hydrochloric acid	5000 lb	5000 lb	5000 lb 2270 kg

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
Water	-	-	X	-	-
Hydrochloric acid	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 contains the following DHS chemicals:
Legend - STQs = Screening Threshold Quantities, APA = A placarded amount

Component	DHS Chemical Facility Anti-Terrorism Standard
Hydrochloric acid	Release STQs - 15000lb (concentration >=37%) Release STQs - 5000lb (anhydrous) Theft STQs - 500lb (anhydrous)

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Water	7732-18-5	-	-	-
Hydrochloric acid	7647-01-0	-	Use restricted. See entry 75. (see link for restriction details)	-

REACH links

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Water	7732-18-5	Listed	Not applicable	Not applicable	Not applicable
Hydrochloric acid	7647-01-0	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?

Not applicable

Other International Regulations

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Water	7732-18-5	Not applicable	Not applicable	Not applicable	Not applicable
Hydrochloric acid	7647-01-0	25 tonne	250 tonne	Not applicable	Annex I - Y34

16. Other Information

Prepared By

Product stewardship (Regulatory Affairs)
Thermo Fisher Scientific
email - begel.sdsdesk@thermofisher.com

Creation Date

24-Aug-2009

Revision Date

18-Dec-2025

Print Date

18-Dec-2025

Revision Summary

Updated to the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) which published its Final Rule in the Federal Register revising the Hazard Communication Standard (HCS/HazCom), 29 CFR 1910.1200 (2024) (HCS §1910.1200, 2024), May 20, 2024, effective July 19, 2024.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Isobutylene

Airgas
an Air Liquide company

Section 1. Identification

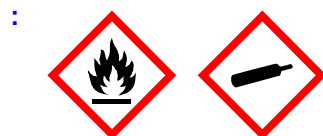
GHS product identifier	: Isobutylene
Chemical name	: Isobutylene
Other means of identification	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1,1-Dimethylethylene; 2-methylprop-1-ene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene
Product type	: Gas.
Product use	: Synthetic/Analytical chemistry.
Synonym	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1,1-Dimethylethylene; 2-methylprop-1-ene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene
SDS #	: 001031
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms



Signal word : Danger

Hazard statements : Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.
May form explosive mixtures with air.

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. In case of leakage, eliminate all ignition sources.

Storage : Protect from sunlight. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture	: Substance
Chemical name	: Isobutylene
Other means of identification	: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1,1-Dimethylethylene; 2-methylprop-1-ene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene
Product code	: 001031

CAS number/other identifiers

CAS number : 115-11-7

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.
Inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
Skin contact	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Ingestion	: As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact	: No known significant effects or critical hazards.
Inhalation	: No known significant effects or critical hazards.
Skin contact	: No known significant effects or critical hazards.
Frostbite	: Try to warm up the frozen tissues and seek medical attention.
Ingestion	: As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact	: No specific data.
Inhalation	: No specific data.
Skin contact	: No specific data.
Ingestion	: No specific data.

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

Notes to physician	: Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	: No specific treatment.

Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

- Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Use only non-sparking tools. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	ACGIH TLV (United States, 1/2021). TWA: 250 ppm 8 hours.

- Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Gas. [Compressed gas.]
- Color** : Colorless.
- Odor** : Characteristic.
- Odor threshold** : Not available.
- pH** : Not applicable.
- Melting point** : -140.7°C (-221.3°F)
- Boiling point** : -6.9°C (19.6°F)
- Critical temperature** : 144.75°C (292.6°F)
- Flash point** : Closed cup: -76.1°C (-105°F)
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Lower and upper explosive (flammable) limits** : Lower: 1.8%
Upper: 9.6%
- Vapor pressure** : 24.3 (psig)
- Vapor density** : 1.94 (Air = 1)
- Specific Volume (ft³/lb)** : 6.6845
- Gas Density (lb/ft³)** : 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.
- Flow time (ISO 2431)** : Not available.
- Molecular weight** : 56.12 g/mole
- Aerosol product**
- Heat of combustion** : -45029034 J/kg

Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Conditions to avoid** : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.
- Incompatible materials** : Oxidizers
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m ³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Section 11. Toxicological information

- Inhalation** : No known significant effects or critical hazards.
Skin contact : No known significant effects or critical hazards.
Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.
Inhalation : No specific data.
Skin contact : No specific data.
Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

- Potential immediate effects** : Not available.
Potential delayed effects : Not available.

Long term exposure

- Potential immediate effects** : Not available.
Potential delayed effects : Not available.

Potential chronic health effects

Not available.

- General** : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Inhalation (vapors)	550 mg/l

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
Isobutylene	2.34	-	low

Mobility in soil

Section 12. Ecological information

Soil/water partition coefficient (K_{oc}) : Not available.

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

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty pressure vessels should be returned to the supplier. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

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

Additional information

- DOT Classification** : **Limited quantity** Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.
Special provisions 19, T50
- TDG Classification** : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
ERAP Index 3000
Passenger Carrying Vessel Index Forbidden
Passenger Carrying Road or Rail Index Forbidden
Special provisions 29
- IATA** : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.
- Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 14. Transport information

Transport in bulk according to IMO instruments : Not available.

Section 15. Regulatory information

U.S. Federal regulations : TSCA 8(a) CDR Exempt/Partial exemption: Not determined
Clean Air Act (CAA) 112 regulated flammable substances: Isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

This product does not require a Safe Harbor warning under California Prop. 65.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Section 15. Regulatory information

Japan	: Japan inventory (CSCL): This material is listed or exempted. Japan inventory (ISHL): Not determined.
New Zealand	: This material is listed or exempted.
Philippines	: This material is listed or exempted.
Republic of Korea	: This material is listed or exempted.
Taiwan	: This material is listed or exempted.
Thailand	: This material is listed or exempted.
Turkey	: Not determined.
United States	: This material is active or exempted.
Viet Nam	: This material is listed or exempted.

Section 16. Other information

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

Health	/	1
Flammability		4
Physical hazards		3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment

History

Date of printing	: 1/8/2022
Date of issue/Date of revision	: 1/8/2022
Date of previous issue	: 10/7/2021
Version	: 3

Section 16. Other information

Key to abbreviations

- : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References

- : Not available.

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.

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

1.1 PRODUCT NAME:	KB-1[®] Primer
PRODUCT CODE:	N/A
CHEMICAL FAMILY NAME:	Mixture
U.N. NUMBER:	None
U.N. DANGEROUS GOODS CLASS:	Not Regulated
1.2 PRODUCT USE:	For preparation of anaerobic water for use in groundwater remediation. KB-1 [®] products are intended for laboratory research and field applications for groundwater remediation, and are not intended to be used as human or animal therapeutics, cosmetics, agricultural or pesticidal products, food additives, or as household chemicals.
1.3 SUPPLIER/MANUFACTURER'S NAME:	SiREM
ADDRESS:	130 Stone Road, West, Guelph, Ontario Canada N1G 3Z2
1.4 EMERGENCY PHONE:	519-515-0840
BUSINESS PHONE:	519-515-0840 (Product Information)
WEB SITE:	www.siremlab.com
1.5 DATE OF PREPARATION:	December 05, 2018
DATE OF LAST REVISION:	New

SECTION 2 - HAZARDS IDENTIFICATION**2.1 Classification of the mixture:**

This product does meet the definition of a hazardous substance or preparation as defined by 29 CFR 1910.1200 AND the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC, 2015/830/EU and subsequent Directives.

Component(s) Contributing to Classification(s)

L-Cysteine

2.2 GHS Label elements, including precautionary statements:**Pictogram(s):**

None applicable.

Signal Word:

Warning!

GHS Hazard Classification(s):

Acute Toxicity Category 5 (Oral) Hazard

Statement(s):

H303: May be harmful if swallowed

Prevention Statement(s):

None Applicable

Response Statement(s):

P312: Call a POISON CENTER/doctor if you feel unwell.

Storage Statement(s):

None Applicable

Disposal Statement(s):

None Applicable.

2.3 Other Hazards:

This mixture does not meet the criteria for PBT or vPvB in accordance with Annex VII.

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

3.1 Substances: Not applicable

3.2 Mixtures:

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	Index #	WT %	GHS CLASSIFICATION
L-Cysteine	52-90-4	200-158-2	Not Listed	1-10%	ACUTE TOX. CAT 4 (ORAL)
Balance of other ingredients are non-hazardous or hazardous below the applicable cut-off level.					

Additional Information: See SECTION 16 for full classification phrases.

SECTION 4 - FIRST-AID MEASURES

4.1 Description of 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 SDS 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.

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 SDS with the victim to the health professional.

4.2 Most important symptoms and effects, both acute and delayed:

May be harmful if swallowed. See section 11 for additional information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin problems may be aggravated by prolonged or repeated contact.

4.3 Indication of immediate medical attention and special treatment needed:

Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

5.1 Extinguishing media:

Use media suitable for surrounding area. Carbon dioxide, foam, dry chemical, halon, water spray.

5.2 Specific hazards arising from the chemical:

No data available for this product.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Not Sensitive

Minimum Ignition Energy (M.I.E.): No Data at this time

5.3 Special firefighting Procedure:

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.

SECTION 6 - ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures:**

No action shall be taken involving any personal risk or without suitable training. Do not touch or walk through spilled material. Avoid breathing dust. Provide adequate ventilation. Use appropriate respirator when ventilation is inadequate and use personal protective clothing as described in Section 8 of this safety data sheet. See section 11 for additional information on health hazards.

6.2 Environmental precautions:

No specific data available for this product.

6.3 Methods and material for containment and cleaning up:

Wear suitable protective clothing. Avoid dust formation. Avoid breathing dust. Carefully sweep up and remove. Place material in a dry container and cover. Remove from the area. Flush spill area with water. Do not let products enter drains. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE**7.1 Precautions for safe handling:**

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. Use in a well-ventilated location. Remove contaminated clothing immediately.

7.2 Conditions for safe storage, including any incompatibilities:

Store in a tightly sealed container in a cool, dry and well-ventilated place. Store away from direct light. Avoid generation of dust. Do not breathe dust. Wash thoroughly after handling. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing. Segregate from strong oxidizing agents, acids, bases.

7.3 Specific end uses:

See section 1.2.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION**8.1. Control parameters:**

EXPOSURE LIMITS/GUIDELINES: None established for this product.

8.2 Exposure Controls:

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: Generally not required under normal conditions of use. If method of use will result in significant dust generation, use in lab hood or under conditions of adequate ventilation.

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: 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 or chemical goggles as appropriate to prevent eye contact. 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

9.1 Information on basic physical and chemical properties:

PHYSICAL STATE:	Solid (Granules)
APPEARANCE:	White to off-white powder or granules
ODOR:	Odorless
ODOR THRESHOLD (PPM):	Not Available
pH:	6-8 (aqueous solution)
MELTING / FREEZING POINT (C°):	Not Available
BOILING POINT (C°):	Not Available
FLASH POINT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Available
FLAMMABILITY (solid, gas):	Not Available
FLAMMABLE LIMITS (in air by volume, %):	Not Available
VAPOR PRESSURE (mmHg):	Not Available
VAPOR DENSITY (AIR=1):	Not Available
RELATIVE DENSITY	2.4 to 2.6 g/cm ³ , depending on formulation
SOLUBILITY IN WATER (%)	Soluble
PARTITION COEFFICIENT: N-OCTANOL/WATER:	Not Available
AUTOIGNITION TEMPERATURE:	Not Available
DECOMPOSITION TEMPERATURE:	Not Available
VISCOSITY:	Not Available
EXPLOSIVE PROPERTIES:	Not Available
OXIDISING PROPERTIES:	Not Available

9.2 Other Information:

PACKING DENSITY:	Not Available
VOC:	Not Available

SECTION 10 - STABILITY and REACTIVITY

10.1 Reactivity: See section 10.5.

10.2 Chemical Stability: Product is stable.

10.3 Possibility of Hazardous Reactions: Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid: Contact with incompatibles, exposure to light, and moist air.

10.5 Incompatible materials: Strong oxidizing agents, bases.

10.6 Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, nitrogen oxides, sulfur oxides, potassium oxides.

SECTION 11 - TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects:

TOXICITY DATA:

L-Cysteine CAS# 52-90-4

Oral LD50 1890 mg/kg Rat

Oral LD50 660 mg/kg Mouse

11.1.2 Mixtures:

Acute toxicity	Acute Toxicity Category 5 (Oral)
Skin corrosion / irritation	Based on available data, the classification criteria are not met
Serious eye damage / irritation	Based on available data, the classification criteria are not met
Respiratory or skin sensitization	Based on available data, the classification criteria are not met
Germ cell mutagenicity	Based on available data, the classification criteria are not met
Carcinogenicity	Based on available data, the classification criteria are not met
Reproductive toxicity	Based on available data, the classification criteria are not met
STOT-single exposure	Based on available data, the classification criteria are not met
STOT-repeated exposure	Based on available data, the classification criteria are not met
Aspiration hazard	Based on available data, the classification criteria are not met

Other Information

POTENTIAL HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE:

EYE CONTACT: Eye exposure may produce irritation.

SKIN CONTACT: Prolonged or repeated skin exposure may cause irritation.

INHALATION HAZARDS: Inhalation of dusts may cause irritation.

INGESTION HAZARDS: May be harmful if swallowed. May cause gastrointestinal tract irritation.

CHRONIC: None Known

TARGET ORGANS:

ACUTE: Organs

CHRONIC: None Known

CARCINOGENICITY: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore are 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 skin and eyes.

SENSITIZATION OF PRODUCT: This product is not considered a skin sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

MUTAGENICITY INFORMATION: This product does not contain a component that is suspected to be a mutagenicity hazard.

SPECIFIC TARGET ORGAN TOXICITY – SINGLE EXPOSURE: Data not sufficient for classification.

SPECIFIC TARGET ORGAN TOXICITY – REPEATED EXPOSURE: Data not sufficient for classification.

ASPIRATION HAZARD: Not applicable

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.1 Toxicity:

No specific data available on this product.

12.2 Persistence and Degradability:

No specific data available on this product.

12.3 Bioaccumulative Potential:

No specific data available on this product.

12.4 Mobility in Soil:

No specific data available on this product.

12.5 Results of PBT and vPvB Assessment:

No specific data available on this product.

12.6 Other Adverse Effects:

No specific data available on this product.

12.7 Water Endangerment Class:

Not believed to be water endangering in accordance with EU Guideline 91/155-EWG. At present there are no ecotoxicological assessments for this product.

SECTION 13 - DISPOSAL CONSIDERATIONS**13.1 Waste Treatment Methods:**

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**14.1 Transport Information:****US DOT; IATA; IMO; ADR:**

THIS PRODUCT IS NOT CLASSIFIED AS DANGEROUS GOODS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: None

HAZARD CLASS NUMBER and DESCRIPTION: Not Regulated

UN IDENTIFICATION NUMBER: None

PACKING GROUP: None

DOT LABEL(S) REQUIRED: None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2016): None

MARINE POLLUTANT: This product does not contain ingredients that are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

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 SHIPPING and MARITIME DANGEROUS GOODS CODE SHIPPING INFORMATION (IMO / IMDG):

This product is not classified as Dangerous Goods.

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**15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture:****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: No

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 SDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as per WHMIS 2015 Hazardous 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: Components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPAN INDUSTRIAL SAFETY AND HEALTH LAW: This product has been classified per the Japan Industrial Safety and Health Law. See Section 2 for the GHS Classification.

KOREA ACT ON REGISTRATION AND EVALUATION OF CHEMICAL SUBSTANCES (K-REACH): This product has been classified per K-REACH. See Section 2 for the GHS Classification.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

15.2 Chemical Safety Assessment:

A chemical safety assessment has not been performed on this product.

SECTION 16 - OTHER INFORMATION

HMIS Rating (Scale 0-4)

Health hazard: 1
Flammability: 0
Physical Hazard: 0

NFPA Rating (Scale 0-4)

Health hazard: 1
Flammability: 0
Physical Hazard: 0

Caution: HMIS and NFPA ratings are based on a 0-4 rating scale

0= Minimal Hazard

1= Slight

2= Moderate

3= High

4= Extreme

Abbreviations and acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
CFR	Code of Federal Regulations
DOT	Federal Department of Transportation
GHS	The Globally Harmonized System of Classification and Labelling of Chemicals
HMIS	Hazardous Material Identification System
HCS	Hazard Communication Standard
IARC	International Agency for Research on Cancer
IATA	The International Air Transport Association
ICAO	The International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
LD50/LC50	Lethal Concentration/Dose, 50 percent
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health

PEL
SARA
TLV
TWA
Acute Tox
Skin Corr

OSHA Permissible Exposure Limit
Superfund Amendments and Reauthorization Act
ACGIH Threshold Limit Value
Time-Weighted Average
Acute Toxicity
Skin Corrosion

PREPARED BY: Chris Eigbrett

MSDS to GHS Compliance

History Log:

December 05, 2018

- Document creation

End of SDS Sheet

SAFETY DATA SHEET

1. CHEMICAL IDENTIFICATION AND COMPANY INFORMATION

Product Name: KB-1®
Company Info: SiREM
130 Stone Rd. W., Guelph, Ontario, Canada, N1G 3Z2
Phone: 519-822-2265
Toll Free, North America: 1-866-251-1747
Fax: 888-635-3470
www.siremlab.com

Emergency Phone Number: 519-822-2265 (for 24/7 assistance, contact poison center hotline in your jurisdiction).

Description: Microbial inoculum (non-pathogenic, non-hazardous) in growth media consisting of a dilute aqueous solution of mineral salts and nutrients.

Recommended Use: Bioremediation of contaminated groundwater.

Restrictions on Use: KB-1® product intended for laboratory research and field applications for cleanup of contaminated groundwater. Products are not intended to be used as human or animal therapeutics, cosmetics, agricultural or pesticide products, food additives, or as household chemicals.

2. HAZARDS IDENTIFICATION

GHS Classification: Not classified as "hazardous" per OSHA 29 CFR 1910.1200, "Hazard Communication".

GHS Label elements, including hazard and precautionary statements: Not Applicable.

HMIS Rating:	Health	Flammability	Physical Hazard	Personal Protection
	1	0	0	B*
NFPA Rating:	Health	Flammability	Reactivity	Special Hazard
	1	0	0	N/A

* B = Safety Glasses, Gloves.

A review of available data indicates minimal potential for health effects related to normal use of this product. Microbial components are non-pathogenic. The product is not expected to be a health hazard as a result of inhalation of mists, ingestion or skin contact. Eye contact may result in mild irritation/redness. Normal hygiene precautions should be observed, including eye protection, skin protection, and hand washing. The potential exists for individuals with hypersensitivity to biological materials to exhibit allergic sensitivity to biological components of this product (see Section 4, "First Aid Measures").

3. COMPOSITION/INFORMATION ON INGREDIENTS

KB-1® is a microbial culture grown in an aqueous dilute solution of mineral salts and nutrients classified as non-hazardous in accordance with provisions of OSHA 29 CFR 1910.1200, "Hazard Communication."

The microbial composition of KB-1®, as determined by phylogenetic analysis, includes:

Dehalococcoides sp.
Geobacter sp.
Methanomethylovorans sp.

Identification of organisms was obtained by matching 16S rRNA gene sequence of organisms in KB-1® to other known organisms. The characteristics of related organisms can be used to identify potential or likely characteristics of organisms in KB-1®.

4. FIRST AID MEASURES

Avoid direct contact with skin and eyes. In any case of any exposure which elicits a response, a physician should be consulted immediately.

Route of Entry	Symptoms	First Aid Procedures
Ingestion	Upset stomach, irritation of digestive tract.	Do not induce vomiting. Drink several cups of water. Seek medical attention.
Skin contact	Skin irritation – reddening, itching or inflammation.	Remove contaminated clothes. Wash skin with plenty of water and soap. Seek medical attention if irritation develops or open wounds are present.
Eye contact	Eye irritation – redness, tearing, blurred vision.	Rinse immediately with plenty of water for 15 – 20 minutes, lifting lower and upper eyelids occasionally (remove contact lenses if easily possible). Seek medical attention if undue irritation or redness occurs.
Inhalation of mist	Respiratory irritation, coughing, breathing difficulty.	Remove victim to fresh air. Administer first aid as appropriate for symptoms. Seek medical attention if serious symptoms occur.

5. FIRE FIGHTING MEASURES

General:	This material is non-flammable, consisting primarily of water, and poses no special hazards if involved in a fire situation.
Suitable extinguishing media:	If material is involved in fire situation, use extinguishing media suitable for surrounding fire.
Special protective equipment and precautions for firefighters:	No special equipment necessary; use equipment appropriate for surrounding fire.
Hazardous combustion products:	Not applicable.
Toxic gases produced:	Not applicable.
Shock/impact sensitivity:	Not shock sensitive.

6. ACCIDENTAL RELEASE MEASURES

Method of containment and cleanup:

Spilled KB-1® should be soaked up with sorbent and saturated with a 10% bleach solution (prepared by making a one in ten dilution of diluted standard bleach [normally sold at a strength of 5.25% sodium hypochlorite] to disinfect affected surfaces. Sorbent should be double bagged and disposed of as indicated in Section 13. After removal of sorbent, area should be washed with 10% bleach solution to disinfect. If liquid from the culture vessel is present on the fittings, non-designated tubing or exterior of the stainless steel pressure vessel liquid should be wiped off and the area washed with 10% bleach solution.

Ventilation:

No special ventilation is required in the event of the spill, as the material consists of water and non-volatile constituents. If the potential for generation of mist exists, open windows and provide adequate ventilation. If high levels of mist are encountered, use personal protective equipment indicated below.

Eye/skin protection:

Have eye-washing facilities readily available where eye contact can occur. Wash skin with soap and water. Use appropriate protective gloves when handling. Showering and changing into street clothes after work is recommended.

Protective equipment for airborne mist:

A NIOSH/MSHA approved dust mask or air purifying respirator with dust/mist filter is recommended where elevated concentrations of airborne mist are expected.

7. HANDLING AND STORAGE

Handling and storage precautions:

Use personal protective equipment (eye & skin protection) and hygiene measures (hand washing) to minimize contact with the material.

KB-1® is shipped in stainless steel pressure vessels and connected to injection lines and inert gas is used to pressurize the vessel to displace the contents. KB-1® should be handled with care to avoid any spillage. Vessels are shipped with 1 to 5 pound per square inch (psi) pressure; valves should not be opened until connections to appropriate lines for subsurface injection are in place.

During storage, avoid exposing stainless steel pressure vessels to undue temperature extremes (i.e., temperatures less than 0°C or greater than 30°C may result in harm to the microbial cultures and damage to the vessels). All valves should be in the closed position when the vessel is not pressurized to prevent the escape of gases and to maintain anaerobic conditions in the vessel.

KB-1® culture can be stored at room temperature (20-24°C) for up to 3 weeks, and in cold storage (4-10°C) for up to 2 months.

Incompatibilities:

Avoid exposure of the culture to air as the presence of oxygen will kill the microbes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OSHA Permissible Exposure Limits (PELs):	No occupational exposure limits are established for microbial constituents. Mixture is not classified as “hazardous” in accordance with 29 CFR 1910.1200 “Hazard Communication,” exceedance of exposure limits is not anticipated either under normal conditions of use, or as the result of an accidental release.
ACHIH Threshold Limit Values (TLVs):	
Engineering controls:	Generally not required under normal conditions of use. If method of use will result in significant mist generation, use under conditions of adequate ventilation.
Work practices:	Use good hygiene practices, avoid mist generation, and minimize contact with the material as a general precautionary measure.
Personal protective equipment:	Under normal conditions of use, wear safety glasses, protective gloves (latex, vinyl or nitrile) and steel toed footwear as general precautionary measures, particularly when opening pressure vessel valves or when pressurizing vessels to inject contents into the subsurface environment. For laboratory use, also wear lab coat. For higher risk of eye contact, wear safety goggles or face shield, as appropriate. Respiratory protection is not required under normal conditions of use (see Section 6, “Accidental Release Measures.”

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, physical state:	Aqueous liquid, dark grey, slightly turbid under anaerobic conditions, pink if exposed to air (oxygen).
Odor:	Pungent (“skunky”) odor.
Solubility:	Soluble in water.
pH:	6.5 – 7.5
Melting range	Not determined, approximately equivalent to water.
Vapor density:	Not determined, approximately equivalent to water.
Vapor pressure:	Not determined, approximately equivalent to water.
Relative density:	Not determined, approximately equivalent to water.
Evaporation rate:	Not determined, approximately equivalent to water.
Initial Boiling point, boiling range	Not determined, approximately equivalent to water.
Flammability	Not flammable.
Partition coefficient	Not applicable
Auto-ignition temperature	Not applicable
Decomposition temperature:	No data, bacterial contents will decompose by heating.
Flash point	N/A

10. STABILITY AND REACTIVITY

Chemical stability and reactivity:	Stable and non-reactive.
Possibility of hazardous reactions:	Stable. Spontaneous hazardous chemical reactions / decomposition will not occur.
Conditions to avoid:	Maintain under anaerobic conditions to preserve product integrity (exposure to air/oxygen will kill microbes).
Incompatible materials:	Strong oxidizers, acids, water reactive materials.
Hazardous decomposition products:	Not applicable.
Shock sensitivity:	Not shock sensitive; will not decompose and form shock sensitive compounds.

11. TOXICOLOGICAL INFORMATION

Potential for pathogenicity: KB-1® has tested **negative** (i.e., the organisms are not present) for a variety of pathogenic organisms indicated below:

Pathogenic Organisms	Disease(s) Caused	Test Results
<i>Salmonella sp.</i>	<i>Typhoid fever, gastroenteritis</i>	Not Detected
<i>Listeria monocytogenes</i>	<i>Listerioses</i>	"
<i>Vibrio sp.,</i>	<i>Cholera, gastroenteritis</i>	"
<i>Campylobacter sp.,</i>	<i>Bacterial diarrhea</i>	"
<i>Clostridia sp.,</i>	<i>Food poisoning, botulism, tetanus, gas gangrene</i>	"
<i>Bacillus anthracis</i>	<i>Anthrax</i>	"
<i>Pseudomonas aeruginosa</i>	<i>Wound infection</i>	"
<i>Yersinia sp.,</i>	<i>Bubonic plague, intestinal infection</i>	"
<i>Yeast and Mold</i>	<i>Candidiasis, yeast infection etc.</i>	"
<i>Fecal coliforms</i>	<i>Indicator organisms for many human pathogens diarrhea, urinary tract infections</i>	"
<i>Enterococci</i>	<i>Various opportunistic infections</i>	"

While there is no evidence that virulent pathogenic organisms are present in KB-1®, there is potential that certain organisms in KB-1® may have the potential to act as opportunistic (mild) pathogens, particularly in individuals with open wounds and/or compromised immune systems. For this reason standard hygienic procedures such as hand washing after use should be observed.

12. ECOLOGICAL INFORMATION

This product is not rated as “hazardous” as either an acute or chronic ecological hazard, in accordance with the OSHA Hazard Communication standard, 29 CFR 1910.1200.

13. DISPOSAL CONSIDERATION

Material must be disinfected or sterilized prior to disposal. Consult local regulations prior to disposal.

14. TRANSPORT INFORMATION

U.S. (D.O.T.):	Proper Shipping Name:	Culture of Micro-organisms
	Hazard Class:	Not applicable
	UN/NA:	Not applicable
	Labels:	Not applicable

Canada (T.D.G.)	Proper Shipping Name:	Culture of Micro-organisms
	Hazard Class:	Not applicable
	UN/NA:	Not applicable
	Labels:	Not applicable

International: IMDG:	Proper Shipping Name:	Culture of Micro-organisms
	Hazard Class:	Not applicable
	UN/NA:	Not applicable
	Labels:	Not applicable

IATA:	Proper Shipping Name:	Culture of Micro-organisms
	Hazard Class:	Not applicable
	UN/NA:	Not applicable
	Labels:	Not applicable

15. REGULATORY INFORMATION

TSCA:	No

SARA TITLE III	
Section 302 (EHS) Ingredients:	No
Section 313 Ingredients:	No
Section 304 (EHS/CERCLA) Ingredients:	No

SARA TITLE III NOTIFICATION INFORMATION	
Acute Health Hazard:	No
Chronic Health Hazard:	No
Fire Hazard:	No
Sudden Release of Pressure Hazard:	No

16. OTHER INFORMATION

SiREM provides the information contained herein for hazard communication and safety planning purposes, based on existing information on each of the product components available in the literature; no

independent testing was conducted on the final product. The above information is intended to be used only as a guide to the appropriate precautionary handling of this material by a properly trained person.

SAFETY DATA SHEET

Creation Date 27-Apr-2009

Revision Date 19-Dec-2025

Revision Number 13

This safety data sheet was created pursuant to the requirements of: US OSHA Hazard Communication Standard 2024 (29 CFR 1910.1200)

1. Identification

Product Name	Methanol
Cat No. :	AC423950000; AC423950010; AC423950025; AC423950040; AC423950200; AC423950250; AC423955000
CAS No	67-56-1
Synonyms	Methyl alcohol
Recommended Use	Laboratory chemicals.
Uses advised against	.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number

For information **US** call: 001-800-227-6701 / **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 according to [US] OSHA (29 CFR 1910.1200, 2024)

Flammable liquids	Category 2
Acute oral toxicity	Category 3
Acute dermal toxicity	Category 3
Acute Inhalation Toxicity - Vapors	Category 3
Specific target organ toxicity (single exposure)	Category 1
Target Organs - Optic nerve, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Liver, spleen, Blood.	

Label Elements

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor

Causes damage to organs

Causes damage to organs through prolonged or repeated exposure

Toxic if swallowed, in contact with skin or if inhaled

**Precautionary Statements****Prevention**

Wash face, hands and any exposed skin thoroughly after handling

Do not eat, drink or smoke when using this product

Wear protective gloves/protective clothing/eye protection/face protection

Use only outdoors or in a well-ventilated area

Do not breathe dust/fume/gas/mist/vapors/spray

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking

Keep container tightly closed

Ground and bond container and receiving equipment

Use explosion-proof electrical/ventilating/lighting equipment

Keep cool

Take action to prevent static discharges

Use non-sparking tools

Response

IF exposed: Call a POISON CENTER or doctor

Inhalation

IF INHALED: Remove person to fresh air and keep comfortable for breathing

Call a POISON CENTER or doctor

Skin

Call a POISON CENTER or doctor if you feel unwell

Take off contaminated clothing and wash before reuse

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor

Rinse mouth

FireIn case of fire: Use CO₂, dry chemical, or foam to extinguish**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)**Hazards classified under paragraph (d)(1)(ii) of 1910.1200**

No information available

Other hazards

Poison, may be fatal or cause blindness if swallowed. Vapor harmful. CANNOT BE MADE NON-POISONOUS.

WARNING. Reproductive Harm - <https://www.p65warnings.ca.gov/>.

3. Composition/information on Ingredients

Component	CAS No	Weight %
Methyl alcohol	67-56-1	>95

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. Immediate medical attention is required.
Inhalation	Remove to fresh air. 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. Immediate medical attention is required.
Ingestion	Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	Difficulty in breathing. May cause blindness: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Water spray, carbon dioxide (CO ₂), dry chemical, alcohol-resistant foam. Water mist may be used to cool closed containers.
Unsuitable Extinguishing Media	Water may be ineffective
Flash Point	10 °C / 50 °F
Method -	CC (closed cup) Abel-Pensky (DIN 51755) Directive 84/449/EEC, A.9
Autoignition Temperature	455 °C / 851 °F
Explosion Limits	
Upper	31.00 vol %
Lower	6.0 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Vapors may form explosive mixtures with air.

Hazardous Combustion Products

Carbon monoxide (CO). Formaldehyde.

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
2Flammability
3Instability
0Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Use personal protective equipment as required. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Should not be released into the environment. See Section 12 for additional Ecological Information.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and Storage

Handling	Wear personal protective equipment/face protection. Do not breathe mist/vapors/spray. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not ingest. If swallowed then seek immediate medical assistance. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.
Storage.	Keep container tightly closed in a dry and well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition. Flammables area. Incompatible Materials. Strong oxidizing agents. Strong acids. Acid anhydrides. Acid chlorides. Strong bases. Metals. Peroxides.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Methyl alcohol	TWA: 200 ppm STEL: 250 ppm Skin	(Vacated) TWA: 200 ppm (Vacated) TWA: 260 mg/m ³ (Vacated) STEL: 250 ppm (Vacated) STEL: 325 mg/m ³ Skin TWA: 200 ppm TWA: 260 mg/m ³	IDLH: 6000 ppm REL = 200 ppm (TWA) REL = 260 mg/m ³ (TWA) STEL: 250 ppm STEL: 325 mg/m ³	TWA: 200 ppm STEL: 250 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures	Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory Protection	Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if

exposure limits are exceeded or if irritation or other symptoms are experienced.

Recommended Filter type: low boiling organic solvent. Type AX. Brown. conforming to EN371.

Hygiene Measures When using do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing.

9. Physical and chemical properties

Appearance

Physical State

Color

Odor

Odor Threshold

Property

Melting Point/Range

Softening Point

Boiling Point/Range

Flash Point

Liquid

Colorless

Alcohol-like

No information available

Values

-98 °C / -144.4 °F

No data available

64.7 °C / 148.5 °F

10 °C / 50 °F

Remarks

• Method

@ 760 mmHg

Method - CC (closed cup) Abel-Pensky (DIN 51755) Directive 84/449/EEC, A.9

On basis of test data

Liquid

Flammability (liquid)

Flammability (solid,gas)

Explosion Limits

Highly flammable

Not applicable

Lower 6 vol%

Upper 31 vol%

455 °C / 851 °F

Autoignition Temperature

Decomposition Temperature

pH

Viscosity

Water Solubility

Solubility in other solvents

Partition Coefficient (n-octanol/water)

Component

Methyl alcohol

Vapor Pressure

Density / Specific Gravity

Bulk Density

Vapor Density

Particle characteristics

No data available

No information available

0.55 cP at 20 °C

Miscible

No information available

log Pow

-0.74

128 hPa @ 20 °C

0.791

Not applicable

1.11

Not applicable (liquid)

Liquid

(Air = 1.0)

Other Information

Molecular Formula

Molecular Weight

VOC Content(%)

Explosive Properties

Evaporation Rate

Surface tension

C H4 O

32.04

100

Not explosive Vapors may form explosive mixtures with air

5.2 (ether = 1)

0.02255 N/m @ 20°C

10. Stability and reactivity

Reactive Hazard

None known, based on information available

Stability

Stable under normal conditions.

Conditions to Avoid

Incompatible products. Heat, flames and sparks. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials

Strong oxidizing agents, Strong acids, Acid anhydrides, Acid chlorides, Strong bases,

Metals, Peroxides

Hazardous Decomposition Products Carbon monoxide (CO), Formaldehyde**Hazardous Polymerization** Hazardous polymerization does not occur.**Hazardous Reactions** None under normal processing.

11. Toxicological information

Information on expected route of exposure

Inhalation Avoid breathing vapors or mists. Harmful by inhalation.
Ingestion May be harmful if swallowed.
Eyes Avoid contact with eyes.
Skin Avoid contact with skin. Prolonged skin contact may defat the skin and produce dermatitis. Harmful in contact with skin.

Toxicology data for the components

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methyl alcohol	LD50 = 1187 – 2769 mg/kg (Rat)	LD50 = 17100 mg/kg (Rabbit)	LC50 = 128.2 mg/L (Rat) 4 h

Toxicologically Synergistic Products Ethanol**(b) skin corrosion/irritation;** Based on available data, the classification criteria are not met**(c) serious eye damage/irritation;** Based on available data, the classification criteria are not met

(d) respiratory or skin sensitization;
Respiratory Based on available data, the classification criteria are not met
Skin Based on available data, the classification criteria are not met

Component	Test method	Test species	Study result
Methyl alcohol 67-56-1 (>95)	OECD Test Guideline 406 Guinea Pig Maximisation Test (GPMT)	guinea pig	non-sensitising

(e) germ cell mutagenicity; Based on available data, the classification criteria are not met

(f) carcinogenicity; Based on available data, the classification criteria are not met
 The table below indicates whether each agency has listed any ingredient as a carcinogen

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Methyl alcohol	67-56-1	Not listed	Not listed	Not listed	Not listed	Not listed

(g) reproductive toxicity; Based on available data, the classification criteria are not met

Component	Test method	Test species / Duration	Study result
Methyl alcohol 67-56-1 (>95)	OECD Test Guideline 416	Rat / Inhalation 2 Generation	NOAEC = 1.3 mg/l (air)

Developmental Effects Component substance is listed on California Proposition 65 as a developmental hazard.**(h) STOT-single exposure;** Category 1**Results / Target organs** Optic nerve, Central nervous system (CNS).

(i) STOT-repeated exposure;	Based on available data, the classification criteria are not met
Target Organs	None known.
(j) aspiration hazard;	Based on available data, the classification criteria are not met
Symptoms / effects, both acute and delayed	May cause blindness. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.
Other Adverse Effects	The toxicological properties have not been fully investigated.
Endocrine Disrupting Properties	This product does not contain any known or suspected endocrine disruptors.

12. Ecological information

Ecotoxicity

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Methyl alcohol	Not listed	Pimephales promelas: LC50 > 10000 mg/L 96h	EC50 = 39000 mg/L 25 min EC50 = 40000 mg/L 15 min EC50 = 43000 mg/L 5 min	EC50 > 10000 mg/L 24h

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Methyl alcohol	-0.74

13. Disposal considerations

Waste Disposal Methods Should not be released into the environment.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Methyl alcohol - 67-56-1	U154	-

14. Transport information

DOT

UN-No	UN1230
Proper Shipping Name	METHANOL
Hazard Class	3
Packing Group	II

TDG

UN-No	UN1230
Proper Shipping Name	METHANOL
Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II

IATA

UN-No	UN1230
Proper Shipping Name	METHANOL
Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II

IMDG/IMO

UN-No	UN1230

Proper Shipping Name METHANOL
Hazard Class 3
Subsidiary Hazard Class 6.1
Packing Group II

15. Regulatory Information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Methyl alcohol	67-56-1	X	ACTIVE	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT) Not applicable

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Methyl alcohol	67-56-1	X	-	200-659-6	X	X	X	X	X	KE-23193

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Component	CAS No	Weight %	SARA 313 - Threshold Values %	SARA 313 - Reporting thresholds
Methyl alcohol	67-56-1	>95	1.0 %	-

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act) Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Methyl alcohol	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) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355).

Component	Hazardous Substances RQs	CERCLA Extremely Hazardous Substances RQs	SARA Reportable Quantity (RQ)
Methyl alcohol	5000 lb	-	5000 lb 2270 kg

California Proposition 65

This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Methyl alcohol	67-56-1	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Methyl alcohol	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**

Serious risk, Grade 3

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Methyl alcohol	67-56-1	-	Use restricted. See entry 69. (see link for restriction details) Use restricted. See entry 75. (see link for restriction details)	-

REACH links<https://echa.europa.eu/substances-restricted-under-reach>**Safety, health and environmental regulations/legislation specific for the substance or mixture**

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Methyl alcohol	67-56-1	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?

Not applicable

Other International Regulations

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Methyl alcohol	67-56-1	500 tonne	5000 tonne	Not applicable	Not applicable

16. Other Information

Prepared By	Product stewardship (Regulatory Affairs) Thermo Fisher Scientific email - begel.sdsdesk@thermofisher.com
Creation Date	27-Apr-2009
Revision Date	19-Dec-2025
Print Date	19-Dec-2025
Revision Summary	Updated to the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) which published its Final Rule in the Federal Register revising the Hazard Communication Standard (HCS/HazCom), 29 CFR 1910.1200 (2024) (HCS §1910.1200, 2024), May 20, 2024, effective July 19, 2024.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 12-Mar-2009

Revision Date 18-Dec-2025

Revision Number 12

This safety data sheet was created pursuant to the requirements of: US OSHA Hazard Communication Standard 2024 (29 CFR 1910.1200)

1. Identification

Product Name Nitric acid (65 - 70%)

Cat No. : AC124650000; AC124650010; AC124650011; AC124650025; 124650026

CAS No 7697-37-2

Synonyms Azotic acid; Engraver's acid; Aqua fortis

Recommended Use Laboratory chemicals.

Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number

For information **US** call: 001-800-227-6701 / **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

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 according to [US] OSHA (29 CFR 1910.1200, 2024)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Acute Inhalation Toxicity - Vapors	Category 3
Skin Corrosion/Irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1

Label Elements

Signal Word

Danger

Hazard Statements

May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage
Toxic if inhaled
Corrosive to the respiratory tract

**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, hot surfaces, sparks, open flames and other ignition sources. No smoking
Keep away from clothing and other combustible materials
Take any precaution to avoid mixing with combustibles
Keep only in original packaging
Wear respiratory protection

Response

Immediately call a POISON CENTER or doctor

Inhalation

IF INHALED: Remove person to fresh air and keep comfortable for breathing
Immediately call a POISON CENTER or doctor

Skin

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower
Take off contaminated clothing and wash before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Ingestion

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

Fire

In case of fire: Use CO₂, dry chemical, or foam to extinguish

Spills

Absorb spillage to prevent material damage

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in a dry place

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Corrosive to the respiratory tract

Hazards classified under paragraph (d)(1)(ii) of 1910.1200

No information available

3. Composition/information on Ingredients

Component	CAS No	Weight %

Nitric acid ...% [C ≤ 70 %]	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 and gloves, including the inside, 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 and 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 (NO_x). 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
4Flammability
0Instability
0Physical hazards
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 as required.

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. Wear self-contained breathing apparatus and protective suit.

7. Handling and Storage

Handling

Use only under a chemical fume hood. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing. Do not ingest. If swallowed then seek immediate medical assistance. Do not breathe mist/vapors/spray. Keep away from clothing and other combustible materials.

Storage.

Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store near combustible materials. Do not store in metal containers. Keep in properly labeled containers. Corrosives area. Incompatible Materials. Combustible material. Strong bases. Reducing Agent. Metals. Finely powdered metals. Organic materials. Aldehydes. Alcohols. Cyanides. Ammonia. Strong reducing agents.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Nitric acid ...% [C ≤ 70 %]	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m ³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m ³ TWA: 2 ppm TWA: 5 mg/m ³	IDLH: 25 ppm REL = 2 ppm (TWA) REL = 5 mg/m ³ (TWA) STEL: 4 ppm STEL: 10 mg/m ³	TWA: 2 ppm STEL: 4 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures

Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. 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. Tight sealing safety goggles. Face protection shield.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Recommended Filter type: Particulates filter conforming to EN 143. or. Acid gases filter. Type E. Yellow. conforming to EN14387.

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 or clothing. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Appearance

Physical State

Liquid

Color

Clear Colorless, Light yellow

Odor

Strong Acrid

Odor Threshold

No information available

Property

Values

Remarks

• Method

Melting Point/Range

-41 °C / -41.8 °F

Softening Point

No data available

Boiling Point/Range

Not applicable

Flash Point

Not applicable

Method - No information available

Flammability (liquid)

No data available

Flammability (solid,gas)

Not applicable

Liquid

Explosion Limits

No data available

Autoignition Temperature

No data available

Decomposition Temperature

No data available

pH

< 1.0

(0.1M)

Viscosity

No data available

Water Solubility

Miscible

Solubility in other solvents

No information available

Partition Coefficient (n-octanol/water)

Component

log Pow

Nitric acid ...% [C ≤ 70 %]

-2.3

Vapor Pressure

0.94 kPa (20°C)

Density / Specific Gravity

1.40

Bulk Density

Not applicable

Liquid

Vapor Density

No data available

(Air = 1.0)

Particle characteristics

Not applicable (liquid)

Other Information

Molecular Formula

HNO₃

Molecular Weight

63.01

Oxidizing Properties

Oxidizer

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 Agent, Metals, Finely powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents

Hazardous Decomposition Products Nitrogen oxides (NO_x), 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

Information on expected route of exposure

Inhalation Causes severe burns. May be harmful if inhaled. May cause pulmonary edema. Harmful by inhalation.

Ingestion Ingestion causes burns of the upper digestive and respiratory tracts. May be harmful if swallowed. Can burn mouth, throat, and stomach. Harmful if swallowed.

Eyes Causes severe burns. May cause blindness or permanent eye damage. Causes burns. Corrosive to the eyes and may cause severe damage including blindness. Risk of serious damage to eyes.

Skin Causes severe burns. May be harmful in contact with skin. Causes burns.

Toxicology data for the components

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid ...% [C ≤ 70 %]	-	-	LC50 = 2500 ppm. (Rat) 1h
Water	-	-	-

Toxicologically Synergistic Products No information available

(b) skin corrosion/irritation; Category 1 A

(c) serious eye damage/irritation; Category 1

(d) respiratory or skin sensitization;

Respiratory
Skin

Based on available data, the classification criteria are not met
Based on available data, the classification criteria are not met

(e) germ cell mutagenicity; Based on available data, the classification criteria are not met

(f) carcinogenicity; Based on available data, the classification criteria are not met

The table below indicates whether each agency has listed any ingredient as a carcinogen

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Nitric acid ...% [C ≤ 70 %]	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

(g) reproductive toxicity; Based on available data, the classification criteria are not met

(h) STOT-single exposure; Based on available data, the classification criteria are not met

(i) STOT-repeated exposure; Based on available data, the classification criteria are not met

Target Organs

None known.

(j) aspiration hazard;	Based on available data, the classification criteria are not met
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.
Other Adverse Effects	The toxicological properties have not been fully investigated.
Endocrine Disrupting Properties	This product does not contain any known or suspected endocrine disruptors.

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

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 ...% [C ≤ 70 %]	-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

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Nitric acid ...% [C ≤ 70 %]	7697-37-2	X	ACTIVE	-
Water	7732-18-5	X	ACTIVE	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

- - Not Listed

TSCA - Per 40 CFR 751, Regulation of Certain Chemical Substances & Mixtures, Under TSCA Section 6(h) (PBT)

Not applicable

TSCA 12(b) - Notices of Export

Not applicable

International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Nitric acid ...% [C ≤ 70 %]	7697-37-2	X	-	231-714-2	X	X	X	X	X	KE-25911
Water	7732-18-5	X	-	231-791-2	X	X		X	X	KE-35400

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)**U.S. Federal Regulations****SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Component	CAS No	Weight %	SARA 313 - Threshold Values %	SARA 313 - Reporting thresholds
Nitric acid ...% [C ≤ 70 %]	7697-37-2	65 - 70	1.0 %	-

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid ...% [C ≤ 70 %]	X	1000 lb	-	-

Clean Air Act

Not applicable

OSHA - Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid ...% [C ≤ 70 %]	-	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) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355).

Component	Hazardous Substances	CERCLA Extremely	SARA Reportable Quantity

	RQs	Hazardous Substances RQs	(RQ)
Nitric acid ...% [C ≤ 70 %]	1000 lb	1000 lb	1000 lb 454 kg

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 ...% [C ≤ 70 %]	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:

Legend - STQs = Screening Threshold Quantities, APA = A placarded amount

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid ...% [C ≤ 70 %]	Release STQs - 15000lb Theft STQs - 400lb

Other International Regulations**Mexico - Grade**

No information available

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Nitric acid ...% [C ≤ 70 %]	7697-37-2	-	Use restricted. See entry 75. (see link for restriction details)	-
Water	7732-18-5	-	-	-

REACH links<https://echa.europa.eu/substances-restricted-under-reach>**Safety, health and environmental regulations/legislation specific for the substance or mixture**

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Nitric acid ...% [C ≤ 70 %]	7697-37-2	Listed	Not applicable	Not applicable	Not applicable
Water	7732-18-5	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?

Not applicable

Other International Regulations

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Nitric acid ...% [C ≤ 70 %]	7697-37-2	Not applicable	Not applicable	Not applicable	Annex I - Y34
Water	7732-18-5	Not applicable	Not applicable	Not applicable	Not applicable

16. Other Information

Prepared By	Product stewardship (Regulatory Affairs) Thermo Fisher Scientific email - begel.sdsdesk@thermofisher.com
Creation Date	12-Mar-2009
Revision Date	18-Dec-2025
Print Date	18-Dec-2025
Revision Summary	Updated to the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) which published its Final Rule in the Federal Register revising the Hazard Communication Standard (HCS/HazCom), 29 CFR 1910.1200 (2024) (HCS §1910.1200, 2024), May 20, 2024, effective July 19, 2024.

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

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: July 29, 2020

1 Identification

- **Product identifier**
- **Trade name:** ORP Standard, 240mV
- **Product code:** OR4240SS
- **Recommended use and restriction on use**
- **Recommended use:** Laboratory chemicals
- **Restrictions on use:** No relevant information available.
- **Details of the supplier of the Safety Data Sheet**
- **Manufacturer/Supplier:**
AquaPhoenix Scientific, Inc.
860 Gitts Run Road
Hanover, PA 17331 USA
Tel +1 (717)632-1291
Toll-Free: (866)632-1291
info@aquaphoenixsci.com
- **Distributor:**
AquaPhoenix Scientific
860 Gitts Run Road,
Hanover, PA 17331
(717) 632-1291
- **Emergency telephone number:**
ChemTel Inc.
(800)255-3924 (North America)
+1 (813)248-0585 (International)

2 Hazard(s) identification

- **Classification of the substance or mixture**
The product is not classified as hazardous according to the Globally Harmonized System (GHS).
- **Label elements**
- **GHS label elements** Not regulated.
- **Hazard pictograms:** Not regulated.
- **Signal word:** None.
- **Hazard statements:** Not regulated.
- **Other hazards** There are no other hazards not otherwise classified that have been identified.

3 Composition/information on ingredients

- **Chemical characterization:** Mixtures

- **Components:**

7732-18-5	Water	>90%
7447-40-7	Potassium chloride Eye Irrit. 2B, H320	<1%
13746-66-2	tripotassium hexacyanoferrate ⚠ Skin Irrit. 2, H315; Eye Irrit. 2A, H319	<1%
14459-95-1	Potassium ferrocyanide	<1%

(Cont'd. on page 2)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: July 29, 2020

Trade name: ORP Standard, 240mV

(Cont'd. of page 1)

· **Additional information:**

For the listed ingredient(s), the identity and/or exact percentage(s) are being withheld as a trade secret.
For the wording of the listed Hazard Statements, refer to section 16.

4 First-aid measures

· **Description of first aid measures**

· **After inhalation:** Supply fresh air; consult doctor in case of complaints.

· **After skin contact:**

Wash with soap and water.

If skin irritation is experienced, consult a doctor.

· **After eye contact:**

Remove contact lenses if worn.

Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

· **After swallowing:**

Rinse out mouth and then drink plenty of water.

Do not induce vomiting; immediately call for medical help.

· **Most important symptoms and effects, both acute and delayed:**

Gastric or intestinal disorders when ingested.

Nausea in case of ingestion.

· **Indication of any immediate medical attention and special treatment needed:**

If medical advice is needed, have product container or label at hand.

5 Fire-fighting measures

· **Extinguishing media**

· **Suitable extinguishing agents:**

The product is not flammable.

Use fire fighting measures that suit the environment.

· **For safety reasons unsuitable extinguishing agents:** No relevant information available.

· **Special hazards arising from the substance or mixture**

Formation of toxic gases is possible during heating or in case of fire.

· **Advice for firefighters**

· **Protective equipment:**

Wear self-contained respiratory protective device.

Wear fully protective suit.

6 Accidental release measures

· **Personal precautions, protective equipment and emergency procedures**

Ensure adequate ventilation.

For large spills, wear protective clothing.

· **Environmental precautions** No special measures required.

· **Methods and material for containment and cleaning up**

Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).

Clean the affected area carefully; suitable cleaners are:

Warm water

(Cont'd. on page 3)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: July 29, 2020

Trade name: ORP Standard, 240mV

(Cont'd. of page 2)

Send for recovery or disposal in suitable receptacles.

· **Reference to other sections**

See Section 7 for information on safe handling.

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

7 Handling and storage

· **Handling**

· **Precautions for safe handling:**

Prevent formation of aerosols.

Avoid splashes or spray in enclosed areas.

Use only in well ventilated areas.

· **Information about protection against explosions and fires:** No special measures required.

· **Conditions for safe storage, including any incompatibilities**

· **Requirements to be met by storerooms and receptacles:**

Store in cool, dry conditions in well sealed receptacles.

· **Information about storage in one common storage facility:** Store away from foodstuffs.

· **Specific end use(s)** No relevant information available.

8 Exposure controls/personal protection

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**

The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.

13746-66-2 tripotassium hexacyanoferrate

PEL (USA)	Long-term value: 5 mg/m ³ as CN; Skin
REL (USA)	Long-term value: 1 mg/m ³ as Fe
TLV (USA)	Long-term value: 1 mg/m ³ as Fe
LMPE (Mexico)	Long-term value: 1 mg/m ³ como Fe

· **Exposure controls**

· **General protective and hygienic measures:**

The usual precautionary measures for handling chemicals should be followed.

Keep away from foodstuffs, beverages and feed.

Immediately remove all soiled and contaminated clothing.

Wash hands and face after working with the substance.

Do not inhale dust / smoke / mist.

Avoid contact with the eyes and skin.

· **Engineering controls:** No relevant information available.

· **Breathing equipment:**

Use suitable respiratory protective device when aerosol or mist is formed.

(Cont'd. on page 4)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: July 29, 2020

Trade name: ORP Standard, 240mV

(Cont'd. of page 3)

For spills, respiratory protection may be advisable.

· **Protection of hands:**



Protective gloves

· **Eye protection:**



Safety glasses

Follow relevant national guidelines concerning the use of protective eyewear.

· **Body protection:**

Protective work clothing

Protection may be required for spills.

· **Limitation and supervision of exposure into the environment** No special requirements.

· **Risk management measures** No special requirements.

9 Physical and chemical properties

· **Information on basic physical and chemical properties**

· **Appearance:**

Form: Liquid

Color: Not determined.

· **Odor:** Not determined.

· **Odor threshold:** Not determined.

· **pH-value:** Not determined.

· **Melting point/Melting range:** Not determined.

· **Boiling point/Boiling range:** 105-110 °C (221-166 °F)

· **Flash point:** The product is not flammable.

· **Flammability (solid, gaseous):** Not applicable.

· **Auto-ignition temperature:** Not determined.

· **Decomposition temperature:** Not determined.

· **Danger of explosion:** Product does not present an explosion hazard.

· **Explosion limits**

Lower: Not determined.

Upper: Not determined.

· **Oxidizing properties:** Not determined.

· **Vapor pressure:** Not determined.

· **Density:**

Relative density: Not determined.

Vapor density: Not determined.

Evaporation rate: Not determined.

(Cont'd. on page 5)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: July 29, 2020

Trade name: ORP Standard, 240mV

(Cont'd. of page 4)

· Solubility in / Miscibility with Water:	Soluble.
· Partition coefficient (n-octanol/water):	Not determined.
· Viscosity	
Dynamic:	Not determined.
Kinematic:	Not determined.
· Other information	No relevant information available.

10 Stability and reactivity

- **Reactivity:** No relevant information available.
- **Chemical stability:** Stable under normal temperatures and pressures.
- **Thermal decomposition / conditions to be avoided:**
No decomposition if used and stored according to specifications.
To avoid thermal decomposition, do not overheat.
- **Possibility of hazardous reactions**
Toxic fumes may be released if heated above the decomposition point.
Reacts with strong alkali.
Contact with acids releases toxic gases.
Reacts with strong oxidizing agents.
- **Conditions to avoid** Excessive heat.
- **Incompatible materials** Oxidizers, strong bases, strong acids
- **Hazardous decomposition products**
Under fire conditions only:
Toxic metal oxide smoke
Chlorine
Hydrogen cyanide (prussic acid)

11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:** Based on available data, the classification criteria are not met.
- **LD/LC50 values that are relevant for classification:** None.
- **Primary irritant effect:**
- **On the skin:** Based on available data, the classification criteria are not met.
- **On the eye:** Based on available data, the classification criteria are not met.
- **Sensitization:** Based on available data, the classification criteria are not met.

· IARC (International Agency for Research on Cancer):

None of the ingredients are listed.

· NTP (National Toxicology Program):

None of the ingredients are listed.

· OSHA-Ca (Occupational Safety & Health Administration):

None of the ingredients are listed.

(Cont'd. on page 6)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: July 29, 2020

Trade name: ORP Standard, 240mV

(Cont'd. of page 5)

- **Probable route(s) of exposure:**
Ingestion.
Inhalation.
Eye contact.
Skin contact.
- **Germ cell mutagenicity:** Based on available data, the classification criteria are not met.
- **Carcinogenicity:** Based on available data, the classification criteria are not met.
- **Reproductive toxicity:** Based on available data, the classification criteria are not met.
- **STOT-single exposure:** Based on available data, the classification criteria are not met.
- **STOT-repeated exposure:** Based on available data, the classification criteria are not met.
- **Aspiration hazard:** Based on available data, the classification criteria are not met.

12 Ecological information

- **Toxicity**
- **Aquatic toxicity** The product contains materials that are harmful to the environment.
- **Persistence and degradability** No relevant information available.
- **Bioaccumulative potential:** No relevant information available.
- **Mobility in soil:** No relevant information available.
- **Additional ecological information**
- **General notes:**
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
The product contains materials that are harmful to the environment.
- **Other adverse effects** No relevant information available.

13 Disposal considerations

- **Waste treatment methods**
- **Recommendation:**
The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.
- **Uncleaned packagings**
- **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

· UN-Number	
· DOT, ADR/RID/ADN, IMDG, IATA	Not regulated.
· UN proper shipping name	
· DOT, ADR/RID/ADN, IMDG, IATA	Not regulated.
· Transport hazard class(es)	

(Cont'd. on page 7)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: July 29, 2020

Trade name: ORP Standard, 240mV

(Cont'd. of page 6)

· DOT, ADR/RID/ADN, IMDG, IATA	
· Class	Not regulated.
· Packing group	
· DOT, ADR/RID/ADN, IMDG, IATA	Not regulated.
· Environmental hazards	
· Marine pollutant:	No
· Special precautions for user	Not applicable.
· Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.

15 Regulatory information

- Safety, health and environmental regulations/legislation specific for the substance or mixture
- United States (USA)
- SARA

· Section 302 (extremely hazardous substances):

None of the ingredients are listed.

· Section 313 (Specific toxic chemical listings):

13746-66-2 | tripotassium hexacyanoferrate

· TSCA (Toxic Substances Control Act)

Contact manufacturer for further information.

· Proposition 65 (California)

· Chemicals known to cause cancer:

None of the ingredients are listed.

· Chemicals known to cause developmental toxicity for females:

None of the ingredients are listed.

· Chemicals known to cause developmental toxicity for males:

None of the ingredients are listed.

· Chemicals known to cause developmental toxicity:

None of the ingredients are listed.

· EPA (Environmental Protection Agency):

13746-66-2 | tripotassium hexacyanoferrate

II

· IARC (International Agency for Research on Cancer):

None of the ingredients are listed.

· Canadian Domestic Substances List (DSL):

Contact manufacturer for further information.

*

(Cont'd. on page 8)

Safety Data Sheet

according to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 Regulations

Revision: July 29, 2020

Trade name: ORP Standard, 240mV

(Cont'd. of page 7)

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· Abbreviations and acronyms:

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

CAS: Chemical Abstracts Service (division of the American Chemical Society)

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

OSHA: Occupational Safety & Health Administration

Skin Irrit. 2: Skin corrosion/irritation – Category 2

Eye Irrit. 2A: Serious eye damage/eye irritation – Category 2A

Eye Irrit. 2B: Serious eye damage/eye irritation – Category 2B

· Sources

Website, European Chemicals Agency (echa.europa.eu)

Website, US EPA Substance Registry Services (ofmpub.epa.gov/sorinternet/registry/substreg/home/overview/home.do)

Website, Chemical Abstracts Registry, American Chemical Society (www.cas.org)

Patty's Industrial Hygiene, 6th ed., Rose, Vernon, ed. ISBN: 978-0-470-07488-6

Casarett and Doull's Toxicology: The Basic Science of Poisons, 8th Ed., Klaasen, Curtis D., ed., ISBN: 978-0-07-176923-5.

Safety Data Sheets, Individual Manufacturers

SDS Prepared by:

ChemTel

1305 North Florida Avenue

Tampa, Florida USA 33602-2902

Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573

Website: www.chemtel.com

SAFETY DATA SHEET

Creation Date 23-Jun-2009

Revision Date 19-Dec-2025

Revision Number 10

This safety data sheet was created pursuant to the requirements of: US OSHA Hazard Communication Standard 2024 (29 CFR 1910.1200)

1. Identification

Product Name Sulfuric acid

Cat No. : AC424520000; AC424520025; AC424520026; AC424520100;
AC424525000; AC424525001, AC424528000

CAS No 7664-93-9
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Fisher Scientific Company
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number

For information **US** call: 001-800-227-6701 / **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 according to [US] OSHA (29 CFR 1910.1200, 2024)

Skin Corrosion/Irritation	Category 1
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

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

Response

Immediately call a POISON CENTER or doctor

Inhalation

IF INHALED: Remove person to fresh air and keep comfortable for breathing

Skin

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower
Take off contaminated clothing and wash before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Ingestion

IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

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)**Hazards classified under paragraph (d)(1)(ii) of 1910.1200**

No information available

WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

3. Composition/information on Ingredients

Component	CAS No	Weight %
Sulfuric acid	7664-93-9	>95

4. First-aid measures

General Advice

Immediate medical attention is required. Remove and isolate contaminated clothing and shoes.

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. Immediate medical attention is required.

Inhalation	Remove to fresh air. 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. Immediate medical attention is required.
Ingestion	Rinse mouth. Drink 1 or 2 glasses of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Call a physician or poison control center immediately.
Most important symptoms and effects	Causes burns by all exposure routes. . Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	DO NOT USE WATER
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

Corrosive material. Reacts violently with water. Reaction with water may generate much heat which will increase the concentration of fumes in the air. Contact with metals may evolve flammable hydrogen gas. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.

Hazardous Combustion Products

Hydrogen. Sulfur oxides.

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	2	W

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Wear self-contained breathing apparatus and protective suit. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Avoid contact with skin, eyes or clothing.
Environmental Precautions	Avoid release to the environment. 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. After cleaning, flush away traces with water.

7. Handling and Storage

Handling	Handle product only in closed system or provide appropriate exhaust ventilation. Wear personal protective equipment/face protection. Do not get in eyes, on skin, or on clothing.

Do not breathe (dust, vapor, mist, gas). Do not ingest. If swallowed then seek immediate medical assistance.

Storage.

Keep containers tightly closed in a dry, cool and well-ventilated place. Corrosives area. Incompatible Materials. Strong oxidizing agents. Combustible material. Bases. Organic materials. Reducing Agent. Finely powdered metals. Peroxides.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH	Mexico OEL (TWA)
Sulfuric acid	TWA: 0.2 mg/m ³	(Vacated) TWA: 1 mg/m ³ TWA: 1 mg/m ³	IDLH: 15 mg/m ³ REL = 1 mg/m ³ (TWA)	TWA: 0.2 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures

Handle in a place equipped with local exhaust ventilation. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment**Eye/face Protection**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Recommended Filter type:

Particulates filter conforming to EN 143. Acid gases filter. Type E. Yellow. conforming to EN14387.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance**Physical State**

Liquid

Color

Colorless

Odor

Odorless

Odor Threshold

No information available

PropertyValuesRemarks• Method**Melting Point/Range**

10 °C / 50 °F

Softening Point

No data available

Boiling Point/Range

290 °C / 554 °F

Flash Point

No information available

Method - No information available

Flammability (liquid)

No data available

Flammability (solid,gas)

Not applicable

Liquid

Explosion Limits

No data available

Autoignition Temperature

No data available

Decomposition Temperature

340 °C

pH	1	1N aq.sol
Viscosity	21mPa.s @ 25 °C	
Water Solubility	Miscible	
Solubility in other solvents	No information available	
Partition Coefficient (n-octanol/water)		
Vapor Pressure	1 mmHg @ 146 °C	
Density / Specific Gravity	1.840	
Bulk Density	Not applicable	Liquid
Vapor Density	No data available	(Air = 1.0)
Particle characteristics	Not applicable (liquid)	
Other Information		
Molecular Formula	H2 O4 S	
Molecular Weight	98.07	

10. Stability and reactivity

Reactive Hazard	Yes
Stability	Water reactive. Hygroscopic.
Conditions to Avoid	Incompatible products. Excess heat. Exposure to moist air or water.
Incompatible Materials	Strong oxidizing agents, Combustible material, Bases, Organic materials, Reducing Agent, Finely powdered metals, Peroxides
Hazardous Decomposition Products	Hydrogen, Sulfur oxides
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	Contact with metals may evolve flammable hydrogen gas. Reacts violently with water.

11. Toxicological information

Information on expected route of exposure

Inhalation	Causes severe burns. May be harmful if inhaled.
Ingestion	Causes severe burns. May be harmful if swallowed.
Eyes	Causes severe burns.
Skin	Causes severe burns. May be harmful in contact with skin.

Toxicology data for the components

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sulfuric acid	2140 mg/kg (Rat)	-	LC50 = 0.375 mg/L (Rat) 4 h

Toxicologically Synergistic Products	No information available
(b) skin corrosion/irritation;	Category 1 A
(c) serious eye damage/irritation;	Category 1
(d) respiratory or skin sensitization;	
Respiratory	Based on available data, the classification criteria are not met
Skin	Based on available data, the classification criteria are not met

(e) germ cell mutagenicity; Based on available data, the classification criteria are not met

(f) carcinogenicity; Based on available data, the classification criteria are not met

The table below indicates whether each agency has listed any ingredient as a carcinogen

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Sulfuric acid	7664-93-9	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

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

(g) reproductive toxicity; Based on available data, the classification criteria are not met

(h) STOT-single exposure; Based on available data, the classification criteria are not met

(i) STOT-repeated exposure; Based on available data, the classification criteria are not met

Target Organs

None known.

(j) aspiration hazard; Based on available data, the classification criteria are not met

Symptoms / effects, both acute and delayed Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Other Adverse Effects The toxicological properties have not been fully investigated.

Endocrine Disrupting Properties This product does not contain any known or suspected endocrine disruptors.

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
Sulfuric acid	-	LC50: > 500 mg/L, 96h static (Brachydanio rerio)	-	EC50: 29 mg/L/24h

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.

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 UN1830
 Proper Shipping Name SULFURIC ACID
 Hazard Class 8
 Packing Group II

TDG

UN-No UN1830
 Proper Shipping Name SULFURIC ACID
 Hazard Class 8
 Packing Group II

IATA

UN-No UN1830
 Proper Shipping Name SULFURIC ACID
 Hazard Class 8
 Packing Group II

IMDG/IMO

UN-No UN1830
 Proper Shipping Name SULFURIC ACID
 Hazard Class 8
 Packing Group II

15. Regulatory Information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Sulfuric acid	7664-93-9	X	ACTIVE	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

**TSCA - Per 40 CFR 751, Regulation of Certain Chemical
 Substances & Mixtures, Under TSCA Section 6(h) (PBT)**

Not applicable

TSCA 12(b) - Notices of Export

Not applicable

International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Sulfuric acid	7664-93-9	X	-	231-639-5	X	X	X	X	X	KE-32570

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations**SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Component	CAS No	Weight %	SARA 313 - Threshold Values %	SARA 313 - Reporting thresholds
Sulfuric acid	7664-93-9	>95	1.0 %	-

SARA 311/312 Hazard Categories

Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications.

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Sulfuric acid	X	1000 lb	-	-

Clean Air Act Not applicable

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) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355).

Component	Hazardous Substances RQs	CERCLA Extremely Hazardous Substances RQs	SARA Reportable Quantity (RQ)
Sulfuric acid	1000 lb	1000 lb	1000 lb 454 kg

California Proposition 65 This product contains the following Proposition 65 chemicals.

Component	CAS No	California Prop. 65	Prop 65 NSRL	Category
Sulfuric acid	7664-93-9	Carcinogen	-	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Sulfuric acid	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	CAS No	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Sulfuric acid	7664-93-9	-	Use restricted. See entry 75. (see link for restriction details)	-

REACH links

<https://echa.europa.eu/substances-restricted-under-reach>

Safety, health and environmental regulations/legislation specific for the substance or mixture

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Sulfuric acid	7664-93-9	Listed	Not applicable	Not applicable	Not applicable

Contains component(s) that meet a 'definition' of per & poly fluoroalkyl substance (PFAS)?

Not applicable

Other International Regulations

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Sulfuric acid	7664-93-9	Not applicable	Not applicable	Not applicable	Annex I - Y34

16. Other Information**Prepared By**

Product stewardship (Regulatory Affairs)
Thermo Fisher Scientific
email - begel.sdsdesk@thermofisher.com

Creation Date

23-Jun-2009

Revision Date

19-Dec-2025

Print Date

19-Dec-2025

Revision Summary

Updated to the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) which published its Final Rule in the Federal Register revising the Hazard Communication Standard (HCS/HazCom), 29 CFR 1910.1200 (2024) (HCS §1910.1200, 2024), May 20, 2024, effective July 19, 2024.

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

TersOx™ Nutrients-QR



Issue Date: 01/21/2026
Version 1.2
SDS # 16B

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifier

Product Name: TersOx™ Nutrients-QR

Synonyms: Water soluble nitrogen and phosphorus nutrient salt supplement for microbial process

Product Form: Mixture

1.2 Recommended use of the chemical and restrictions on use

Recommended Use: For use in stimulating biological activity in soils and sludges
Remediation of contaminated groundwater and soils

Restrictions on Use: Use as recommended by the label

1.3 Details of the supplier and of the safety data sheet

Supplier: Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)
+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Relevant identified uses of the substance or mixture

Hazard Classification	Category	H-statement
Skin irritant	2	H315
Eye irritant	2A	H319
Acute toxicity – Inhalation	4	H332
Specific Target Organ Toxicity – Repeated	2	H371
Mutagenicity	2	H341

2.2 Label elements

2.2.1 Hazard pictograms



2.2.2 Hazard statements

Causes skin irritation (H315)
Causes serious eye irritation (H319)
Harmful if inhaled (H332)
May cause damage to lungs through prolonged or repeated exposure to inhalation of Urea: Known to cause emphysema (lung disease) (H371)
Urea is suspected of causing genetic defects (H341)

Note: See 2.1 for further information

2.2.3 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.
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.
P280 – Wear protective gloves, clothing, eye, and face protection.
P302 + P352 – IF ON SKIN: Wash with soap and plenty of water.
P304 + P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing.
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 + P311 + P313 – IF exposed or concerned: Call a POISON CONTROL CENTER, or doctor and get medical advice/attention.
P312 – Call a POISON CONTROL CENTER, or doctor if you feel unwell.
P332 + P313 – If skin irritation occurs: Get medical advice/attention.
P337 + P313 – If eye irritation persists: Get medical advice/attention.
P362 + P364 – Take off contaminated clothing and wash it before reuse.
P405 – Store locked up.
P501 – Dispose of contents in container that follow in accordance with local, regional, and federal regulations.

2.3 Further information

Persons who have a compromised immune system or a history of severe allergic response should avoid contact and/or breathing dust or mist from product handling or manufacturing processes.

2.4 Other hazard information

None known.

3. COMPOSITION/INFORMATION ON INGREDIENTS**3.1 Chemical Formula**

Mixture

3.2 Hazardous components

Chemical Name	Concentration (%)	CAS Number
Urea	> 75	57-13-6
Diammonium Phosphate	< 25	7783-28-0
Tricalcium Phosphate	< 1	1306-06-5

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

4. FIRST AID MEASURES**4.1 General Information**

Check the vital functions. If unconscious place in recovery position and seek medical advice. In case of respiratory arrest, administer artificial respiration. Cardiac arrest: perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Take victim to a doctor if irritation persists.

Remove affected person from source of contamination.

4.1.1 Eye Contact

Product is a severe eye irritant. Direct contact with eyes must be avoided. In case of contact with eyes, flush eyes with low pressure water for at least 15 minutes. If irritation persists, seek medical attention.

4.1.2 Skin Contact

Product may cause slight irritation. Prolonged or repeated direct contact with skin may cause reddening, itching and inflammation. In case of contact with skin, wash skin with soap and water. Remove contaminated clothing and wash. If irritation persists, consult a physician.

4.1.3 Inhalation

May cause sensitization by inhalation in hypersensitive individuals, irritation of respiratory tract, or physical interference with breathing. Avoid inappropriate handling which may result in dust generation. If inhaled, remove from contaminated area to fresh air. Initiate CPR if victim has stopped breathing. Administer oxygen if victim has difficulty breathing. Report situation. Seek medical attention if allergic response or difficulty breathing is exhibited. No incidences of health effects from dust inhalation have been reported.

4.1.4 Ingestion

Ingestion of material may cause gastric disturbance including irritation, nausea, vomiting, and diarrhea. If swallowed, rinse mouth and throat with tap water. Consult a physician if symptoms exist.

4.2 Important symptoms and effects (acute and delayed)

Most important symptoms/effects, acute and delayed: A single dose of 100 g has been reported to cause mild central nervous system depression, e.g. drowsiness and slow reflexes. Sensitization (shortness of breath, wheezing, and labored coughing) take individual to emergency room.

4.3 Indication of any immediate medical attention and special treatment needed

If exposed or concerned, get medical advice and attention.

5. FIRE-FIGHTING MEASURES**5.1 Suitable Extinguishing Media**

Dry chemical, carbon dioxide, chemical foam or water (all common agents as appropriate to surrounding fire – this material burns with difficulty).

5.2 Specific Hazards Arising from the Chemical or Mixture

Avoid mixtures with strong acids (nitric or perchloric) which may create explosive mixture.

5.3 Special Fire Fighting Procedures

Irritating toxic substances may be emitted on thermal decomposition. Exposed firefighters should wear self-contained breathing apparatus and protective clothing.

Cool containers exposed to flames with water until well after the fire is out. Use water spray to reduce vapors. If risk of water pollution occurs, notify appropriate authorities. Avoid water in straight hose stream; will scatter and spread fire. Keep upwind. Do not inhale explosion and combustion gases. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Cool containers exposed to flames with water until well after the fire is out. Use water spray to reduce vapors. If risk of water pollution occurs, notify appropriate authorities. Avoid water in straight hose stream; will scatter and spread fire. Wear positive-pressure, self-contained breathing apparatus (SCBA) and chemical protective clothing.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal Precautions**

Provide enough ventilation. Advice for emergency responders: protective equipment see Section 8. Wear protective clothing as described in Section 8 of this safety data sheet. Do not smoke or use open fire or other sources of ignition. Contact with walking surface may result in formation of slippery film/falling hazard.

6.2 First Aid

In case of contact with skin, wash with soap and water. If symptoms occur, seek medical attention. In case of contact with eyes, rinse with plenty of water for at least 15 minutes and see an eye specialist if irritation persists. In case of inhalation, remove to fresh air. In case of ingestion, drink water. If symptoms occur, seek medical assistance.

6.3 Environmental Precautions

Do not discharge into drains, sewers or watercourses or onto the ground. Inform the relevant authorities if this occurs. Spilled product should be removed immediately to avoid formation of dust. Contain spill, sweep up avoiding airborne dust. Provide enough ventilation. Recover product for reuse if possible. Avoid contamination of waterways and (if large quantity) vegetation.

6.4 Methods for Containment and Clean Up

Spilled product should be removed immediately to avoid formation of dust. Contain spill, sweep up avoiding airborne dust. Provide enough ventilation. Recover product for reuse if possible. Avoid contamination of waterways and (if large quantity) vegetation. Absorb in non-combustible material, vermiculite, dry sand or earth and place into containers.

7. HANDLING AND STORAGE

7.1 Precautions for Safe Handling

Avoid creating dust. Adequately ventilate when handling this product. Provide eyewash capability. Contain with applicable regulations. Avoid contact with eyes. Avoid inhalation of vapors and spray/mist. Remove contaminated clothing immediately. Clean contaminated objects and areas thoroughly observing environmental regulations. Keep away from sources of ignition – No smoking. Handle in accordance with good industrial hygiene and safety procedures. Discharge into the environment must be avoided. Keep container tightly closed. Either local exhaust or general room ventilation is usually required.

7.2 Hygiene Measures

Handle in accordance with good industrial hygiene and safety procedures. Use good personal hygiene practices.

7.3 Conditions for Safe Storage and Incompatibilities

Avoid mixtures with strong acids (nitric or perchloric) which may create explosive mixture.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control Parameters

Exposure guidelines, ingredients with workplace control parameters.

Name	CAS-No	TLV (ACGIH)	PEL (OSHA)
Urea	57-13-6	10mg/m ³ {3}*	15mg/m ³ {5}*
Diammonium phosphate	7783-28-0	10mg/m ³ {3}*	15mg/m ³ {5}*
Tricalcium phosphate	1306-06-5	10mg/m ³ {3}*	15mg/m ³ {5}*

* Specific limits not set for these chemicals. Limits are shown for Particles Not Otherwise Regulated (PNOR) or Particles Not Otherwise Classified (PNOC). First number is for total dust second number {#} is for respirable dust.

8.2 Exposure Control**8.2.1 Protective equipment**



8.3 Appropriate Engineering Controls

Provide adequate general and local exhaust ventilation. Observe any occupational exposure limits for the product or ingredients. Do not allow uncontrolled discharge of product into the environment.

8.3.1 Face Protection

The following protection should be worn: Safety glasses with shields, chemical splash goggles or face shield.

8.3.2 Respiratory Protection

Dust mask or respirator for particle removal (NIOSH)

8.3.3 Hand Protection

Gloves that are made up of either: neoprene, vinyl, or rubber / butyl rubber should always be worn even when skin contact isn't highly possible. These gloves should also be chemical-resistant, and impervious gloves that comply with any approved standard. PVC gloves should be worn specifically if a risk assessment indicates skin contact is highly possible. And, PVA gloves, under no circumstances, should ever be worn.

8.3.4 Body Protection

Wear appropriate clothing to prevent any possibility of skin contact.

8.4 Hygiene Measures

Wash promptly if skin becomes contaminated. Wash hands at the end of each work shift and before eating, smoking and using the toilet. When using do not eat, drink or smoke.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	White granular solid
Odor	Mild ammonia odor
Odor threshold	Information Not Available
pH	7 – 10 (10% sol)
Melting point /Freezing Point	130 °C
Initial Boiling point and boiling point range	Does Not Apply
Flash Point	Does Not Apply
Evaporation rate	Does Not Apply
Flammability (solid; gas)	Information Not Available
Upper/lower flammability or explosive limits	Does Not Apply
Vapor pressure	Low
Vapor density	Does Not Apply
Relative density	Information Not Available
Solubility (ies)	100g / 100mL in water
Partition coefficient: n-octanol/water	Does Not Apply
Initial Boiling point and boiling point range	Does Not Apply
Auto-ignition temperature	Information Not Available

Decomposition temperature
Viscosity
Other Physical/Chemical Properties

Information Not Available
Does Not Apply
Specific Gravity at 25°C – 1.3

10. STABILITY AND REACTIVITY

10.1 Reactivity

Stable under normal conditions and use.

10.2 Chemical stability

Information not available

10.3 Possibility of Hazardous Reactions

Information not available

10.4 Conditions to Avoid

Avoid mixtures with strong acids (nitric or perchloric) which may create explosive mixture, and extreme heat.

10.5 Incompatible Materials

Strong alkalis, active metals (aluminum, magnesium), ammonia, inorganic materials. Strong oxidizers, and chlorine compounds.

10.6 Hazardous Decomposition Products

Information not available

10.7 Hazardous Polymerization

Information not available

11. TOXICOLOGICAL INFORMATION

11.1 Acute Toxicity

Acute toxicity	(low) LD50 > 1000 mg/kg body weight
Skin Corrosion/Irritation	Dust may cause slight skin irritation, prolonged or repeated direct skin contact may cause reddening, itching and inflammation.
Serious Eye Damage/Irritation	Dust may cause severe irritation.
Respiratory or Skin Sensitization	Dust may cause irritation or allergy in susceptible individuals. May cause respiratory allergy in susceptible individuals: sensitization (shortness of breath, wheezing, and labored coughing) take individual to emergency room.
Ingestion	May cause severe gastric disturbances, sore throat.
Germ Cell Mutagenicity	Information Not Available
Carcinogenicity	Information Not Available
Reproductive Toxicity	Information Not Available
Specific Target Organ Toxicity – Single Exposure	Information Not Available
Specific Organ Toxicity – Repeated Exposure	Information Not Available
Aspiration Hazard	Information Not Available
General Remarks	Information Not Available

11.2 European Chemical Agency data for urea: Additional information

The 24 -hour EC₅₀ for urea in Daphnia was reported to be >10000 mg/l; urea is not acutely toxic to daphnids. The 24-hour LC₅₀ values for freshwater snail eggs, juveniles and adults were reported to be 14,241 mg/l, 18255 mg/l and 22998 mg/l. Following 48-hour exposure, the LC₅₀ value for adults was calculated to be 13,477 mg/l. In another study, the 24-hour LC₅₀ values for eggs, juvenile and adult snails were reported to be 13,532 mg/l, 24504 mg/l and 26024 mg/l, respectively. Following 48 hours exposure, the LC₅₀ value for adults was calculated to be 21,412 mg/l. It is

concluded that, under normal laboratory conditions, urea displays low molluscicidal activity. The 4-hour LC₅₀ in mosquito (*Aedes aegypti*) larvae is reported to be 60,000 mg/l.

species: *Daphnia carinata* LC₅₀ (72 h) 1,790 mg/L Diammonium Phosphate; Standard Methods for the Examination of Water and wastewater (APHA)

11.3 European Chemical Agency data for tricalcium phosphate

A static freshwater toxicity test was conducted to determine the acute toxicity of tricalcium phosphate to the water flea, *Daphnia magna* according to OECD Guideline 202. Adverse effects and immobility were examined daily. The criterion of immobilization was an inability to swim for approximately 15 seconds after gentle stir. No mortality or adverse effects were observed at control or 100 mg/L (nominal). The 48-hours EC₅₀ of tricalcium phosphate was >100 mg/L (measured concentration: >5.35 mg/L) in *Daphnia magna*. The concentration of the test substance was calculated using the concentration of calcium expecting the mean calcium concentration at control. The results suggest that the concentration of the test substance was significantly lower than nominal, and the test substance was insoluble in water. Therefore, the test results were expressed as nominal concentration.

12. ECOLOGICAL INFORMATION

Component		Species – Test duration	Test Result
Aquatic			
Acute			
Crustacea	LC50	<i>Ceriodaphnia dubia</i> – 48 hrs	>2,000 mg/L
Fish	LC50	Fathead minnow (<i>Pimephalas promelas</i>) – 96 hrs.	287.2 mg/L

12.1 Chemical Fate Information

Product is readily biodegradable in wastewater treatment systems.

12.2 Biodegradability

Readily degradable.

Excess product in waterways may encourage eutrophication.

13. DISPOSAL CONSIDERATIONS

13.1 Waste Disposal Methods

Dispose according to federal, state and local laws. Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Authority. Waste is suitable for incineration.

14. TRANSPORTATION INFORMATION

14.1 UN Number

Mixture not classified as Hazardous according to Regulation (EC) 1272/2008.

14.2 UN Proper Shipping Name

N/A

14.3 Transport Hazard Class

N/A

14.4 Packing Group (if applicable)

N/A

14.5 Environmental Hazards

N/A

14.6 Special Precautions for User

N/A

14.7 Transport in Bulk According to Annex II of the MARPOL 73/78 and the IBC Code

N/A

14.9 DOT Proper Shipping Name

Chemicals not otherwise indexed (NOI) non-hazardous.

15. REGULATORY INFORMATION

All ingredients used are listed on the USEPA TSCA Inventory list.

Ingredients are not listed in: Reportable Quantity (49CFR 172.101), SARA Title III Section 302/313 (Extremely Hazardous Substance List/ Toxic Chemicals), RCRA Hazardous Waste, California Proposition 65, State Right to Know Laws (Connecticut, Florida, Illinois, Louisiana, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island)

16. OTHER INFORMATION

Mixture classified as not dangerous according to Regulation (EC) 1272/2008.

Observe employment restrictions for people.

Product is not listed with IARC, NTP, ACGIH or OSHA as a carcinogen.

Components not precisely identified are proprietary or non-hazardous. All chemical ingredients appear on the EPA TSCA inventory.

Disclaimer:

The information provided in this Safety Data Sheet (SDS) is believed to be accurate and reliable as of the issue date. However, Tersus Environmental makes no warranties, express or implied, regarding the completeness or accuracy of the data or any recommendations. It is the responsibility of each recipient to review this SDS thoroughly and consult appropriate technical or regulatory resources as needed to understand the hazards and ensure safe handling and use of the product.

Regulations may vary by location and are subject to change. Users are responsible for compliance with all applicable federal, state, provincial, and local laws and regulations. Because the conditions of use, handling, and application are beyond our control, Tersus Environmental assumes no liability for any loss or damage resulting from the use of this product. It is the user's responsibility to determine the suitability and safety of the product for its intended use, and to ensure that such use does not infringe upon any intellectual property rights.

This SDS applies only to the product in its original form as shipped. Recommendations provided—whether verbal, written, or inferred from test data—are based on current knowledge at the time of issuance and may be revised as new information becomes available. However, circumstances beyond our control may affect the validity of such recommendations. Users must independently verify the product's suitability for their specific process or application.

Only SDSs issued directly by Tersus Environmental should be considered current and valid. If you have received an SDS from another source or are unsure of its version, please contact us to obtain the most up-to-date document.



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End of Safety Data Sheet



Section 1. Identification

Product name : Zero Valent Iron (ZVI)

Chemical name : Iron (Fe)

Other means of identification : Iron powder

Product type : Powder.

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

Material uses : Environmental Applications:
Chemical reduction of halogenated organics and-or metals

Supplier's details : **Redox Tech**
200 Quade Drive
Cary NC 27513
919-678-0140

Emergency telephone number : Within USA and Canada: 1-800-424-9300

Section 2. Hazards identification

OSHA/HCS status : While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this SDS contains valuable information critical to the safe handling and proper use of the product. This SDS should be retained and available for employees and other users of this product.

Classification of the substance or mixture : Not classified.

GHS label elements

Signal word : No signal word.

Hazard statements : No known significant effects or critical hazards.

Section 2. Hazards identification

Precautionary statements

Prevention : Not applicable.

Response : Not applicable.

Storage : Not applicable.

Disposal : Not applicable.

Hazards not otherwise classified : Handling and/or processing of this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose and throat. Fine dust clouds may form explosive mixtures with air. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation and pneumoconiosis.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : iron

CAS number/other identifiers

CAS number : 7439-89-6

Ingredient name	%	CAS number
Iron	>99	7439-89-6
carbon alloyed	<1	7440-44-0

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.

Additional information

For more details on the composition, refer to Certificate of Analysis.

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. Get medical attention if irritation occurs.

Inhalation : Move exposed person to fresh air. Get medical attention if symptoms occur.

Skin contact : Wash with soap and water. Get medical attention if symptoms occur.

Ingestion : Wash out mouth with water. Get medical attention if symptoms occur.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.

Inhalation : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
irritation
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Section 4. First aid measures

Ingestion : No specific data.

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

Notes to physician : No specific treatment. Treat symptomatically.

Specific treatments : No specific treatment.

Protection of first-aiders : No special protection is required. See Section 8 for information on appropriate personal protective equipment.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use a fog nozzle to spray water.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Fine dust clouds may form explosive mixtures with air. As with any finely granulated product, (i.e flour) a risk of fire is present should the material be dispersed in air and exposed to a source of ignition.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
metal oxide/oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

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.

Remark : Fine dust clouds may form explosive mixtures with air.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing dust. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). 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 : Recycle, if possible. Waste must be disposed of according to applicable regulations.

Large spill : Avoid creating dusty conditions and prevent wind dispersal. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. Waste must be disposed of according to applicable regulations. Recycle, if possible.

Section 7. Handling and storage

Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Avoid breathing dust.
- 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 so as to avoid dust generation and dispersal. Store in a segregated and approved area. Do not store in unlabeled containers. Segregate from oxidizing materials. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Iron	ACGIH TLV (United States). TWA: 5 mg/m ³ , (as iron oxide) 8 hours. Form: Dust and fumes NIOSH REL (United States). TWA: 5 mg/m ³ , (as iron oxide) 10 hours. Form: Dust and fumes OSHA PEL (United States). TWA: 10 mg/m ³ , (as iron oxide) 8 hours. Form: Fume
carbon alloyed	None.

- Recommended monitoring procedures** : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

- Appropriate engineering controls** : Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

- Environmental exposure controls** : Avoid creating dusty conditions and prevent wind dispersal.

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. If operating conditions cause high dust concentrations to be produced, use dust goggles. Recommended: Safety glasses.

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. Recommended: leather gloves

- 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. Recommended: overall

Section 8. Exposure controls/personal protection

- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.
- Personal protective equipment (Pictograms)** :



Section 9. Physical and chemical properties

Appearance

- Physical state** : Solid. [Powder.]
- Color** : Gray.
- Odor** : Odorless.
- Odor threshold** : Not applicable.
- pH** : Not applicable.
- Melting point** : 1535°C (2795°F)
- Boiling point** : 2861°C (5181.8°F)
- Flash point** : Not applicable.
- Evaporation rate** : Not applicable.
- Flammability (solid, gas)** : Non-flammable.
- Lower and upper explosive (flammable) limits** : Not available.
- Vapor pressure** : Not applicable.
- Vapor density** : Not available.
- Bulk density** : 2.4 - 3.2 [g/cm³]
- Granulometry** : <1.5 mm
- Relative density** : 7.8
- Solubility** : Insoluble in the following materials: cold water and hot water.
- Solubility in water** : 0 g/l
- Partition coefficient: n-octanol/water** : Not applicable.
- Auto-ignition temperature** : Not applicable.
- Decomposition temperature** : Not applicable.
- Viscosity** : Not applicable.
- Flow time (ISO 2431)** : Not available.

Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.

Section 10. Stability and reactivity

- Conditions to avoid** : Reactive or incompatible with the following materials: oxidizing materials and acids. Emits toxic fumes when heated. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.
- Incompatible materials** : Reactive or incompatible with the following materials: oxidizing materials and acids. Emits toxic fumes when heated.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Iron	LCLo Inhalation Dusts and mists LD50 Oral	Rat Rat	250 mg/m ³ 7500 mg/kg	6 hours -

Conclusion/Summary : No known significant effects or critical hazards.

Irritation/Corrosion

Conclusion/Summary

- Skin** : Non-irritating to the skin.
- Eyes** : Non-irritating to the eyes.
- Respiratory** : Non-irritating to the respiratory system.

Sensitization

Conclusion/Summary

- Skin** : Non-sensitizer to skin.

Mutagenicity

Conclusion/Summary : No known significant effects or critical hazards.

Carcinogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Reproductive toxicity

Conclusion/Summary : No known significant effects or critical hazards.

Teratogenicity

Conclusion/Summary : No known significant effects or critical hazards.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Routes of entry anticipated: Oral, Dermal, Inhalation.

Potential acute health effects

- Eye contact** : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the eyes.
- Inhalation** : Exposure to airborne concentrations above statutory or recommended exposure limits may cause irritation of the nose, throat and lungs.

Section 11. Toxicological information

- Skin contact** : No known significant effects or critical hazards.
Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:
 irritation
 redness
- Inhalation** : Adverse symptoms may include the following:
 respiratory tract irritation
 coughing
- 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** : No known significant effects or critical hazards.
Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

- Potential immediate effects** : No known significant effects or critical hazards.
Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
Iron	Sub-chronic LOAEL Oral	Rat	26 mg/kg	12 weeks
	Sub-chronic NOAEL Inhalation Dusts and mists	Rat	5 mg/m ³	4 weeks

- Conclusion/Summary** : Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation and pneumoconiosis.
- General** : Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.
- Carcinogenicity** : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Iron	Chronic NOEC 100 mg/l Marine water	Algae - Glenodinium halli	72 hours

- Conclusion/Summary** : Not classified.

Persistence and degradability

- Conclusion/Summary** : Inorganic: Not readily biodegradable.

Section 12. Ecological information

Bioaccumulative potential

Not available.

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. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. 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. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Recycle, if possible.

Section 14. Transport information

	DOT Classification	TDG Classification	Mexico Classification	ADR/RID	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-	-	-
Transport hazard class(es)	-	-	-	-	-	-
Packing group	-	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.	No.

Special precautions for user : Not applicable.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not applicable.

Section 15. Regulatory information

U.S. Federal regulations : TSCA 8(a) CDR Exempt/Partial exemption: Not determined

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

Section 15. Regulatory information

DEA List I Chemicals : Not listed
(Precursor Chemicals)

DEA List II Chemicals : Not listed
(Essential Chemicals)

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Not applicable.

Composition/information on ingredients

No products were found.

State regulations

Massachusetts : None of the components are listed.

New York : None of the components are listed.

New Jersey : None of the components are listed.

Pennsylvania : None of the components are listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

International lists

Australia : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

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

Malaysia : Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : Not determined.

Thailand : Not determined.

Turkey : Not determined.

United States : All components are listed or exempted.

Viet Nam : Not determined.

Canada

WHMIS (Canada) : Not classified.

Canadian NPRI : None of the components are listed.

Section 16. Other information

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

Health	/	0
Flammability		0
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)



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
Not classified.	

History

Date of issue/Date of revision : 06/28/2024

Date of previous issue : 06/11/2016

Version : 2.0

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
- IMSBC = International Maritime Solid Bulk Cargoes Code
- LogPow = logarithm of the octanol/water partition coefficient
- MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
- UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

United States / 4.9 / EN-US

Notice to reader

Section 16. Other information

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.

APPENDIX B

OZARK UNDERGROUND LABORATORY PROCEDURES

**PROCEDURES AND CRITERIA
ANALYSIS OF FLUORESCENT DYES
IN WATER AND CHARCOAL SAMPLERS:

FLUORESCEIN, EOSINE, RHODAMINE WT,
AND SULFORHODAMINE B DYES**

Revision Date:
March 3, 2015

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and
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INTRODUCTION

This document describes standard procedures and criteria currently in use at the Ozark Underground Laboratory (OUL) as of the date shown on the title page. Some samples may be subjected to different procedures and criteria because of unique conditions; such non-standard procedures and criteria are identified in reports for those samples. Standard procedures and criteria change as knowledge and experience increases and as equipment is improved or upgraded. The OUL maintains a summary of changes in standard procedures and criteria.

TRACER DYES AND SAMPLE TYPES

Dye Nomenclature

Dye manufacturers and retailers use a myriad of names for the dyes. This causes confusion among dye users and report readers. The primary dyes used at the OUL and described in this document are included in Table 1 below.

Table 1. Primary OUL Dye Nomenclature.

OUL Common Name	Color Index Number	Color Index Name	Other Names
Fluorescein	45350	Acid Yellow 73	uranine, uranine C, sodium fluorescein, fluorescein LT and fluorescent yellow/green
Eosine	45380	Acid Red 87	eosin, eosine OJ, and D&C Red 22
Rhodamine WT	None assigned	Acid Red 388	fluorescent red (but not the same as rhodamine B)
Sulforhodamine B	45100	Acid Red 52	pontacyl brilliant pink B, lissamine red 4B, and fluoro brilliant pink

The OUL routinely provides dye for tracing projects. Dyes purchased for groundwater tracing are always mixtures that contain both dye and an associated diluent. Diluents enable the manufacturer to standardize the dye mixture so that there are minimal differences among batches. Additionally, diluents are often designed to make it easier to dissolve the dye mixture in water, or to produce a product which meets a particular market need (groundwater tracing is only a tiny fraction of the dye market). The percent of dye in “as-sold” dye mixtures often varies dramatically among manufacturers and retailers, and retailers are sometimes incorrect about the percent of dye in their products. The OUL subjects all of its dyes to strict quality control (QC) testing. Table 2 summarizes the as-sold dye mixtures used by the OUL.

Table 2. As-Sold Dye Mixtures at the OUL.

OUL Common Name	Form	Dye Equivalent
Fluorescein	Powder	75% dye equivalent, 25% diluent
Eosine	Powder	75% dye equivalent, 25% diluent
Rhodamine WT	Liquid	20% dye equivalent, 80% diluent
Sulforhodamine B	Powder	75% dye equivalent, 25% diluent

Analytical results are based on the as-sold weights of the dyes provided by the OUL. The use of dyes from other sources is discouraged due to the wide variability of dye equivalents within the market. However, if alternate source dyes are used, a sample should be provided to the OUL for quality control and to determine if a correction factor is necessary for the analytical results.

Types of Samples

Typical samples that are collected for fluorescent tracer dye analysis include charcoal samplers (also called activated carbon or charcoal packets) and water samples.

The charcoal samplers are packets of fiberglass screening partially filled with 4.25 grams of activated coconut charcoal. The charcoal used by the OUL is Calgon 207C coconut shell carbon, 6 to 12 mesh, or equivalent. The most commonly used charcoal samplers are about 4 inches long by 2 inches wide. A cigar-shaped sampler is made for use in very small diameter wells (such as 1-inch diameter piezometers); this is a special order item and should be specifically requested in advance when needed. All of the samplers are closed by heat sealing.

In specialized projects, soil samples have been collected from soil cores and analyzed for fluorescent tracer dyes. Project-specific procedures have been developed for projects such as these. For additional information, please contact the OUL.

FIELD PROCEDURES

Field procedures included in this section are intended as guidance, and not firm requirements. Placement of samplers and other field procedures require adjustment to field conditions. Personnel at the OUL are available to provide additional assistance for implementation of field procedures specific to specialized field conditions.

Placement of Samplers

Charcoal samplers are placed so as to be exposed to as much water as possible. Water should flow through the packet. In springs and streams they are typically attached to a rock or other anchor in a riffle area. Attachment of the packets often uses plastic tie wires. In swifter water galvanized wire (such as electric fence wire) is often used. Other types of anchoring wire can be used. Electrical wire with plastic insulation is also good. Packets are attached so that they extend outward from the anchor rather than laying flat against it. Two or more separately anchored packets are typically used for sampling springs and streams. The placement of multiple packets is recommended in order to minimize the chance of loss during the sampling period. The use of fewer packets is discouraged except when the spring or stream is so small that there is not appropriate space for placing multiple packets.

When pumping wells are being sampled, the samplers are typically placed in sample holders made of plastic pipe fittings. Brass hose fittings can be at the end of the sample holders so that the sample holders can be installed on outside hose bibs and water which has run through the samplers can be directed to waste through a connected garden hose. The samplers can be unscrewed in the middle so that charcoal packets can be changed. The middle portions of the samplers consist of 1.5 inch diameter pipe and pipe fitting.

Charcoal packets can be lowered into monitoring wells for sampling purposes. In general, if the well is screened, samplers should be placed approximately in the middle of the screened interval. Due to the typically lower volume of water that flows through a well, only one charcoal sampler should be used per well. However, multiple packets can be placed in a single well at depths to test different depth horizons when desirable. A weight should be added near the charcoal packet to ensure that it will not float. The weight should be of such a nature that it will not affect water quality. One common approach is to anchor the packets with a white or uncolored plastic cable tie to the top of a dedicated weighted disposable bailer. We typically run nylon cord from the top of the well to the charcoal packet and its weight. ***Do not use colored cord*** since some of them are colored with fluorescent dyes. Nylon fishing line should not be used since it can be readily cut by a sharp projection in the well.

In some cases, especially with small diameter wells and appreciable well depths, the weighted disposable bailers sink very slowly or may even fail to sink because of friction and floating of the anchoring cord. In such cases a weight may be added to the top of the disposable bailer. Stainless steel weights are ideal, but are not needed in all cases. All weights should be cleaned prior to use; the cleaning approach should comply with decontamination procedures in use at the project site.

Optional Preparation of Charcoal Samplers

Charcoal packets routinely contain some fine powder that washes off rapidly when they are placed in water. While not usually necessary, the following optional preparation step is suggested if the fine charcoal powder is problematic.

Charcoal packets can be triple rinsed with distilled, demineralized, or reagent water known to be free of tracer dyes. This rinsing is typically done by soaking. With this approach,

approximately 25 packets are placed in one gallon of water and soaked for at least 10 minutes. The packets are then removed from the water and excess water is shaken off the packets. The packets are then placed in a second gallon of water and again soaked for at least 10 minutes. After this soaking they are removed from the water and excess water is shaken off the packets. The packets are then placed in a third gallon of water and the procedure is again repeated. Rinsed packets are placed in plastic bags and are placed at sampling stations within three days. Packets can also be rinsed in jets of water for about one minute; this requires more water and is typically difficult to do in the field with water known to be free of tracer dyes.

Collection and Replacement of Samplers

Samplers are routinely collected and replaced at each of the sampling stations. The frequency of sampler collection and replacement is determined by the nature of the study. Collections at one week intervals are common, but shorter or longer collection frequencies are acceptable and sometimes more appropriate. Shorter sampling frequencies are often used in the early phases of a study to better characterize time of travel. As an illustration, we often collect and change charcoal packets 1, 2, 4, and 7 days after dye injection. Subsequent sampling is then weekly.

The sampling interval in wells at hazardous wastes sites should generally be no longer than about a week. Contaminants in the water can sometimes use up sorption sites on the charcoal that would otherwise adsorb the dye. This is especially important if the dye might pass in a relatively short duration pulse.

Where convenient, the collected samplers should be briefly rinsed in the water being sampled to remove dirt and accumulated organic material. This is not necessary with well samples. The packets are shaken to remove excess water. Next, the packet (or packets) are placed in a plastic bag (Whirl-Pak® bags are ideal). The bag is labeled on the outside with a black permanent type felt marker pen, such as a Sharpie®. ***Use only pens that have black ink;*** colored inks may contain fluorescent dyes. The notations include station name or number and the date and time of collection. Labels must not be inserted inside the sample bags.

Collected samplers are kept in the dark to minimize algal growth on the charcoal prior to analysis work. New charcoal samplers are routinely placed when used charcoal packets are collected. The last set of samplers placed at a stream or spring is commonly not collected.

Water Samples

Water samples are often collected. They should be collected in either glass or plastic; the OUL routinely uses 50 milliliter (mL) research-grade polypropylene copolymer Perfector Scientific vials (Catalog Number 2650) for such water samples. No more than 30 mL of water is required for analysis. The sides of the vials should be labeled with the project name, sample ID, sample date and time with a black permanent felt tip pen. ***Do not label the lid only.*** The vials should be placed in the dark and refrigerated immediately after collection, and maintained under refrigeration until shipment. The OUL supplies vials for the collection of water samples.

Sample Shipment

When water or charcoal samplers are collected for shipment to the OUL they should be shipped promptly. We prefer (and in some studies require) that samples be refrigerated with frozen re-usable ice packs upon collection and that they be shipped refrigerated with frozen ice packs by overnight express. ***Do not ship samplers packed in wet ice*** since this can create a potential for cross contamination when the ice melts. Our experience indicates that it is not essential for samplers to be maintained under refrigeration; yet maintaining them under refrigeration clearly minimizes some potential problems. A product known as "green ice" should not be used for maintaining the samples in a refrigerated condition since this product contains a dye which could contaminate samples if the "green ice" container were to break or leak.

We receive good overnight and second day air service from both UPS and FedEx. The U.S. Postal Service does not typically provide next day service to us. DHL does not provide overnight service to us. FedEx is recommended for international shipments. The OUL does not receive Saturday delivery.

Each shipment of charcoal samplers or water samples ***must be accompanied by a sample custody document***. The OUL provides a sheet (which bears the title "Samples for Fluorescence Analysis") that can be used if desired. These sheets can be augmented by a client's chain-of-custody forms or any other relevant documentation. OUL's custody document works well for charcoal samplers because it allows for both the placement date and time as well as the collection date and time. Many other standard chain-of-custody documents do not allow for these types of samples. Attachment 1 includes a copy of OUL's Sample Collection Data Sheet.

Please write legibly on the custody documents and ***use black ink***. Check the accuracy of the sample sheet against the samples prior to shipment to identify and correct errors that may delay the analysis of your samples following receipt at the laboratory.

Supplies Provided by the OUL

The OUL provides supplies for the collection of fluorescent tracer dyes. Supplies provided upon request are charcoal packets, Whirl-Pak® bags (to contain the charcoal packets after collection for shipment to the laboratory), and water vials. These supplies are subjected to strict QA/QC procedures to ensure the materials are free of any potential tracer dye contaminants. The charge for these materials is included in the cost of sample analysis. Upon request, coolers and re-freezable ice packs are also provided for return shipment of samples.

The OUL also has tracer dyes available for purchase. These dyes are subject to strict QA/QC testing. All analytical work is based upon the OUL as-sold weight of the dyes.

LABORATORY PROCEDURES

The following procedures are followed upon receipt of samples at the laboratory.

Receipt of Samples

Samplers shipped to the OUL are logged in and refrigerated upon receipt. Prior to cleaning and analysis, samplers are assigned a laboratory identification number.

It sometimes occurs that there are discrepancies between the sample collection data sheet and the actual samples received. When this occurs, a "Discrepancy Sheet" form is completed and sent to the shipper of the sample for resolution. The purpose of the form is to help resolve discrepancies, even when they may be minor. Many discrepancies arise from illegible custody documents. ***Please write legibly*** on the custody documents and ***use black ink***. Check the accuracy of the sample sheet against the samples prior to shipment to identify and correct errors that may delay the analysis of your samples following receipt at the laboratory.

Cleaning of Charcoal Samplers

Samplers are cleaned by spraying them with jets of clean water from a laboratory well in a carbonate aquifer. OUL uses non-chlorinated water for the cleansing to minimize dye deterioration. We do not wash samplers in public water supplies. Effective cleansing cannot generally be accomplished simply by washing in a conventional laboratory sink even if the sink is equipped with a spray unit.

The duration of packet washing depends upon the condition of the sampler. Very clean samplers may require less than a minute of washing; dirtier samplers may require several minutes of washing.

Elution of the Charcoal

There are various eluting solutions that can be used for the recovery of tracer dyes. The solutions typically include an alcohol, water, and a strong basic solution such as aqueous ammonia and /or potassium hydroxide.

The standard elution solution used at the OUL is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution. Preparation of eluting solutions uses dedicated glassware which is never used in contact with dyes or dye solutions.

The eluting solution will elute fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes. It is also suitable for separating fluorescein peaks from peaks of some naturally present materials found in may be found in samplers.

Fifteen mL of the eluting solution is poured over the washed charcoal in a disposable sample beaker. The sample beaker is capped. The sample is allowed to stand for 60 minutes. After this time, the liquid is carefully poured off the charcoal into a new disposable beaker which has been appropriately labeled with the laboratory identification number. A few grains of charcoal may inadvertently pass into the second beaker; no attempt is made to remove these from the second sample beaker. After the pouring, a small amount of the elutant will remain in the initial sample beaker. After the transfer of the elutant to the second sample beaker, the contents of the first sample beaker (the eluted charcoal) are discarded. Samples are kept refrigerated until analyzed.

pH Adjustment of Water Samples

The fluorescence intensity of several of the commonly used fluorescent tracer dyes is pH dependent. The pH of samples analyzed for fluorescein, eosine, and pyranine dyes are adjust to a target pH of greater than 9.5 in order to obtain maximum fluorescence intensities.

Adjustment of pH is achieved by placing samples in a high ammonia atmosphere for at least two hours in order to increase the pH of the sample. Reagent water standards are placed in the same atmosphere as the samples. If dye concentrations in a sample are off-scale and require dilution for quantification of the dye concentration, the diluting water used is OUL reagent water that has been pH adjusted in a high ammonia atmosphere. Samples that are only analyzed for rhodamine WT or sulforhodamine B are not required to be pH adjusted.

Analysis on the Shimadzu RF-5301

The OUL uses a Shimadzu spectrofluorophotometer model RF-5301. This instrument is capable of synchronous scanning. The OUL also owns a Shimadzu RF-540 spectrofluorometers that is occasionally used for special purposes.

A sample of the elutant or water is withdrawn from the sample container using a disposable polyethylene pipette. Approximately 3 mL of the sample is then placed in disposable rectangular polystyrene cuvette. The cuvette has a maximum capacity of 3.5 mL. The cuvette is designed for fluorometric analysis; all four sides and the bottom are clear. The acceptable spectral range of these cuvettes is 340 to 800 nm. The pipettes and cuvettes are discarded after one use.

The cuvette is then placed in the RF-5301. This instrument is controlled by a programmable computer and operated by proprietary software developed for dye tracing applications.

Our instruments are operated and maintained in accordance with the manufacturer's recommendations. On-site installation of our first instrument and a training session on its use was provided by the instrument supplier. Repairs are made by a Shimadzu-authorized repairman.

Our typical analysis of an elutant sample where fluorescein, eosine, rhodamine WT, or sulforhodamine B dyes may be present includes synchronous scanning of excitation and emission spectra with a 17 nm separation between excitation and emission wavelengths. For these dyes,

the excitation scan is from 443 to 613 nm; the emission scan is from 460 to 630 nm. The emission fluorescence from the scan is plotted on a graph. The typical scan speed setting is "fast" on the RF-5301. The typical sensitivity setting used is "high."

Table 3. Excitation and emission slit width settings routinely used for dye analysis.

Parameter	Excitation Slit (nm)	Emission Slit (nm)
ES, FL, RWT, and SRB in elutant	3	1.5
ES, FL, RWT, and SRB in water	5	3

Note: ES = Eosine. FL = Fluorescein. RWT = Rhodamine WT. SRB = Sulforhodamine B.

The instrument produces a plot of the synchronous scan for each sample; the plot shows emission fluorescence only. The synchronous scans are subjected to computer peak picks using proprietary software; peaks are picked to the nearest 0.1 nm. Instrument operators have the ability to manually adjust peaks as necessary based upon computer-picked peaks and experience. All samples run on the RF-5301 are stored electronically with sample information. All samples analyzed are recorded in a bound journal.

Quantification

We calculate the magnitude of fluorescence peaks for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in both elutant and water samples. Dye quantities are expressed in microgram per liter (parts per billion; ppb). The dye concentrations are calculated by separating fluorescence peaks due to dyes from background fluorescence on the charts, and then calculating the area within the fluorescence peak. This area is proportional to areas obtained from standard solutions.

We run dye concentration standards each day the RF-5301 is used. Six standards are used; the standard or standards appropriate for the analysis work being conducted are selected. All standards are based upon the as-sold weights of the dyes. The standards are as follows:

- 1) 10 ppb fluorescein and 100 ppb rhodamine WT in well water from the Jefferson City-Cotter Formation
- 2) 10 ppb eosine in well water from the Jefferson City-Cotter Formation
- 3) 100 ppb sulforhodamine B in well water from the Jefferson City-Cotter Formation.
- 4) 10 ppb fluorescein and 100 ppb rhodamine WT in elutant.
- 5) 10 ppb eosine in elutant.
- 6) 100 ppb sulforhodamine B in elutant.

Preparation of Standards

Dye standards are prepared as follows:

Step 1. A small sample of the as-sold dye is placed in a pre-weighed sample vial and the vial is again weighed to determine the weight of the dye. We attempt to use a sample weighing between 1 and 5 grams. This sample is then diluted with well water to make a 1% dye solution by weight (based upon the as-sold weight of the dye). The resulting dye solution is allowed to sit for at least four hours to ensure that all dye is fully dissolved.

Step 2. One part of each dye solution from Step 1 is placed in a mixing container with 99 parts of well water. Separate mixtures are made for fluorescein, rhodamine WT, eosine, and sulforhodamine B. The resulting solutions contain 100 mg/L dye (100 parts per million dye mixture). The typical prepared volume of this mixture is appropriate for the sample bottles being used; we commonly prepare about 50 mL of the Step 2 solutions. The dye solution from Step 1 that is used in making the Step 2 solution is withdrawn with a digital Finnpiquette which is capable of measuring volumes between 0.200 and 1.000 mL at intervals of 0.005 mL. The calibration certificate with this instrument indicates that the accuracy (in percent) is as follows:

At 0.200 mL, 0.90%

At 0.300 mL, 0.28%

At 1.000 mL, 0.30%

The Step 2 solution is called the long term standard. OUL experience indicates that Step 2 solutions, if kept refrigerated, will not deteriorate appreciably over periods of less than a year. Furthermore, these Step 2 solutions may last substantially longer than one year.

Step 3. A series of intermediate-term dye solutions are made. Approximately 45 mL of each intermediate-term dye solution is made. All volume measurements of less than 5 mL are made with a digital Finnpiquette. (see description in Step 2). All other volume measurements are made with Rheinland Kohn Geprüfte Sicherheit 50 mL capacity pump dispenser which will pump within plus or minus 1% of the set value. The following solutions are made; all concentrations are based on the as-sold weight of the dyes:

- 1) 1 ppm fluorescein dye and 10 ppm rhodamine WT dye.
- 2) 1 ppm eosine.
- 3) 10 ppm sulforhodamine B dye.

Step 4. A series of six short-term dye standards are made from solutions in Step 3. These standards were identified earlier in this section. In the experience of the OUL these standards have a useful shelf life in excess of one week. However, in practice, Step 4 elutant standards are made weekly, and Step 4 water standards are made daily.

Dilution of Samples

Samples with peaks that have arbitrary fluorescence unit values of 500 or more are diluted a hundred fold to ensure accurate quantification.

Some water samples have high turbidity or color which interferes with accurate detection and measurement of dye concentrations. It is often possible to dilute these samples and then measure the dye concentration in the diluted sample.

The typical dilutions are either 10 fold (1:10) or 100 fold (1:100). A 1:10 dilution involves combining one part of the test sample with 9 parts of water (if the sample is water) or elutant (if the sample is elutant). A 1:100 dilution involves combining one part of the test sample is combined with 99 parts of water or elutant, based upon the sample media. Typically, 0.300 mL of the test solution is combined with 29.700 mL of water (or elutant as appropriate) to yield a new test solution.

All volume measurements of less than 5 mL are made with a digital Finnpiquette. All other volume measurements are made with Rheinland Kohn Geprüfte Sicherheit 50 mL capacity pump dispenser which will pump within plus or minus 1% of the set value.

The water used for dilution is from a carbonate aquifer. All dilution water is pH adjusted to greater than pH 9.5 by holding it in open containers in a high ammonia concentration chamber. This adjustment takes a minimum of two hours.

Quality Control

Laboratory blanks are run for every sample where the last two digits of the laboratory numbers are 00, 20, 40, 60, or 80. A charcoal packet is placed in a pumping well sampler and at least 25 gallons of unchlorinated water is passed through the sampler at a rate of about 2.5 gallons per minute. The sampler is then subjected to the same analytical protocol as all other samplers.

System functioning tests of the analytical instruments are conducted in accordance with the manufacturer's recommendations. Spiked samples are also analyzed when appropriate for quality control purposes.

All materials used in sampling and analysis work are routinely analyzed for the presence of any compounds that might create fluorescence peaks in or near the acceptable wavelength ranges for any of the tracer dyes. This testing includes approximately 1% of materials used.

Project specific QA/QC samples may include sample replicates and sample duplicates. A replicate sample is when a single sample is analyzed twice. A sample duplicate is where two samples are collected in a single location and both are analyzed. Sample replicates and duplicates are run for QA/QC purposes upon request of the client. These results are reported in the Certificate of Analysis.

Reports

Sample analysis results are typically reported in a Certificate of Analysis. However, specialized reports are provided in accordance with the needs of the client. Certificates of Analysis typically provide a listing of station number, sample ID, and dye concentrations if detected. Standard data format includes deliverables in MS Excel and Adobe Acrobat (.pdf)

format. Hard copy of the data package, and copies of the analytical charts are available upon request.

Work at the OUL is directed by Mr. Thomas Aley. Mr. Aley has 45 years of professional experience in hydrology and hydrogeology. He is certified as a Professional Hydrogeologist (Certificate #179) by the American Institute of Hydrology and licenced as a Professional Geologist in Missouri, Arkansas, Kentucky, and Alabama. Additional details regarding laboratory qualifications are available upon request.

Waste Disposal

All laboratory wastes are disposed of according to applicable state and federal regulations. Waste elutant and water samples are collected in 15 gallon poly drums and disposed with a certified waste disposal facility as non-hazardous waste.

In special cases, wastes for a particular project may be segregated and returned to the client upon completion of the project. These projects may have samples that contain contaminants that the client must account for all materials generated and disposed. These situations are managed on a case-by-case basis.

CRITERIA FOR DETERMINATION OF POSITIVE DYE RECOVERIES

Normal Emission Ranges and Detection Limits

The OUL has established normal emission fluorescence wavelength ranges for each of the four dyes described in this document. The normal acceptable range equals mean values plus and minus two standard deviations. These values are derived from actual groundwater tracing studies conducted by the OUL.

The detection limits are based upon concentrations of dye necessary to produce emission fluorescence peaks where the signal to noise ratio is 3. The detection limits are realistic for most field studies since they are based upon results from actual field samples rather than being based upon values from spiked samples in a matrix of reagent water or the elutants from unused activated carbon samplers. In some cases detection limits may be smaller than reported if the water being sampled has very little fluorescent material in it. In some cases detection limits may be greater than reported; this most commonly occurs if the sample is turbid due to suspended material or a coloring agent such as tannic compounds. Turbid samples are typically allowed to settle, centrifuged, or, if these steps are not effective, diluted prior to analysis.

Table 4 provides normal emission wavelength ranges and detection limits for the four dyes when analyzed on the OUL's RF-5301 for samples analyzed as of March 3, 2015.

Table 4. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL.

Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

It is important to note that the normal acceptable emission wavelength ranges are subject to change based on instrument maintenance, a change in instrumentation, or slight changes in dye formulation. Significant changes in normal acceptable emission wavelength ranges will be updated in this document as they occur.

Fluorescence Background

Due to the nature of fluorescence analysis, it is important to identify and characterize any potential background fluorescence at dye introduction and monitoring locations prior to the introduction of any tracer dyes.

There is generally little or no detectable fluorescence background in or near the general range of eosine, rhodamine WT, and sulforhodamine B dyes encountered in most groundwater tracing studies. There is often some fluorescence background in or near the range of fluorescein dye present at some of the stations used in groundwater tracing studies.

Criteria for Determining Dye Recoveries

The following sections identify normal criteria used by the OUL for determining dye recoveries. The primary instrument in use is a Shimadzu RF-5301.

EOSINE

Normal Criteria Used by the OUL for Determining Eosine Dye Recoveries in Elutants from Charcoal Samplers

Criterion 1. There must be at least one fluorescence peak in the range of 540.0 to 545.8 nm in the sample.

Criterion 2. The dye concentration associated with the fluorescence peak must be at least 3 times the detection limit. The eosine detection limit in elutant samples is 0.050 ppb, thus this dye concentration limit equals 0.150 ppb.

Criterion 3. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Criterion 4. The shape of the fluorescence peak must be typical of eosine. Much background fluorescence yields low, broad, and asymmetrical fluorescence peaks rather than the more narrow and symmetrical fluorescence peaks typical of eosine. In addition, there must be no other factors which suggest that the fluorescence peak may not be eosine dye from our groundwater tracing work.

Normal Criteria Used by the OUL for Determining Eosine Dye Recoveries in Water Samples

Criterion 1. In most cases, the associated charcoal samplers for the station should also contain eosine dye in accordance with the criteria listed above. This criterion may be waived if no charcoal sampler exists.

Criterion 2. There must be no factors which suggest that the fluorescence peak may not be eosine dye from our groundwater tracing work. The fluorescence peak should generally be in the range of 532.8 to 537.3 nm.

Criterion 3. The dye concentration associated with the fluorescence peak must be at least three times the detection limit. Our eosine detection limit in water samples is 0.015 ppb, thus this dye concentration limit equals 0.045 ppb.

Criterion 4. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

FLUORESCEIN

Normal Criteria Used by the OUL for Determining Fluorescein Dye Recoveries in Elutants from Charcoal Samplers

Criterion 1. There must be at least one fluorescence peak in the range of 514.5 to 519.6 nm in the sample.

Criterion 2. The dye concentration associated with the fluorescence peak must be at least 3 times the detection limit. The fluorescein detection limit in elutant samples is 0.025 ppb, thus this dye concentration limit equals 0.075 ppb.

Criterion 3. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Criterion 4. The shape of the fluorescence peak must be typical of fluorescein. Much background fluorescence yields low, broad, and asymmetrical fluorescence peaks rather than the more narrow and symmetrical fluorescence peaks typical of fluorescein. In addition, there must be no other factors which suggest that the fluorescence peak may not be fluorescein dye from our groundwater tracing work.

Normal Criteria Used by the OUL for Determining Fluorescein Dye Recoveries in Water Samples

Criterion 1. In most cases, the associated charcoal samplers for the station should also contain fluorescein dye in accordance with the criteria listed above. This criterion may be waived if no charcoal sampler exists.

Criterion 2. There must be no factors which suggest that the fluorescence peak may not be fluorescein dye from our groundwater tracing work. The fluorescence peak should generally be in the range of 506.8 to 510.6 nm.

Criterion 3. The dye concentration associated with the fluorescence peak must be at least three times the detection limit. Our fluorescein detection limit in water samples is 0.002 ppb, thus this dye concentration limit equals 0.006 ppb.

Criterion 4. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

RHODAMINE WT

Normal Criteria Used by the OUL for Determining Rhodamine WT Dye Recoveries in Elutants from Charcoal Samplers

Criterion 1. There must be at least one fluorescence peak in the sample in the range of 565.2 to 571.8 nm.

Criterion 2. The dye concentration associated with the rhodamine WT peak must be at least 3 times the detection limit. The detection limit in elutant samples is 0.170 ppb, thus this dye concentration limit equals 0.510 ppb.

Criterion 3. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Criterion 4. The shape of the fluorescence peak must be typical of rhodamine WT. In addition, there must be no other factors which suggest that the fluorescence peak may not be dye from the groundwater tracing work under investigation.

Normal Criteria Used by the OUL for Determining Rhodamine WT Dye Recoveries in Water Samples

Criterion 1. In most cases, the associated charcoal samplers for the station should also contain rhodamine WT dye in accordance with the criteria listed above. These criteria may be waived if no charcoal sampler exists.

Criterion 2. There must be no factors which suggest that the fluorescence peak may not be rhodamine WT dye from the tracing work under investigation. The fluorescence peak should generally be in the range of 572.4 to 577.7 nm.

Criterion 3. The dye concentration associated with the fluorescence peak must be at least three times the detection limit. Our rhodamine WT detection limit in water samples is 0.015 ppb, thus this dye concentration limit is 0.045 ppb.

Criterion 4. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

SULFORHODAMINE B

Normal Criteria Used by the OUL for Determining Sulforhodamine B Dye Recoveries in Elutants from Charcoal Samplers

Criterion 1. There must be at least one fluorescence peak in the sample in the range of 576.4 to 583.2 nm.

Criterion 2. The dye concentration associated with the sulforhodamine B peak must be at least 3 times the detection limit. The detection limit in elutant samples is 0.080 ppb, thus this dye concentration limit equals 0.240 ppb.

Criterion 3. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Criterion 4. The shape of the fluorescence peak must be typical of sulforhodamine B. In addition, there must be no other factors which suggest that the fluorescence peak may not be dye from the groundwater tracing work under investigation.

Normal Criteria Used by the OUL for Determining Sulforhodamine B dye Recoveries in Water Samples

Criterion 1. In most cases, the associated charcoal samplers for the station should also contain sulforhodamine B dye in accordance with the criteria listed earlier. This criterion may be waived if no charcoal sampler exists.

Criterion 2. There must be no factors which suggest that the fluorescence peak may not be sulforhodamine B dye from the tracing work under investigation. The fluorescence peak should generally be in the range of 580.8 to 584.4 nm.

Criterion 3. The dye concentration associated with the fluorescence peak must be at least three times the detection limit. The detection limit in water is 0.008 ppb, thus this dye concentration limit equals 0.024 ppb.

Criterion 4. The dye concentration must be at least 10 times greater than any other concentration reflective of background at the sampling station in question.

Standard Footnotes

Sometimes not all the criteria are met for a straight forward determination of tracer dye in a sample. For these reasons, the emission graph is scrutinized carefully by the analytical technician and again during the QA/QC process. Sometimes the emission graphs require interpretation as to whether or not a fluorescence peak represents the tracer dye or not. Background samples from each of the sampling stations aid in the interpretation of the emission fluorescence graphs. When the results do not meet all the criteria for a positive dye detection, often the fluorescence peak is quantified and flagged with a footnote to the result as not meeting all the criteria for a positive dye detection. Standard footnotes are as follows:

Single asterisk (*): A fluorescence peak is present that does not meet all the criteria for a positive dye recovery. However, it has been calculated as though it were the tracer dye.

Double asterisk (**): A fluorescence peak is present that does not meet all the criteria for this dye. However, it has been calculated as a positive dye recovery.

Other footnotes specific to the fluorescence signature are sometimes also used. These footnotes are often developed for a specific project.

The quantification of fluorescence peaks that do not meet all the criteria for a positive dye detection can be important for interpretation of the dataset as a whole.

ATTACHMENT 1
Sample Collection Data Sheet

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protom, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project _____ Week No: ____ Samples Collected By: _____

Samples Shipped By: _____ Samples Received By: _____

Date Samples Shipped: _____ Date Samples Received: _____ Time Samples Received: _____ Return Cooler? Yes ☐ No ☐

Bill to: _____ Send Results to: _____

Analyze for: ☐ Fluorescein ☐ Eosine ☐ Rhodamine WT ☐ Other _____ Ship cooler to: _____

<i>OUL use only</i>		<u>Please indicate stations where dye was visible in the field</u> <i>for field technician use - use black ink only</i>						<i>OUL use only</i>
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	

COMMENTS _____

This sheet filled out by OUL staff? Yes ☐ No ☐ Charts for samples on this page proofed by OUL: _____

OUL Project No. _____ Date Analyzed: _____ Analyzed By: _____

APPENDIX C

CALCULATIONS

Appendix C: Calculations
Table C1: Bedrock Aperture Volumes

Well ID	# Fractures	Total Fracture Aperture (mm)	Largest Fracture (mm)	2nd Largest Fracture (mm)	Depth Largest Fracture (ft bgs)	Total Fracture Aperture (ft)	Fracture Volume (ft ³ Assuming 60 ft Radius)	Volume Water (Assuming fractures saturated)(gallons)	Liters	Effective Porosity
RW-1	6	23	12	--	20.4	0.0755	853	6,384		0.0044
RW-2	8	29	6	--	20.8	0.0951	1076	8,049		0.0053
RW-3	7	106	54	28	19.3, 17.9	0.3478	3933	29,420		0.0183
RW-4	4	44	31	--	17.1	0.1444	1633	12,212		0.0072
RW-5	6	33	9	--	30.1	0.1083	1224	9,159		0.0064
Planned wells		Anticipated aperture					Total gallons =	65,224		
RW-6	?	40				0.1312	1484	11,102		0.0077
RW-7	?	40				0.1312	1484	11,102		0.0077
RW-8	?	40				0.1312	1484	11,102		0.0077
							Total potential volume=	98,529	372,973	
Average effective porosity =										0.0081

Notes:
 # of fractures and fracture aperture estimated from borehole geophysics; using fractures > 1 mm
 mm = millimeters
 ft = feet
 bgs = below ground surface
 effective porosity = Total fracture aperture per boring in ft, divided by length of open borehole in ft
 2nd largest fracture only shown if greater than 20 mm
 For planned wells, aperture and volumes estimated based on evaluation of fractures identified in existing wells.

Appendix C: Calculations

Table C2: Amendment Quantities

Basis of design calculations for Scobell Chemical
Sirem Laboratories Treatability Dosing Tested Below; Water treated contained ~70,000 micrograms per liter (µg/L) Trichloroethene (TCE)
Average groundwater concentration of area being targeted for treatment equals ~ 50,000 ug/L to ~120,000 ug/L TCE

product	lab dose	lab dose	Note
ISR-CL™	3.512	g/l	
IronGel (tested)	7.967	g/l (Iron Gel)	Iron Gel = 45% ZVI by weight
	3.585	g/l (ZVI portion of Iron Gel)	
EDS-ER™	1	g/l	
EDS-Activator™	0.223	g/l	
Substrate Shuttle™	0.215	g/l	
TersOx™ Nutrients-QR	0.015	g/l	
KB-1® Primer	0.794	g/l	

Field dose concentrations below. Increase dosing based change from lab conditions to field conditions

Field dose assumes treating 88,000 gallons (estimated range of 70,000 to 100,000 gallons)

Product	Field Dose	Notes	unit (grams per liter [g/l])	Percent Increase from Lab Dose	Field Dose in Pounds per Gallon	Total pounds to treat 88,000 gallons
ISR-CL™	28.1		g/l	700%	0.2345	20,637
Zero Valent Iron (ZVI) (45 micron)	21.8	Will use ZVI, not IronGel. Increase from lab dose assumes only ZVI portion (3.585 g/L ZVI)	g/l	508%	0.1819	16,010
EDS-ER™	8.6	Within typical range (2 to 10 g/l) - high end due to DNAPL	g/l	760%	0.0718	6,316
EDS-Activator™	2	proportional to EDS-ER	g/l	797%	0.0167	1,469
Substrate Shuttle™	1.9	proportional to EDS-ER	g/l	784%	0.0159	1,395
TersOx™ Nutrients-QR	0.1	Within typical range	g/l	567%	0.0008	73
KB-1® Primer	0.8	Function of how much injection water treated. Assuming 60,000 gallons	g/l	-20%	0.0067	588

Total amount of product to be ordered below is based on dosing above and available container sizes.

Water to be included	ISR-CL	45 um ZVI powder	EDS-ER	EDS-Activator	Substrate Shuttle	TersOx Nutrients-QR	KB-1	KB-1 Primer
60,000 gallons 60 to 100% pore volume replacement	20,650 lbs (2,100 gal) 28.1 g/l	16,000 lbs (2100 gal) 21.8 g/l in situ	6,300 lbs (821 gal) 8.6 g/l	1,500 lbs (196 gal) 2 g/l	1,448 lbs (1187 gal) 2 g/l	75lbs 0.1 g/l	80 liters 10 l/pt	400 lbs 50 lbs/pt (if 60,000 gallons)

(Water volume may be reduced based on ability to inject above volumes; however, quantity of amendments to remain the same divided over the 24 injection intervals)
(um = micron; ZVI = zero valent iron; lbs = pounds; gal = gallons; g/l = grams per liter)

Amendment Amounts to be shipped.

Item	Concept	Units	Quantity per Unit	Units	Quantity	Total
1	ISR-CL™ Iron sulfide-based reagent	tote	2950	pounds	7	20650
2	ZVI	bag/sack	2000	pounds	8	16000
3	EDS-ER™	tote	2100	pounds	3	6300
4	EDS-Activator	drum	375	pounds	4	1500
5	Substrate Shuttle	drum	362	pounds	4	1448
6	TersOx™ Nutrients-QR	bag	25	pounds	3	75
7	KB-1	Liter	1	liter	80	80
8	KB-1 Primer	bucket	50	pounds	8	400

Amendment batch mixtures to be completed by Cascade Remediation Services based on above ratios. EEGE to field check calculations.
Amendment to be distributed as evenly as possible over the 8 injection wells and proposed 24 injection intervals.

APPENDIX D

AMENDMENT SAFETY DATA SHEET

SAFETY DATA SHEET

EDS-ER™



Revision Date: 07/30/2025
Version 1.2
SDS # 01A

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name: EDS-ER™

Synonyms: Electron Donor Solution – Extended Release

Product Form: Mixture

1.2 Recommended use of the chemical and restrictions on use

Recommended Use: Remediation of contaminated groundwater and soils.

Restrictions on Use: Use as recommended by the label.

1.3 Details of the supplier and of the safety data sheet

Supplier: Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)

+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Relevant identified uses of the substance or mixture

No applicable GHS categories. This product is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Other hazards None known.

2.2 Label element The product does not require a hazard warning label in accordance with GHS. The normal safety precautions for the handling of chemicals must be observed.

Hazard statement Non-Regulated Material

Precautionary statement

Prevention	No GHS prevention statements
Response	No GHS response statements
Storage	No GHS storage statements
Disposal	No GHS disposal statements

2.3 Classification system

NFPA Ratings (scale 0-4)
Health = 0
Fire = 1
Reactivity = 0

HMIS Ratings (scale 0-4)
Health = 0 Flammability = 1 Reactivity = 0

3. COMPOSITION/INFORMATION ON INGREDIENTS**3.1 Chemical Formula** Mixture**3.2 Hazardous components**

Chemical Name	Concentration (%)	CAS Number
None	None	None

3.3 Nonhazardous components

Chemical Name	Concentration (%)	CAS Number
Soybean Oil	90 to 93	8001-22-7
Emulsifiers	7 to 10	Proprietary

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.

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

4. FIRST AID MEASURES**4.1 General Information**

Check the vital functions. If unconscious place in recovery position and seek medical advice. In case of respiratory arrest, administer artificial respiration. Cardiac arrest, perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Take the victim to a doctor if irritation persists.

Remove affected person from source of contamination.

Eye Contact

Promptly wash eye with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes and get medical attention. Do not apply (chemical) neutralizing agents. In case of eye irritation consult an ophthalmologist. Remove any contact lenses and open eyelids wide apart.

Skin Contact

Wash off promptly and flush contaminated skin with water. Promptly remove clothing of soaked through and flush skin with water. Get medical attention if irritation persists after washing. Do not apply (chemical) neutralizing agents.

Inhalation

Move the exposed person to fresh air at once. When breathing is difficult, properly trained personnel may assist affected person by administering oxygen. Perform artificial respiration if breathing has stopped. Keep the affected person warm and at rest. Get prompt medical attention.

Ingestion

Drink plenty of water. DO NOT induce vomiting. Get medical attention

immediately. Never give anything by mouth to an unconscious person.
Keep the affected person warm and at rest.

**4.2 Important
symptoms and effects
(acute and delayed)**

Symptoms/injuries after skin contact: Causes skin irritation.
Symptoms/injuries after eye contact: Eye damage / irritation.

5. FIRE-FIGHTING MEASURES

**5.1 Suitable Extinguishing
Media**

Alcohol resistant foam. Carbon dioxide (CO₂). Dry chemicals, sand, dolomite, etc. Water spray

**5.2 Specific Hazards
Arising from the chemical
or mixture**

Fire hazard: high.
Explosion hazard: Not known.
Oxides of the following substances: Carbon, Sulfurous gases (SO_x)

**5.3 Special Fire Fighting
Procedures**

Cool containers exposed to flames with water until well after the fire is out. Use water spray to reduce vapors. If the risk of water pollution occurs, notify appropriate authorities. Avoid water in straight hose stream; will scatter and spread fire. Keep upwind. Do not inhale explosions and combustion gases. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Cool containers exposed to flames with water until well after the fire is out. Use water spray to reduce vapor. If the risk of water pollution occurs, notify appropriate authorities. Avoid water in straight hose stream; will scatter and spread fire. Wear positive-pressure, self-contained breathing apparatus (SCBA) and chemical protective clothing.

**5.4 Unusual Fire and
Explosion Hazards**

Rags containing this material may heat and burn spontaneously. If a material with a large surface area, like rags, filters etc., is saturated with vegetable oils spontaneous combustion has been known to happen

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions

Wear protective clothing as described in Section 8 of this safety data sheet. Do not smoke or use open fire or other sources of ignition. Contact with walking surface may result in formation of slippery film/falling hazard.

6.2 First Aid

In case of contact with skin, wash with soap and water. If symptoms occur, seek medical attention. In case of contact with eyes, rinse with plenty of water for at least 15 minutes and see an eye specialist if irritation persists. In case of inhalation, remove to fresh air. In case of ingestion, drink water. If symptoms occur, seek medical assistance. Do not discharge into drains, sewers, or watercourses or onto the ground. Inform the relevant authorities if this occurs.

**6.3 Environmental
Precautions**

**6.4 Methods for
Containment and Clean Up**

Spilled product should be removed immediately. Provide enough ventilation. Recover product for reuse if possible. Avoid contamination of waterways and (if large quantity) vegetation. Absorb in non-combustible material, vermiculite, dry sand or earth and place into containers. If in mist form and levels are above 12mg/m³(total), an air

purifying respirator (APR) and goggles are recommended. Avoid runoff into storm sewers and ditches which lead to waterway.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Contain with applicable regulations. Avoid contact with eyes. Avoid inhalation of vapors and spray/mist. Remove contaminated clothing immediately. Clean contaminated objects and areas thoroughly observing environmental regulations. Keep away from sources of ignition – No smoking. Handle in accordance with good industrial hygiene and safety procedures. Discharge into the environment must be avoided. Keep container tightly closed. Either local exhaust or general room ventilation is usually required.

7.2 Hygiene measures

Handle in accordance with good industrial hygiene and safety procedures. Use good personal hygiene practices.

7.3 Conditions for safe storage (with incompatibilities)

Technical measures: Clean bulk tanks periodically to prevent accumulation of bacteria

Storage conditions: Store in tightly closed, original container in a well-ventilated place. Protect against frost. Protect against direct sunlight.

Storage temperature: See technical datasheet. Above 10°C (50°F) and away from heat or flame.

Storage area: Store in a dry area. Comply with applicable regulations. Collect spillage.

Packaging materials: Stainless steel. Plastic.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control parameters

Exposure guidelines, ingredients with workplace control parameters.

Components with occupational exposure limits

Soybean Oil (8001-22-7)

TWA Short-term value: 5 mg/m³

Long-term value: 15 mg/m³

8.2 Exposure Control



Appropriate engineering controls

Provide adequate general and local exhaust ventilation. Observe any occupational exposure limits for the product or ingredients. Do not allow uncontrolled discharge of product into the environment.

Eye/face protection

The following protection should be worn: Chemical splash goggles.

Respiratory protection

An approved NIOSH respirator must be worn if exposed to excessive oil vapors

Hand protection	Neoprene. Vinyl, Rubber (natural, latex), Butyl rubber. Wear protective gloves made of the following material: Chemical-resistant, impervious gloves complying with an approved standard should be worn if a risk assessment indicates skin contact is possible. Polyvinyl chloride (PVC). Manufactured/tested in accordance with EN 374, Avoid the following conditions: Polyvinyl alcohol (PVA).
Other skin and body protection	Wear appropriate clothing to prevent any possibility of skin contact. If using hot oil, insulated gloves may be required
Hygiene measures	Wash promptly if skin becomes contaminated. Wash hands at the end of each work shift and before eating, smoking, and using the toilet. When using do not eat, drink, or smoke.
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.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Clear yellow to clear brown, amber
Odor	Light Vegetable Oil
Odor threshold	Not determined.
pH	Not determined. Natural when diluted with water.
Melting point /Freezing Point	-2°C
Initial Boiling point and boiling point range	Not determined.
Flash Point	282°C (540°F)
Evaporation rate	Not determined.
Flammability (solid; gas)	Not determined.
Upper/lower flammability or explosive limits	Not determined.
Vapor pressure	Not determined.
Vapor density	Not determined.
Relative density	0.925 g/cm ³ (7.719 lbs/gal)
Solubility (ies)	Dispersible
Partition coefficient: n-octanol/water	Not determined.
Initial Boiling point and boiling point range	Not determined.
Auto-ignition temperature	Unknown
Decomposition temperature	Unknown
Viscosity	80 cP at 24°C; 35 cSt at 40°C

10. STABILITY AND REACTIVITY

10.1 Reactivity No further relevant information available.

10.2 Chemical stability Stable under normal conditions and use.

10.3 Possibility of hazardous reactions

No dangerous reactions known.

10.4 Conditions to avoid

No further relevant information available.

10.5 Incompatible materials

No further relevant information available.

10.6 Hazardous decomposition productsOxides of carbon (CO_x).**10.7 Hazardous Polymerization**

Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION**11.1 Acute Toxicity**

Acute toxicity (oral)

LD50

Species: Rat (male/female)

Dose: >2.000 mg/kg

Method: OECD 423

Skin

Acute toxicity estimate: 3,571 mg/kg

Method: Calculation method

Serious Eye

Not classified

Damage/Irritation

Respiratory or Skin

Not classified

Sensitization

Ingestion

Not classified

Germ Cell Mutagenicity

Not classified

Carcinogenicity

Not classified

Reproductive Toxicity

Not classified

Specific Target Organ

Not classified

Toxicity (Single Exposure)

Specific Organ Toxicity

Not classified

(Repeated Exposure)

Aspiration Hazard

Not classified

General Remarks

Not classified

Repeated does toxicity

> 5000 mg/Kg bw/day [OECD 422, CAS# 8001-30-7]

Reproductive toxicity

> 2000 mg/Kg bw/day [OECD 422, CAS# 8001-30-7]

11.2 Additional Toxicological Information

When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us. The substance is not subject to classification.

11.3 Carcinogenic Categories

11.3.1 IRAC (International Agency for Research on Cancer): 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.

11.3.2 ACGIH (American Conference of Governmental Industrial Hygienists): 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 ACGIH.

11.3.3 NTP (National Toxicology Program): 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 NTP.

11.3.4 OSHA (Occupational Safety & Health Administration): No component of this product

present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

12. ECOLOGICAL INFORMATION

12.1 Chemical Fate Information

Product is readily biodegradable in wastewater treatment systems.

12.2 Biodegradability

Slow, not readily degradable Method: OECD 301 D

Chemical Oxygen Demand: 2.324 mg/g DIN 38409 T.31

12.3 Toxicity

Acute toxicity to fish- LC0: >100 mg/L 96h (no data, OCED 203, s-s)

Acute toxicity to aquatic invertebrates: No data

Toxicity to aquatic algae: No data

Toxicity to microorganisms- EC50: >100 mg/L 3 h (a.s. bacteria, OCED 209, s)

12.4 Bioaccumulative potential

No data available

12.5 Aquatotoxicity, invertebrates

Species: *Daphnia magna*

Exposure duration: 48 h

EC50: > 100 mg/l

Method: OECD 202

12.6 Aquatotoxicity, algae / aquatic plants

Species: *Scenedesmus subspicatus*

Exposure duration: 72 h

EbC50: 341 mg/l

Method: OECD 201

12.7 Mobility in soil

Adsorption coefficient in soil (log Koc): no data

12.8 Results of PBT and vPvB assessment

The substance is not PBT or vPvB

12.9 Other adverse effects

No information available

13. DISPOSAL CONSIDERATIONS

13.1 Waste Disposal Methods

Dispose according to federal, state, and local laws. Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Authority. Waste is suitable for incineration.

14. TRANSPORTATION INFORMATION**14.1 U.S. (D.O.T.)**

Proper Shipping Name: Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.2 Canada (T.D.G.)

Proper Shipping Name: Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.3 IMDG

Proper Shipping Name: Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.4 IATA

Proper Shipping Name: Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.5 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

N/A for product as supplied.

15. REGULATORY INFORMATION**15.1 EPCRA - Emergency Planning and Community Right-to-Know Act****CERCLA Reportable Quantity**

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

15.2 SARA 311/312 Hazards No SARA Hazards

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

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

15.3 California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

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

CH INV: On the inventory, or in compliance with the inventory
DSL: All components of this product are on the Canadian DSL
AICS: On the inventory, or in compliance with the inventory
NZIoC: On the inventory, or in compliance with the inventory

ENCS:	On the inventory, or in compliance with the inventory
KECI:	Not in compliance with the inventory
PICCS:	On the inventory, or in compliance with the inventory
IECSC:	On the inventory, or in compliance with the inventory
TCSI:	On the inventory, or in compliance with the inventory
TSCA:	On the inventory, or in compliance with the inventory

16. OTHER INFORMATION

16.1 Abbreviation/acronyms used

UVCB (substance)- Chemical substances of Unknown or Variable Composition, complex reaction products and biological materials

CAS (number)- Chemical Abstracts Service

EC (number)- Ref. EINECS/ELINCS number

R.E.A.Ch.- Registration, Evaluation, Authorisation and Restriction of Chemicals

TARIC - Tariffa Integrata della Comunità (Integrated Community Tariff code)

GHS - Globally Harmonised System of Classification and Labelling of Chemicals

CLP - Classification, Labelling and Packaging regulation

n/a - not applicable

PPE - Personal Protection Equipment

(Q)SAR - (Quantitative) Structure-Activity Relationship

bw – body weight

NOAEL - No Observed Adverse Effect Levels

STOT - Specific Target Organ Toxicity

BCF - Bioconcentration Factor

PBT (substance) - Persistent Bioaccumulative Toxic

vPvB (substance) - very Persistent, Very Bioaccumulative

SVHC (substance) - Substances of Very High Concern

Components not precisely identified are proprietary or non-hazardous.

Mixture classified as not dangerous according to Regulation (EC) 1272/2008.

Observe employment restrictions for people.

Product is not listed with IARC, NTP, ACGIH or OSHA as a carcinogen.

Disclaimer:

The information provided in this Safety Data Sheet (SDS) is believed to be accurate and reliable as of the issue date. However, Tersus Environmental, LLC makes no warranties, express or implied, regarding the completeness or accuracy of the data or any recommendations. It is the responsibility of each recipient to review this SDS thoroughly and consult appropriate technical or regulatory resources as needed to understand the hazards and ensure safe handling and use of the product.

Regulations may vary by location and are subject to change. Users are responsible for compliance with all applicable federal, state, provincial, and local laws and regulations. Because the conditions of use, handling, and application are beyond our control, Tersus Environmental, LLC assumes no liability for any loss or damage resulting from the use of this product. It is the user's responsibility to determine the suitability and safety of the product for its intended use, and to ensure that such use does not infringe upon any intellectual property rights.

This SDS applies only to the product in its original form as shipped. Recommendations provided—whether verbal, written, or inferred from test data—are based on current knowledge at the time of issuance and may be revised as new information becomes available. However, circumstances beyond

our control may affect the validity of such recommendations. Users must independently verify the product's suitability for their specific process or application.

Only SDSs issued directly by Tersus Environmental, LLC should be considered current and valid. If you have received an SDS from another source or are unsure of its version, please contact us to obtain the most up-to-date document.



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End of Safety Data Sheet

SAFETY DATA SHEET

TersOx™ Nutrients-QR



Revision Date: 2022-07-07
Version 1.2

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifier

Product Name: TersOx™ Nutrients-QR

Synonyms: Water soluble nitrogen and phosphorus nutrient salt supplement for microbial process

Product Form: Mixture

1.2 Recommended use of the chemical and restrictions on use

Recommended Use: For use in stimulating biological activity in soils and sludges
Remediation of contaminated groundwater and soils

Restrictions on Use: Use as recommended by the label

1.3 Details of the supplier and of the safety data sheet

Supplier: Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

Contact Person: David F. Alden
Phone: +1-919-453-5577 x2002
Email: david.alden@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)
+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Relevant identified uses of the substance or mixture

Hazard Classification	Category	H-statement
Skin irritant	2	H315
Eye irritant	2A	H319
Acute toxicity – Inhalation	4	H332
Specific Target Organ Toxicity – Repeated	2	H371
Mutagenicity	2	H341

2.2 Label elements

2.2.1 Hazard pictograms



2.2.2 Hazard statements

Causes skin irritation (H315)
Causes serious eye irritation (H319)
Harmful if inhaled (H332)
May cause damage to lungs through prolonged or repeated exposure to inhalation of Urea: Known to cause emphysema (lung disease) (H371)
Urea is suspected of causing genetic defects (H341)

Note: See 2.1 for further information

2.2.3 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.
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.
P280 – Wear protective gloves, clothing, eye, and face protection.
P302 + P352 – IF ON SKIN: Wash with soap and plenty of water.
P304 + P340 – IF INHALED: Remove person to fresh air and keep comfortable for breathing.
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 + P311 + P313 – IF exposed or concerned: Call a POISON CONTROL CENTER, or doctor and get medical advice/attention.
P312 – Call a POISON CONTROL CENTER, or doctor if you feel unwell.
P332 + P313 – If skin irritation occurs: Get medical advice/attention.
P337 + P313 – If eye irritation persists: Get medical advice/attention.
P362 + P364 – Take off contaminated clothing and wash it before reuse.
P405 – Store locked up.
P501 – Dispose of contents in container that follow in accordance with local, regional, and federal regulations.

2.3 Further information

Persons who have a compromised immune system or a history of severe allergic response should avoid contact and/or breathing dust or mist from product handling or manufacturing processes.

2.4 Other hazard information

None known.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical Formula

Mixture

3.2 Hazardous components

Chemical Name	Concentration (%)	CAS Number
Urea	> 75	57-13-6
Diammonium Phosphate	< 25	7783-28-0
Tricalcium Phosphate	< 1	1306-06-5

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

4. FIRST AID MEASURES

4.1 General Information

Check the vital functions. If unconscious place in recovery position and seek medical advice. In case of respiratory arrest, administer artificial respiration. Cardiac arrest: perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Take victim to a doctor if irritation persists.

Remove affected person from source of contamination.

4.1.1 Eye Contact

Product is a severe eye irritant. Direct contact with eyes must be avoided. In case of contact with eyes, flush eyes with low pressure water for at least 15 minutes. If irritation persists, seek medical attention.

4.1.2 Skin Contact

Product may cause slight irritation. Prolonged or repeated direct contact with skin may cause reddening, itching and inflammation. In case of contact with skin, wash skin with soap and water. Remove contaminated clothing and wash. If irritation persists, consult a physician.

4.1.3 Inhalation

May cause sensitization by inhalation in hypersensitive individuals, irritation of respiratory tract, or physical interference with breathing. Avoid inappropriate handling which may result in dust generation. If inhaled, remove from contaminated area to fresh air. Initiate CPR if victim has stopped breathing. Administer oxygen if victim has difficulty breathing. Report situation. Seek medical attention if allergic response or difficulty breathing is exhibited. No incidences of health effects from dust inhalation have been reported.

4.1.4 Ingestion

Ingestion of material may cause gastric disturbance including irritation, nausea, vomiting, and diarrhea. If swallowed, rinse mouth and throat with tap water. Consult a physician if symptoms exist.

4.2 Important symptoms and effects (acute and delayed)

Most important symptoms/effects, acute and delayed: A single dose of 100 g has been reported to cause mild central nervous system depression, e.g. drowsiness and slow reflexes. Sensitization (shortness of breath, wheezing, and labored coughing) take individual to emergency room.

4.3 Indication of any immediate medical attention and special treatment needed

If exposed or concerned, get medical advice and attention.

5. FIRE-FIGHTING MEASURES**5.1 Suitable Extinguishing Media**

Dry chemical, carbon dioxide, chemical foam or water (all common agents as appropriate to surrounding fire – this material burns with difficulty).

5.2 Specific Hazards Arising from the Chemical or Mixture

Avoid mixtures with strong acids (nitric or perchloric) which may create explosive mixture.

5.3 Special Fire Fighting Procedures

Irritating toxic substances may be emitted on thermal decomposition. Exposed firefighters should wear self-contained breathing apparatus and protective clothing.

Cool containers exposed to flames with water until well after the fire is out. Use water spray to reduce vapors. If risk of water pollution occurs, notify appropriate authorities. Avoid water in straight hose stream; will scatter and spread fire. Keep upwind. Do not inhale explosion and combustion gases. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Cool containers exposed to flames with water until well after the fire is out. Use water spray to reduce vapors. If risk of water pollution occurs, notify appropriate authorities. Avoid water in straight hose stream; will scatter and spread fire. Wear positive-pressure, self-contained breathing apparatus (SCBA) and chemical protective clothing.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal Precautions**

Provide enough ventilation. Advice for emergency responders: protective equipment see Section 8. Wear protective clothing as described in Section 8 of this safety data sheet. Do not smoke or use open fire or other sources of ignition. Contact with walking surface may result in formation of slippery film/falling hazard.

6.2 First Aid

In case of contact with skin, wash with soap and water. If symptoms occur, seek medical attention. In case of contact with eyes, rinse with plenty of water for at least 15 minutes and see an eye specialist if irritation persists. In case of inhalation, remove to fresh air. In case of ingestion, drink water. If symptoms occur, seek medical assistance.

6.3 Environmental Precautions

Do not discharge into drains, sewers or watercourses or onto the ground. Inform the relevant authorities if this occurs. Spilled product should be removed immediately to avoid formation of dust. Contain spill, sweep up avoiding airborne dust. Provide enough ventilation. Recover product for reuse if possible. Avoid contamination of waterways and (if large quantity) vegetation.

6.4 Methods for Containment and Clean Up

Spilled product should be removed immediately to avoid formation of dust. Contain spill, sweep up avoiding airborne dust. Provide enough ventilation. Recover product for reuse if possible. Avoid contamination of waterways and (if large quantity) vegetation. Absorb in non-combustible material, vermiculite, dry sand or earth and place into containers.

7. HANDLING AND STORAGE

7.1 Precautions for Safe Handling

Avoid creating dust. Adequately ventilate when handling this product. Provide eyewash capability. Contain with applicable regulations. Avoid contact with eyes. Avoid inhalation of vapors and spray/mist. Remove contaminated clothing immediately. Clean contaminated objects and areas thoroughly observing environmental regulations. Keep away from sources of ignition – No smoking. Handle in accordance with good industrial hygiene and safety procedures. Discharge into the environment must be avoided. Keep container tightly closed. Either local exhaust or general room ventilation is usually required.

7.2 Hygiene Measures

Handle in accordance with good industrial hygiene and safety procedures. Use good personal hygiene practices.

7.3 Conditions for Safe Storage and Incompatibilities

Avoid mixtures with strong acids (nitric or perchloric) which may create explosive mixture.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control Parameters

Exposure guidelines, ingredients with workplace control parameters.

Name	CAS-No	TLV (ACGIH)	PEL (OSHA)
Urea	57-13-6	10mg/m ³ {3}*	15mg/m ³ {5}*
Diammonium phosphate	7783-28-0	10mg/m ³ {3}*	15mg/m ³ {5}*
Tricalcium phosphate	1306-06-5	10mg/m ³ {3}*	15mg/m ³ {5}*

* Specific limits not set for these chemicals. Limits are shown for Particles Not Otherwise Regulated (PNOR) or Particles Not Otherwise Classified (PNOC). First number is for total dust second number {#} is for respirable dust.

8.2 Exposure Control**8.2.1 Protective equipment**



8.3 Appropriate Engineering Controls

Provide adequate general and local exhaust ventilation. Observe any occupational exposure limits for the product or ingredients. Do not allow uncontrolled discharge of product into the environment.

8.3.1 Face Protection

The following protection should be worn: Safety glasses with shields, chemical splash goggles or face shield.

8.3.2 Respiratory Protection

Dust mask or respirator for particle removal (NIOSH)

8.3.3 Hand Protection

Gloves that are made up of either: neoprene, vinyl, or rubber / butyl rubber should always be worn even when skin contact isn't highly possible. These gloves should also be chemical-resistant, and impervious gloves that comply with any approved standard. PVC gloves should be worn specifically if a risk assessment indicates skin contact is highly possible. And, PVA gloves, under no circumstances, should ever be worn.

8.3.4 Body Protection

Wear appropriate clothing to prevent any possibility of skin contact.

8.4 Hygiene Measures

Wash promptly if skin becomes contaminated. Wash hands at the end of each work shift and before eating, smoking and using the toilet. When using do not eat, drink or smoke.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	White granular solid
Odor	Mild ammonia odor
Odor threshold	Information Not Available
pH	7 – 10 (10% sol)
Melting point /Freezing Point	130 °C
Initial Boiling point and boiling point range	Does Not Apply
Flash Point	Does Not Apply
Evaporation rate	Does Not Apply
Flammability (solid; gas)	Information Not Available
Upper/lower flammability or explosive limits	Does Not Apply
Vapor pressure	Low
Vapor density	Does Not Apply
Relative density	Information Not Available
Solubility (ies)	100g / 100mL in water
Partition coefficient: n-octanol/water	Does Not Apply
Initial Boiling point and boiling point range	Does Not Apply
Auto-ignition temperature	Information Not Available

Decomposition temperature	Information Not Available
Viscosity	Does Not Apply
Other Physical/Chemical Properties	Specific Gravity at 25°C – 1.3

10. STABILITY AND REACTIVITY

<u>10.1 Reactivity</u>	Stable under normal conditions and use.
<u>10.2 Chemical stability</u>	Information not available
<u>10.3 Possibility of Hazardous Reactions</u>	Information not available
<u>10.4 Conditions to Avoid</u>	Avoid mixtures with strong acids (nitric or perchloric) which may create explosive mixture, and extreme heat.
<u>10.5 Incompatible Materials</u>	Strong alkalis, active metals (aluminum, magnesium), ammonia, inorganic materials. Strong oxidizers, and chlorine compounds.
<u>10.6 Hazardous Decomposition Products</u>	Information not available
<u>10.7 Hazardous Polymerization</u>	Information not available

11. TOXICOLOGICAL INFORMATION

11.1 Acute Toxicity

Acute toxicity	(low) LD50 > 1000 mg/kg body weight
Skin Corrosion/Irritation	Dust may cause slight skin irritation, prolonged or repeated direct skin contact may cause reddening, itching and inflammation.
Serious Eye Damage/Irritation	Dust may cause severe irritation.
Respiratory or Skin Sensitization	Dust may cause irritation or allergy in susceptible individuals. May cause respiratory allergy in susceptible individuals: sensitization (shortness of breath, wheezing, and labored coughing) take individual to emergency room.
Ingestion	May cause severe gastric disturbances, sore throat.
Germ Cell Mutagenicity	Information Not Available
Carcinogenicity	Information Not Available
Reproductive Toxicity	Information Not Available
Specific Target Organ Toxicity – Single Exposure	Information Not Available
Specific Organ Toxicity – Repeated Exposure	Information Not Available
Aspiration Hazard	Information Not Available
General Remarks	Information Not Available

11.2 European Chemical Agency data for urea: Additional information

The 24-hour EC₅₀ for urea in *Daphnia* was reported to be >10000 mg/l; urea is not acutely toxic to daphnids. The 24-hour LC₅₀ values for freshwater snail eggs, juveniles and adults were reported to be 14,241 mg/l, 18255 mg/l and 22998 mg/l. Following 48-hour exposure, the LC₅₀ value for adults was calculated to be 13,477 mg/l. In another study, the 24-hour LC₅₀ values for eggs, juvenile and adult snails were reported to be 13,532 mg/l, 24504 mg/l and 26024 mg/l, respectively. Following 48 hours exposure, the LC₅₀ value for adults was calculated to be 21,412 mg/l. It is concluded that, under normal laboratory conditions, urea displays low molluscicidal activity. The 4-hour LC₅₀ in mosquito (*Aedes aegypti*) larvae is reported to be 60,000 mg/l.

species: *Daphnia carinata* LC₅₀ (72 h) 1,790 mg/L Diammonium Phosphate; Standard Methods for the Examination of Water and wastewater (APHA)

11.3 European Chemical Agency data for tricalcium phosphate

A static freshwater toxicity test was conducted to determine the acute toxicity of tricalcium phosphate to the water flea, *Daphnia magna* according to OECD Guideline 202. Adverse effects and immobility were examined daily. The criterion of immobilization was an inability to swim for approximately 15 seconds after gentle stir. No mortality or adverse effects were observed at control or 100 mg/L (nominal). The 48-hours EC₅₀ of tricalcium phosphate was >100 mg/L (measured concentration: >5.35 mg/L) in *Daphnia magna*. The concentration of the test substance was calculated using the concentration of calcium expecting the mean calcium concentration at control. The results suggest that the concentration of the test substance was significantly lower than nominal, and the test substance was insoluble in water. Therefore, the test results were expressed as nominal concentration.

12. ECOLOGICAL INFORMATION

Component	Species – Test duration		Test Result
Aquatic			
<i>Acute</i>			
Crustacea	LC50	<i>Ceriodaphnia dubia</i> – 48 hrs	>2,000 mg/L
Fish	LC50	Fathead minnow (<i>Pimephalas promelas</i>) – 96 hrs.	287.2 mg/L

12.1 Chemical Fate Information

Product is readily biodegradable in wastewater treatment systems.

12.2 Biodegradability

Readily degradable.

Excess product in waterways may encourage eutrophication.

13. DISPOSAL CONSIDERATIONS

13.1 Waste Disposal Methods

Dispose according to federal, state and local laws. Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Authority. Waste is suitable for incineration.

14. TRANSPORTATION INFORMATION

14.1 UN Number

Mixture not classified as Hazardous according to Regulation (EC) 1272/2008.

14.2 UN Proper Shipping Name

N/A

14.3 Transport Hazard Class

N/A

<u>14.4 Packing Group (if applicable)</u>	N/A
<u>14.5 Environmental Hazards</u>	N/A
<u>14.6 Special Precautions for User</u>	N/A
<u>14.7 Transport in Bulk According to Annex II of the MARPOL 73/78 and the IBC Code</u>	N/A
<u>14.9 DOT Proper Shipping Name</u>	Chemicals not otherwise indexed (NOI) non-hazardous.

15. REGULATORY INFORMATION

All ingredients used are listed on the USEPA TSCA Inventory list.

Ingredients are not listed in: Reportable Quantity (49CFR 172.101), SARA Title III Section 302/313 (Extremely Hazardous Substance List/ Toxic Chemicals), RCRA Hazardous Waste, California Proposition 65, State Right to Know Laws (Connecticut, Florida, Illinois, Louisiana, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island)

16. OTHER INFORMATION

Mixture classified as not dangerous according to Regulation (EC) 1272/2008.

Observe employment restrictions for people.
Product is not listed with IARC, NTP, ACGIH or OSHA as a carcinogen.

Components not precisely identified are proprietary or non-hazardous. All chemical ingredients appear on the EPA TSCA inventory.

The information contained in this Safety Data Sheet, as of the issue date, is believed to be true and correct. However, the accuracy or completeness of this information and any recommendations or suggestions are made without warranty or guarantee. Since the conditions of use are beyond the control of our company, it is the responsibility of the user to determine the conditions of safe use of this product. The information in this sheet does not represent analytical specifications; for this information contact Tersus Environmental.

Disclaimer: This 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. All recommendations for the use of our products, whether given by us, orally or to be implied from data or lab tests results by us, are based on the current state of our knowledge at the time those recommendations are made. When additional information is obtained, these recommendations may be updated. They may also be influenced by circumstances outside our control. Notwithstanding, such recommendation the user is responsible that the product as supplied by us is suitable to the process or purpose he intends to use it. The user of the product is solely responsible for compliance with all laws and regulations applying to the use of this product. Since we cannot control the application, use or processing of the product, we do not accept responsibility. Therefore, the user should assure that the intended use of the product will not infringe in any party's intellectual property right.



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End of Safety Data Sheet

SAFETY DATA SHEET
Zero Valent Iron (ZVI) Powder D50 = 45 µm



Revision Date: 4/19/2022
Version: 1.1

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifier

Product Name Zero Valent Iron (ZVI) Powder D50 = 45 µm

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

Recommended Use: Professional use, Industrial use. Environmental remediation, water treatment, various.
Restrictions on Use: Use as recommended by the label

1.3 Details of the supplier and of the safety data sheet

Supplier Tersus Environmental, LLC
 1116 Colonial Club Rd
 Wake Forest, NC 27587
 Phone: +1-919-453-5577
 Email: info@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)
+1-919-638-7892 (Tersus Outside office hours)
+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)
+1-703-527-3887 (Chemtrec Outside United States 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS) Not classified as hazardous

2.2 GHS Label elements, including precautionary statements

Signal Word

Warning

Hazard Statements

May form combustible dust concentrations in air

Precautionary Statements

Not applicable

2.3 Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS**3.1 Substances/Mixtures**

Formula: Fe
Molecular Weight: 55.85 g/mol
CAS-No.: 7439-89-6
EC-No.: 231-096-4

Carbon: 1.5 to 2%
Sulfur: 0.1%
Silicon: 1 to 1.5%
Phosphorus 0.1%
Iron: Balance

Synonyms are provided in Section 1.
Occupational exposure limits, if available, are listed in Section 8.

4. FIRST AID MEASURES**4.1 Description of first-aid measures**

Inhalation	Move to fresh air. If symptoms persist, call a physician.
Skin contact	Take off contaminated clothing. Wash skin with soap and water.
Eye contact	Rinse thoroughly with plenty of water, also under the eyelids. Get medical attention if irritation persists.
Ingestion	Drink 1 or 2 glasses of water. If possible, drink milk afterwards. Get medical attention.

4.2 Most important symptoms and effects, both acute and delayed

Inhalation	Main symptoms: Cough and shortness of breath. May cause irritation of respiratory tract.
Skin contact	Long term contact can cause irritation.
Eye contact	May cause mechanical irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

4.3 Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

5. FIRE-FIGHTING MEASURES**5.1 Extinguishing media****Suitable Extinguishing Media**

Use Class D or other metal extinguishing agent.

5.2 Special hazards arising from the substance or mixture**Special Hazard**

These materials, as coarse particles, are non-flammable and do not react with water or other materials used for extinguishing fire. Fine metal dust may pose a risk of fire or explosion if accumulated, mixed, and

confined with an ignition source. When handling fine particles generated from this material, avoid creating dust clouds and ignition sources. May release iron oxide fume if involved in a fire.

5.3 Advice for firefighters

As in any fire, wear self-contained breathing apparatus and full protective gear.

5.4 Further information

Use water spray to cool unopened containers.

6. FIRE-FIGHTING MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Remove all sources of ignition. For personal protection equipment see section 8.

6.2 Environmental precautions

Try to prevent the material from entering drains or water sources.

6.3 Methods and material 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

Refer to protective measures listed in section 8 and 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Protective measures

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 buildup of electrostatic charge.

Advice on general occupational hygiene

Avoid inhalation, ingestion and contact with skin and eyes. General occupational hygiene measures are required to ensure safe handling of the substance. The measures involve good personal and housekeeping practices (i.e., regular cleaning with suitable cleaning devices), no drinking, eating, and smoking at the workplace. Shower and change clothes at end of work shift.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in dry place to avoid oxidation of material. Make sure the product does not come in contact with acids or strong oxidizers.

7.3 Specific end uses

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

8. EXPOSURE CONTROL / PERSONAL PROTECTION**8.1 Control parameters**

Exposure limits	ACGIH TLV	OSHA PEL	NIOSH IDLH
Iron 7439-89-6	Nuisance dust: 15 mg/m ³	Nuisance Dust: 15 mg/m ³	-

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**Eyeface 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

Impermeable gloves, protective work clothing as necessary.

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.

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

Physical state	Powder
Appearance	Light grey metal Powder.
Odor	Odorless
Odor Threshold	Not applicable
Particle size	D50 = 45 µm (micron)

Property	Values	Note
pH	Not applicable	Insoluble in water.
Melting/freezing point	1,535 °C (2,795 °F) - lit.	
Boiling point/boiling range	2,750 °C (4,982 °F) - lit.	
Flash Point	Not Applicable	Not relevant for inorganic substance
Evaporation rate	Solid with a melting point >300°C	

Property	Values	Note
Flammability (solid, gas)	Not flammable.	According to Method A10, EU-Regulation 440/2008
Flammability Limits in Air		
• Upper flammability or explosive limit	No information available	
• Lower flammability or explosive limit	No information available	
Vapor pressure	No information available	Solid with a melting point >300°C
Vapor density	No information available	Solid with a melting point >300°C
Relative density	7.86 g/cm ³ at 25 °C (77 °F)	
Water Solubility	insoluble	
Solubility in other solvents	No information available	
Partition coefficient: n-octanol/water	Not determined	Not relevant for inorganic substances
Autoignition temperature	Not classified.	UN test N.4
Decomposition temperature	Will not decompose	Not relevant for inorganic substances
Viscosity	No information available	Solid with a melting point >300°C
Explosive properties	Not explosive	The substance contains no chemical groups associated with explosive properties.
Oxidizing Properties	Not oxidizing	The substance is incapable of reacting exothermically with combustible materials based on the chemical structure.

9.2 Other information

Bulk Density 1.0-3.0 g/cm³

10. STABILITY AND REACTIVITY

10.1 Reactivity

Stable under normal conditions.

10.2 Chemical stability

Stable under normal handling and storage conditions.

10.3 Possibility of hazardous reactions

None under normal processing.

10.4 Conditions to Avoid

Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Heat, flames, and sparks. Extremes of temperature and direct sunlight

10.5 Incompatible Materials

Acids, Oxygen, Strong oxidizing agents, Halogens, Phosphorus

10.6 Hazardous decomposition products

Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION**11.1 Information on toxicological effects****Information on likely routes of exposure**

General	The principal risk to human health presented by "iron" dust is related to the concentration of dust in the air acting as a nuisance dust. The higher the concentration of dust the greater the risk of irritation to the respiratory system and mechanical irritation to the eyes
Acute Toxicity	The substance is not toxic for skin, inhalation or ingestion
Skin corrosion/irritation	Not irritating.
Serious Eye Damage/Eye Irritation	OECD 405: Not irritating
Respiratory or skin sensitization	Not sensitizing.
Germ Cell Mutagenicity	Ames test OECD 471 negative
Reproductive Toxicity	Testing of metallic iron for reproductive toxicity is not appropriate due to a lack of systemic exposure.
STOT-single exposure	Not classified according to the criteria of the Globally Harmonized System (GHS)
STOT-repeated exposure	Not classified according to the criteria of the Globally Harmonized System (GHS)
Aspiration hazard	Not classified according to the criteria of the Globally Harmonized System (GHS)

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Iron 7439-89-6	7500 mg/kg bw (Rat)	-	-

Carcinogenicity Not classified according to the criteria of the Globally Harmonized System (GHS)

Legend:**ACGIH: (American Conference of Governmental Industrial Hygienists)**

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

A4 - Not Classifiable as a Human Carcinogen

IARC: (International Agency for Research on Cancer) Group 1 -

Carcinogenic to Humans

Group 2A - Probably

Carcinogenic to Humans Group

2B - Possibly Carcinogenic to

Humans Group 3 - Not Classifiable

as to Carcinogenicity in Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

OSHA: (Occupational Safety & Health Administration)

X – Present

12. ECOLOGICAL INFORMATION**12.1 Toxicity****Ecotoxicity effects**

Contains forms of iron which are highly insoluble and non-hazardous.

Chemical Name	Toxicity to algae	Toxicity to fish	Toxicity to microorganisms	Toxicity to daphnia and
Iron	-	LC50 96 h = 13.6 mg/L (Morone saxatilis - static) LC50 96 h = 0.56 mg/L (Cyprinus carpio -	-	-

12.2 Persistence and degradability

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

12.3 Bioaccumulative potential

Iron and its compounds are essential compounds. Iron is an essential trace element, well-regulated in all living organisms. The available evidence shows the absence of iron biomagnification across the trophic chain both in the aquatic and terrestrial food chains. The existing information suggests not only that iron does not biomagnify, but rather that it tends to exhibit biodelution.

12.4 Mobility in soil

Iron and its compounds are found in the form of hydroxides in the environment. They are stabilized in the form of oxides in the long term.

12.5 Results of PBT and vPvB assessment

As iron is not bio-available, owing to its extreme insolubility in water, it is not systematically available or bio-accumulative, and hence it does not fulfil either of the PBT or vPvB criteria for classification.

12.6 Other adverse effects

None anticipated.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product disposal**

Dispose of in accordance with local regulations.

Packaging disposal

Packaging that cannot be cleaned should be disposed as special waste in compliance with local and national regulations.

14. TRANSPORTATION INFORMATION**DOT****UN/ID No**

Not applicable

Proper shipping name

Not applicable

Transport hazard class(es)

Not applicable

Packaging group	Not applicable

IATA

UN/ID No	Not applicable

Proper shipping name	Not applicable

Transport hazard class(es)	Not applicable

Packing Group	Not applicable

IMDG

UN/ID No	Not applicable

Proper shipping name	Not applicable

Transport hazard class(es)	Not applicable

Packing Group	Not applicable

Marine pollutant	Not applicable

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**International Inventories**

All of the components in the product are on the following Inventory lists:

TSCA	Complies
EINECS/ELINCS	Complies
DSL/NDSL	Complies
ENCS	-
IECSC	Complies
KECL	Complies
PICCS	Complies
AICS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

U.S. Federal Regulations**SARA 313**

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Acute Health Hazard	No

Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

U.S. State Regulations**California Proposition 65**

This product does not contain any Proposition 65 chemicals.

16. OTHER INFORMATION

Components not precisely identified are proprietary or non-hazardous.

<u>NFPA</u>	Health Hazard 0	Flammability 1	Instability 0	Physical and chemical hazards -
<u>HMIS</u>	Health Hazard 0	Flammability 1	Physical Hazard 0	Personal protection E

Abbreviations

EC50: median effective concentration

LC50: median lethal concentration.

LD50: median lethal dose.

NIOSH: The National Institute for Occupational Safety and Health
NOEC: no observable effect concentration

OEL: occupational exposure limit

OSHA Occupational Safety & Health Administration

PBT: Persistent, bioaccumulative, and toxic chemicals
PNEC: Predicted no effect concentration (PNEC)

STEL: short-term exposure limit

TLV: Substance with TLV-values

TWA: Time weighted average

vPvB: very persistent, very bioaccumulative chemical

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ensure that his activities comply with all federal, state, provincial or local laws. Since we cannot control the application, use or processing of the product, we do not accept responsibility. Therefore, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product and assure that the intended use of the product will not infringe in any party's intellectual property right. The information presented here pertains only to the product as shipped.

All recommendations for the use of our products, whether given by us, orally or to be implied from data or lab tests results by us, are based on the current state of our knowledge at the time those recommendations are made. When additional information is obtained, these recommendations may be updated. They may also be influenced by circumstances outside our control. Notwithstanding, such recommendation the user is responsible that the product as supplied by us is suitable to the process or purpose he/she intends to use it.

Due to the proliferation of sources for information such as manufacturer specific SDSs, we are not and cannot be responsible for SDSs obtained from any source other than ourselves. If you have obtained an SDS from another source or if you are not sure that the SDS you have is current, please contact us for the most current version.



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End of Safety Data Sheet

SAFETY DATA SHEET

ISR-CI



Creation Date: 10/1/2018
Revision Date: 5/25/2023
Version 1.1
SDS # 28A

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name: ISR-CI

Synonyms: Ferrous sulfide / Iron sulfide / Iron sulphide / Iron(II) sulfide / Ferrous sulfide / Iron sulfide / Iron sulphide / Iron(II) sulfide

Product form: Mixture

1.2 Other means of identification

CAS No: 1317-37-9

Formula: FeS

1.3 Recommended use of the chemical and restrictions on use

Recommended Use: Remediation of contaminated groundwater and soils

Restrictions on Use: Use as recommended by the label

1.4 Details of the supplier and of the safety data sheet

Supplier Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

1.5 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)
+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Classification

GHS-US classification		
Skin corrosion/irritation	Category 2	H315
Serious eye damage/eye irritation	Category 2A	H319

Full text of H statements: see Section 16.

2.2 GHS Label elements, including precautionary statements

2.2.1 Label elements**Hazard Pictograms**

GHS07

2.3 Signal word

Warning!

2.4 Hazard statement

H315 - Causes skin irritation

H319 - Causes serious eye irritation

2.5 Precautionary statement

P264 - Wash hands thoroughly after handling

P280 - Wear eye protection, protective clothing, protective gloves

P302+P352 - If on skin: Wash with plenty of water

P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes.

Remove contact

lenses, if present and easy to do. Continue rinsing

P321 - Specific treatment (see Consult a doctor/medical service if you feel unwell on this label)

P332+P313 - If skin irritation occurs: Get medical advice/attention

P337+P313 - If eye irritation persists: Get medical advice/attention

P362+P364 - Take off contaminated clothing and wash it before reuse

2.6 Hazard(s) not otherwise classified (HNOC)**2.6.1 HMIS Classification:**

Health hazard: 0

Flammability: 0

Physical hazards: 0

2.6.2 NFPA Rating:

Health hazard: 1

Fire: 0

Reactivity Hazard: 0

2.6.3 Inhalation

May be harmful if inhaled. May cause respiratory tract irritation.

2.6.4 Skin

May be harmful if absorbed through skin. May cause skin irritation.

2.6.5 Eyes

May cause eye irritation.

2.6.6 Ingestion

May be harmful if swallowed.

2.6.7 Other Hazards not contributing to the classification

Generates toxic gas in contact with acid.

2.7 Supplemental information N/A**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Chemical Name	CAS Number	Concentration (wt. %)	GHS-US classification
Iron sulfide (FeS)	1317-37-9	7 -11	N/A
Sodium Sulfide	1313-82-2	0.1 - 1	Acute Tox. 3 (Oral), H301

Occupational exposure limits, if available, are listed in Section 8.

Full text of hazard classes and H-statements: see Section 16.

4. FIRST AID MEASURES**4.1 General**

Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

4.1.1 Eye Contact

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a doctor/physician. If eye irritation persists: Get medical advice/attention.

4.1.2 Skin Contact

Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention.

4.1.3 Inhalation

Remove person to fresh air and keep comfortable for breathing. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.

4.1.4 Ingestion

Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor/physician.

Call a poison center/doctor/physician if you feel unwell.

4.2 Important symptoms and effects (acute and delayed)

- Symptoms/injuries: Causes skin and eye irritation.
- Symptoms/injuries after skin contact: Irritation.
- Symptoms/injuries after eye contact: Causes serious eye damage. Eye irritation.

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

Treat symptomatically.

5. FIRE-FIGHTING MEASURES**5.1 Suitable Extinguishing Media**

Foam. Dry powder. Carbon dioxide. Water spray. Sand.

5.2 Unsuitable extinguishing media

Do not use a heavy water stream.

5.3 Specific Hazards Arising from the Chemical

Reactivity: Corrosive vapors.

5.4 Firefighting instructions

Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

5.5 Protective equipment and precautions for firefighters

Do not enter fire area without proper protective equipment, including respiratory protection. Do not attempt to act without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal Precautions**

Ventilate spillage area. Evacuate unnecessary personnel. Avoid contact with skin and eyes. Do not attempt to act without suitable protective equipment. Equip cleanup crew with proper protection. For further information refer to Section 8: "Exposure controls/personal protection".

6.2 Environmental Precautions

Avoid release to the environment. Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3 Methods for Containment

Dike to collect large liquid spills. Stop leak and contain spill if this can be done safely. Small spillage: Dilute with large quantities of water.

6.4 Methods for Cleaning Up

Take up liquid spill into absorbent material. Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials. Dispose of materials or solid residues at an authorized site.

7. HANDLING AND STORAGE**7.1 Precautions for Safe Handling****7.1.1 Handling**

Ensure good ventilation of the workstation. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. Do not breathe dust, fume, gas, mist, spray, vapors. Avoid contact during pregnancy/while nursing. Avoid contact with skin and eyes. Wear personal protective equipment.

7.1.2 Hygiene

Wash hands thoroughly after handling. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2 Conditions for Safe Storage, Including Incompatibilities**7.2.1 Technical Measures**

Comply with applicable regulations.

7.2.2 Storage Conditions

Keep only in the original container in a cool, well-ventilated place away from: Ignition sources, Incompatible materials. Keep container closed when not in use. Store in a well-ventilated place. Keep cool.

7.2.3 Incompatible Products

Strong bases. Strong acids.

7.2.4 Incompatible Materials Sources of ignition. Direct sunlight.**8. EXPOSURE CONTROL / PERSONAL PROTECTION****8.1 Control parameters**

Exposure guidelines, ingredients with workplace control parameters.

Chemical name	ACGIH TLV	OSHA PEL	NIOSH
ISR-CL 1317-37-9	TWA: 1.4 mg/m ³ TWA: 1 ppm STEL: 7 mg/m ³ STEL: 5 ppm	No information available	No information available
Iron sulfide (FeS) (1317-37-9)	No information available		
Sodium sulfide (1313-82-2)	No information available		

8.2 Appropriate engineering controls

8.2.1 Appropriate engineering controls Ensure good ventilation of the workstation. Provide eyewash station.

8.3 Individual protection measures, such as personal protective equipment

8.3.1 Eye/face protection Wear safety glasses with side shields (or goggles) and a face shield.

8.3.2 Skin Protection (Hands) Wear appropriate chemical resistant gloves. Suitable gloves can be recommended by the glove supplier. Be aware that the liquid may penetrate the gloves. Frequent change is advisable.

8.3.3 Skin Protection (Other) Wear suitable protective clothing.

8.3.4 Respiratory protection Try to ensure good ventilation as previously stated. However, if this is not possible, in case of insufficient ventilation, wear suitable respiratory equipment.

8.3.5 General hygiene considerations Keep from contact with clothing and other combustible materials. Remove and wash contaminated clothing promptly. Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Do not eat, drink, or smoke during use.

9. PHYSICAL AND CHEMICAL PROPERTIES**9.1 Information on basic physical and chemical properties**

Appearance	Black liquid with visible suspended solids.
Physical State	Liquid
Color	Black
Odor	Rotten eggs
Odor threshold	No information available

pH	11.5 to 12.8
Melting point/freezing point	Not applicable
Boiling Point/Range	No information available
Flash point	No information available
Evaporation Rate	No information available
Flammability (solid, gas)	Non flammable
Flammability Limit in Air	No information available
Upper flammability limit:	No information available
Lower flammability limit:	No information available
Vapor pressure	No information available
Vapor density	No information available
Specific gravity	1.15 to 1.22
Water solubility	Minimally soluble in water.
Solubility in other solvents	No information available
Partition coefficient log Kow	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Viscosity, kinematic	No information available
Viscosity, dynamic	No information available
Explosive properties	No information available
Oxidizing properties	No information available

10. STABILITY AND REACTIVITY

10.1 Reactivity

Acidic vapors.

10.2 Chemical stability

Not established.

10.3 Possibility of hazardous reactions

Contact with acids liberates toxic gas.

10.4 Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5 Incompatible materials

Acids will cause the release of highly toxic Hydrogen Sulfide. Reacts violently with diazonium salts. Ferrous sulfide(s) solution is not compatible with copper, zinc, aluminum, or their alloys (i.e., bronze, brass, galvanized metals, etc.). Corrosive to steel above 150° F (65.5° C). These materials of construction should not be used in handling systems or storage containers for this product.

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire may include sulfur oxides, iron oxides.

11. TOXICOLOGICAL INFORMATION

11.1 Sodium Sulfide (113-82-2)

LD50 oral rat	208 mg/kg
ATE US (oral)	208 mg/kg body weight
LD50 dermal rabbit	< 340 mg/kg
ATE US (dermal)	300.000 mg/kg body weight

11.2 Information on toxicological effects

11.2.1 Acute toxicity

Not classified

11.2.2 Skin corrosion/irritation	Causes skin irritation. pH: 11.5 - 12.8
11.2.3 Serious eye damage/eye irritation	Causes eye irritation. pH: 11.5 - 12.8
11.2.4 Respiratory sensitization	Not classified
11.2.5 Skin sensitization	Not classified
11.2.6 Germ cell mutagenicity	Not classified
11.2.7 Carcinogenicity	Not classified
11.2.8 Reproductive toxicity	Not classified
11.2.9 Specific target organ toxicity (Single exposure)	Not classified.
11.2.10 Specific target organ toxicity (Repeated exposure)	Not classified.
11.2.11 Aspiration hazard	Not classified
11.2.12 Chronic effects	Not classified
11.2.13 Potential Adverse human health effects and symptoms	Based on available data, the classification criteria are not met.
11.2.14 Symptoms/injuries after skin contact	Irritation.
11.2.15 Symptoms/injuries after eye contact	Causes eye irritation.

12. ECOLOGICAL INFORMATION

12.1 Ecotoxicity Effects

Ecology - general: The product is not considered harmful to aquatic organisms or to cause long-term adverse effects in the environment.

Active Ingredient	Duration	Species	Value	Units
ISR-CI (1317-37-9)	LC50	Mosquito fish	>10,000	mg/L
Sodium Sulfide (1313-82-2)	96 h LC50	Poecilia reticulata	7.7 - 29.1	mg/L
Sodium Sulfide (1313-82-2)	48 h EC50	Daphnia magna	2.1	mg/L

12.2 Persistence and Degradability

Not established.

12.3 Bioaccumulation

ISR-CI (1317-37-9): Bioaccumulative potential not established.
Sodium Sulfide (16721-80-5): Log Pow, -3.5 (at 25°C)

12.4 Mobility

No additional information available

12.5 Other Adverse Effects

12.5.1 Effect on the global warming: No known effects from this product.

12.5.2 GWPmix comment: No known effects from this product.

12.5.3 Other information: Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Dispose of contents/container in accordance with licensed collector's sorting instructions.

13.2 Waste disposal recommendations

Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.

13.3 Ecology - waste materials

Do not release out into the environment.

14. TRANSPORTATION INFORMATION

14.1 U.S. (D.O.T.)

Proper Shipping Name:	Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class:	Not applicable
UN/NA:	Not applicable
Labels:	Not applicable

14.2 Canada (T.D.G.)

Proper Shipping Name:	Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class:	Not applicable
UN/NA:	Not applicable
Labels:	Not applicable

14.3 IMDG

Proper Shipping Name:	Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class:	Not applicable
UN/NA:	Not applicable
Labels:	Not applicable

14.4 IATA

Proper Shipping Name:	Chemicals not otherwise indexed (NOI) nonhazardous.
Hazard Class:	Not applicable
UN/NA:	Not applicable
Labels:	Not applicable

15. REGULATORY INFORMATION

15.1 U.S. Federal Regulations

15.1.1 Iron sulfide (FeS) (1317-37-9)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.1.2 Sodium Sulfide (1313-82-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2 International regulations

15.2.1 Canada

15.2.1.1 Iron sulfide (FeS) (1317-37-9)

Listed on the Canadian DSL (Domestic Substances List)

WHMIS Classification Uncontrolled product according to WHMIS classification criteria

15.2.1.2 Sodium Sulfide (1313-82-2)

Listed on the Canadian DSL (Domestic Substances List)

15.2.2 EU-Regulations

15.2.2.1 Iron sulfide (FeS) (1317-37-9)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2.2 Sodium Sulfide (1313-82-2)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.3 National regulations

15.3.1 Iron sulfide (FeS) (1317-37-9)

Listed on the AICS (Australian Inventory of Chemical Substances)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)

Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory

Listed on the Korean ECL (Existing Chemicals List)

Listed on NZIoC (New Zealand Inventory of Chemicals)

Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

15.3.2 Sodium Sulfide (1313-82-2)

Listed on the AICS (Australian Inventory of Chemical Substances)

Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)

Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory

Listed on the Korean ECL (Existing Chemicals List)

Listed on NZIoC (New Zealand Inventory of Chemicals)

Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)

Listed on INSQ (Mexican National Inventory of Chemical Substances)

Listed on CICR (Turkish Inventory and Control of Chemicals)

15.4 US State Regulations

15.4.1 Sodium Sulfide (1313-82-2)

U.S. - Massachusetts - Right to Know List

U.S. - New Jersey - Right to Know Hazardous Substance List

16. OTHER INFORMATION

Full text of H-phrases:

H301 Toxic if swallowed

H315 Causes skin irritation

H319 Causes serious eye irritation

H400 Very toxic to aquatic life

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All recommendations for the use of our products, whether given by us, orally or to be implied from data or lab tests results by us, are based on the current state of our knowledge at the time those recommendations are made. When additional information is obtained, these recommendations may be updated. They may also be influenced by circumstances outside our control. Notwithstanding such recommendation the user is responsible for ensuring that the product supplied by us is suitable for the process or purpose he/she intends to use it.

Due to the proliferation of sources for information such as manufacturer specific SDSs, we are not and cannot be responsible for SDSs obtained from any source other than ourselves. If you have obtained an SDS from another source or if you are not sure that the SDS you have is current, please contact us for the most current version.



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End of Safety Data Sheet

SAFETY DATA SHEET
EDS Substrate Shuttle



Creation Date: 12/18/2020
Revision Date: 06/18/2025
Version 1.1
SDS # 34A

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name: EDS Substrate Shuttle

Synonyms: Isopropanol, Isopropyl Alcohol, 2-Propanol, sec-propyl alcohol, dimethylcarbinol, Rubbing alcohol, IPA

Other means of identification: CAS# 67-63-0
EINECS# 200-661-7

Product Form: Liquid

1.2 Recommended use of the chemical and restrictions on use

Recommended Use: General use organic solvent; remediation of contaminated groundwater and soils.
Restrictions on Use: Use as recommended by the label

1.3 Details of the supplier and of the safety data sheet

Supplier: Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

Contact Person: Gary M. Birk
Phone: +1-919-638 7892
Email: gary.birk@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)
+1-919-638-7892 (Tersus Outside office hours)
+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Hazard/Emergency Overview

Highly Flammable in the Liquid and Vapor Phase. Can Cause Severe Eye Irritation!

2.2 OSHA Hazards

Flammable Liquid, Target organ effect, Irritant

2.3 Target Organs

Cardiovascular system, gastrointestinal tract, kidney, liver, nerves

2.4 GHS label elements (including precautionary statements)**2.5 Signal Word****DANGER!****2.6 Hazard Statement(s)**

H225 Highly flammable liquid and vapor
 H319 Causes serious eye irritation
 H336 May cause drowsiness or dizziness

2.7 Precautionary Statement(s)

P261 Avoid breathing dust/fumes/gas/mist/vapors
 P312 Call a POISON CENTER or doctor/physician if you feel unwell
 P501 Dispose of contents and container to an approved waste disposal plant
 P240 Ground/bond container and receiving equipment
 P337 + P313 If eye irritation persists: Get medical attention
 P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Seek medical attention.
 P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
 P303 + P361 + P353 IF ON SKIN (or hair): Remove immediately all contaminated clothing. Rinse skin with water.
 P370 + P378 In case of fire: Use dry sand, dry chemical, or alcohol-resistant foam for extinction.
 P210 Keep away from heat, sparks, open flames and hot surfaces. No smoking.
 P233 Keep container tightly closed
 P102 Keep out of reach of children
 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
 P243 Take precautionary measures against static discharge
 P241 Use explosion-proof electrical, ventilating and lighting equipment
 P242 Use only non-sparking tools
 P271 Use only outdoors or in a well-ventilated area
 P264 Wash hands thoroughly after handling
 P280 Wear protective gloves and eye and face protection

2.8 GHS Classification(s)

Eye Irritation (Category 2)
 Flammable Liquids (Category 2)
 Specific Target Organ Toxicity Single Exposure (Category 3)

2.8.1 Other hazards which do not**result in classification: Potential****2.9 Health Effects:**

Organ	Effect
Eyes	Can cause irritation to the eyes

Ingestion	Can be harmful if ingested
Inhalation	Can be harmful if inhaled. Can cause respiratory tract irritation. Vapors may cause drowsiness and dizziness.
Skin	Can cause irritation if absorbed through skin

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical Identity: Isopropyl Alcohol

3.1.1 CAS #: 67-63-0
3.1.2 EINECS #: 200-661-7
3.1.3 ICSC #: 0554
3.1.4 RTECS #: NT8050000
3.1.5 UN #: 1219
3.1.6 EC #: 603-117-00-0
GHS02-GHS07

% Weight	Material	CAS
75 to 100	Isopropyl Alcohol	67-63-0

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

4. FIRST AID MEASURES

4.1 General Information

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.

4.2 Eye Contact

Thoroughly flush the eyes with large amounts of clean low-pressure water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Seek medical attention. Remove contact lenses if worn.

4.3 Inhalation

Rescuers should put on appropriate protective gear. Remove person to fresh air. If signs/symptoms continue, get medical attention. Give oxygen or artificial respiration as needed. Keep victim warm.

4.4 Ingestion

NEVER give anything by mouth to an unconscious person. If vomiting does occur, have victim lean forward to prevent aspiration. Rinse mouth with water. Immediately have victim drink several glasses of water to dilute. Seek medical attention. To prevent aspiration, keep head below knee.

4.5 Skin Contact

Remove all contaminated clothing. Wash skin with soap and water. Get medical attention. Wash clothes and shoes before reuse.

4.6 Indication of any immediate medical attention and special treatment needed

If exposed or concerned, get medical advice and attention.

5. FIRE-FIGHTING MEASURES**5.1 Suitable Extinguishing Media**

CO₂, Dry Chemical, Alcohol-resistant Foam, and/or H₂O (water fog)

5.2 Specific Hazards Arising from the Chemicals, or Chemical Mixtures

Carbon oxides, Combustible. Pay attention to flashback. Vapors are heavier than air and may spread along floors. Development of hazardous combustion gases or vapors possible in the event of fire. Forms explosive mixtures with air at ambient temperatures.

5.3.1 Special Protective Equipment and Precautions for Fire Fighters

Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Keep unopened containers cool by spraying with water. Use with caution and be aware that water runoff can lead to environmental damage. Dike and collect the water used to fight the fire. Avoid use of solid water streams.

5.3.2 Unusual Fire and Explosion Hazards

Vapors may travel to source of ignition and flash back. For container storage and ignition specifics, do not pressurize, cut, weld, braze, solder, drill, grind, or expose containers to heat, flames, static, or any other potential forms of ignition.

5.3.3 Flammable Properties

Classification	OSHA/NFPA Class IB Flammable Liquid
Flash Point	12° C (53°F) – closed cup
Autoignition temp.	399° C (750°F)

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal Precautions**

Do not inhale vapors, mist, or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas (make sure said safe areas are upwind of the spill). Beware of vapors accumulating to form explosive concentrations. Do not touch or walk through spilled material. Ventilate spill area. Stay upwind of spill.

Vapors can accumulate in low areas. A vapor suppressing foam may be brought in to help with this potential accumulation. However, this should only be done if the vapor has ignited (otherwise use water fog spray).

6.2 Environmental Precautions

Stop leak. Contain spill if possible and safe to do so. Prevent product from entering drains.

6.3 Methods for Containment and Clean Up

Contain spill, then collect with an electrically protected vacuum cleaner, by wet-brushing, or by using an inert material (like dry sand or earth) and put material into a chemical waste disposal container. Keep chemical waste container closed. Recover by pumping.

7. HANDLING AND STORAGE**7.1 Figures Regarding Safe Handling and Storage**

There is to be no smoking, eating, or drinking with in the same location as where the containers are to be stored.

7.2 Precautions for Safe Handling

Do not get on skin or in eyes. Do not inhale vapors or mist. Keep away from sources of ignition-no smoking. Take measures to prevent the buildup of electrostatic charge. Use only in well-ventilated area.

7.3 Handling

Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Follow all MSDS/label precaution even after containers are emptied because they may retain product residues.

7.3 Hygiene Measures

Handle in accordance with good industrial hygiene and safety procedures. Use good personal hygiene practices.

7.4 Conditions for Safe Storage, Including Any Incompatibilities

Keep container firmly closed in a cool, dry and well-ventilated place (this will prevent excess pressure from building up). However, when opening these containers, make sure to open them to slowly, allowing all excess air and gas pressure to be released before the container is opened entirely. Keep away from direct sunlight. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSRE CONTROL / PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational Exposure Limits

Component	Source	Type	Value	Note
Isopropyl Alcohol	US (OSHA)	TWA	400 ppm	N/A
Isopropyl Alcohol	US (ACGIH)	TWA	200 ppm	N/A
Isopropyl Alcohol	US (ACGIH)	STEL	400 ppm	N/A
Isopropyl Alcohol	US (OSHA)	Ceiling	N.D.	N/A

8.2 Exposure Control

8.2.1 Protective equipment



8.2.2 Appropriate engineering controls

General room or local exhaust ventilation is usually required to meet exposure limit(s). Electrical equipment should be grounded and conform to applicable electrical code. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

8.2.3 Eye/face 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

8.2.4 Respiratory protection

fountain and quick-drench facilities in work area.

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).

8.2.5 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.

8.2.6 Other 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.

8.2.7 Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance (<i>physical state, color, etc.</i>)	Liquid. Colorless.
Odor	Specific data not available
Odor threshold	Specific data not available
pH	Specific data not available
Freezing point	Specific data not available
Boiling Range	83 °C (181 °F)
Flash point	12 °C (54 (53.6) °F) – Closed cup
Evaporation rate	2.88 (n-Bu acetate = 1)
Flammability (solid, gas)	Specific data not available
Upper / Lower flammability or explosive limits	13.4% (V) / 2.0%(V)
Vapor pressure	43 hPa at 20 °C (68 °F)
Vapor density	2.08 where air = 1 at 20 °C (68 °F)
Relative density	0.790 g/cm ³ at 25 °C (77 °F)
Solubility(ies)	Miscible
Partition coefficient n-octanol/water(ies)	Log Pow: 0.05
Auto-ignition temperature	425 °C (797 °F)
Decomposition temperature	Distillable in an undecomposed state at a normal
Formula (ISOPROPYL ALCOHOL)	C ₃ H ₈ O
Molecular weight (ISOPROPYL ALCOHOL)	60.1 g/mol

10. STABILITY AND REACTIVITY

10.1 Chemical Stability**10.2 Possibility of Hazardous Reactions**

Vapors may form explosive mixture with air

10.3 Conditions to avoid (e.g., static

Heat, flames, and spark. Extreme temperatures

10.4 Incompatible materials

Caustics, inorganic acids, chlorinated

10.5 Hazardous decomposition products

Carbon oxides are expected to be, under fire conditions, the primary hazardous decomposition

11. TOXICOLOGICAL INFORMATION**11.1 Product Summary**

Long term exposure (2 years) to Isopropyl Alcohol via inhalation at concentrations up to 5000 ppm caused to exposure related increases in tumors in animals. No data available for the teratogenicity, mutagenicity, or reproductive toxicity of this product. No data available to designate the product as causing specific target organ toxicity through repeated exposure. No data available to designate product as an aspiration hazard.

11.2 Acute Toxicity

LC50 Inhalation	Rat	25 mg/l	4 hours
LD50 Dermal	Rabbit	13,900 mg/kg	
LD50 Oral	Rat	5,840 mg/kg	Behavioral abnormalities observed such as altered sleep time and decreased activity

11.3 Irritation**11.3.1 Eyes**

Rabbit - Irritating to eyes 24 hours

11.3.2 Eyes (ISOPROPANOL)

Mildly irritating to the eye at an airborne concentration of 400 ppm, unpleasant at 800 ppm

11.3.3 Respiratory or Skin Sensitization

No data available

11.3.4 Skin

Rabbit - mild skin irritation

11.3.5 Specific Target Organ Toxicity. Single Exposure (Globally Harmonized System)

Inhalation - May cause drowsiness or dizziness - central nervous system

11.4 Carcinogenicity

11.4.1 IARC: Group 3: Not classifiable as to its carcinogenicity to humans.

11.4.2 ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

11.4.3 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.

11.4.4 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.

11.5 Other Hazards

Exposure	Description
11.5.1 Eyes	Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.
11.5.2 Ingestion	May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea.
11.5.3 Inhalation (or Lungs)	Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness. May cause narcotic effects in high concentration. Causes upper respiratory tract irritation. Inhalation of vapors may cause drowsiness and dizziness.
11.5.4 Skin	May cause irritation with pain and stinging, especially if the skin is abraded. Isopropanol has a low potential to cause allergic skin reactions; however, rare cases of allergic contact dermatitis have been reported. May be absorbed through intact skin. Dermal absorption has been considered toxicologically insignificant.

12. ECOLOGICAL INFORMATION**12.1 Ecotoxicity (aquatic and terrestrial, where available)****12.1.1 Acute Fish Toxicity**

LD50 / 96 hours Pimephales promelas: 9,640 mg/L

12.1.2 Toxic to Daphnia and Other Aquatic Invertebrates

EC50 - Daphnia magna (Water flea) - 13,299 mg/l - 48 h Remarks: (IUCLID)

12.1.3 Toxicity to AlgaeIC50 - Desmodesmus subspicatus (green algae) - > 1,000 mg/l - 72 h
Remarks: (IUCLID)**12.1.4 Persistence and degradability**aerobic - Exposure time 5 d
Result: 53 % - Readily biodegradable.
(Directive 67/548/EEC, Annex V, C.6)**12.1.5 Bioaccumulative potential**

No bioaccumulation is to be expected (log Pow <= 4).

12.1.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS**13.1 Waste Disposal Methods**

Dispose according to federal, state, and local laws. Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Authority. Waste is suitable for incineration. For other information, please section 6.3 methods for containments and clean up.

14. TRANSPORTATION INFORMATION**14.1 U.S. (D.O.T.)**

Proper Shipping Name:	Isopropanol
Hazard Class:	Class 3
Packing Group:	II
UN/NA:	1219
Labels:	Flammable Liquid

14.2 IMDG

Proper Shipping Name:	ISOPROPANOL
Hazard Class:	Class 3
Packing Group:	II
UN/NA:	1219
EMS-No:	F-E, S-D
Marine pollutant:	No

14.3 IATA

Proper Shipping Name:	Isopropanol
Hazard Class:	Class 3
Packing Group:	II
UN/NA:	1219

15. REGULATORY INFORMATION**15.1 OSHA Hazards**

Flammable liquid, Target Organ Effect, 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

15.2 SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

15.3 SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313: ISOPROPYL ALCOHOL (CAS# 67-63-0) Revision date: 1987-01-01

15.4 SARA 311/312 Hazards Acute Health Hazard

Chronic Health Hazard, Fire Hazard, Acute Health Hazard

15.5 CERCLA

No chemicals in this material with known CAS numbers are subject to the reporting requirements of CERCLA

15.6 Massachusetts Right to Know Components

Isopropyl Alcohol CAS-No. 67-63-0 Revision Date 1987-01-01

15.7 Pennsylvania Right to Know Components

The following non-hazardous ingredients are present in the product at greater than 3%.
NO PA right-To-Know components exist in this product.

15.8 California Prop 65 Components

This product does contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

15.9 New Jersey Right to Know Components

The following materials are non-hazardous but are among the top five components in this product. No TSCA components exist in this product.

15.10 Toxic Substance Control Act

This product contains the following chemical substance subject to the reporting requirements of TSCA 12(B) if exported from the United States:
NO TSCA components exist in this product.

15.11 Candian Whims

This SDS has been prepared in compliance with Controlled Product Regulations except for the use of the 16 headings.

16. OTHER INFORMATION**16.1 HMIS Rating**

Health	2
Flammability	3
Reactivity	0
Personal Protection	x

16.2 NFPA

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buyer's/user's duty to determine the conditions necessary for the safe use of this product and assure that the intended use of the product will not infringe in any party's intellectual property right. The information presented here pertains only to the product as shipped.

All recommendations for the use of our products, whether given by us, orally or to be implied from data or lab tests results by us, are based on the current state of our knowledge at the time those recommendations are made. When additional information is obtained, these recommendations may be updated. They may also be influenced by circumstances outside our control. Notwithstanding such recommendation the user is responsible that the product as supplied by us is suitable to the process or purpose he/she intends to use it.

Due to the proliferation of sources for information such as manufacturer specific SDSs, we are not and cannot be responsible for SDSs obtained from any source other than ourselves. If you have obtained an SDS from another source or if you are not sure that the SDS you have is current, please contact us for the most current version.



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End of Safety Data Sheet

SAFETY DATA SHEET

EDS-Activator™



Creation date: 4/19/2022
Revision date: 6/19/2025
Version 1.2
SDS # 34C

PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name: EDS-Activator™

Synonyms: Electron Donor Solution – Activator, Methanolic solution

Product Form: Solution

1.2 Recommended use of the chemical and restrictions on use

Recommended Use: Remediation of contaminated groundwater and soils. Chemical for synthesis.
Restrictions on Use: Use as recommended by the label.

1.3 Details of the supplier and of the safety data sheet

Supplier: Tersus Environmental, LLC
1116 Colonial Club Rd
Wake Forest, NC 27587
Phone: +1-919-453-5577
Email: info@tersusenv.com

1.4 Emergency telephone number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)
+1-919-638-7892 (Tersus Outside office hours)
+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

1. HAZARD IDENTIFICATION

2.1 EMERGENCY OVERVIEW: Highly flammable liquid and vapor. Toxic if inhaled. Causes serious eye damage. Harmful if swallowed. Toxic in contact with skin.

2.2 GHS Classification

Acute Tox. 3 Dermal, Acute Tox. 3 Inhalation, Eye Dam. 1, Flam. Liq. 2, Skin Irrit. 2, STOT SE 1

2.3 GHS-Labeling

Hazard pictograms



2.4 Signal Word

DANGER!**2.5 Hazard Statements**

Flammable Liquid, category 2	H225	Highly flammable liquid and vapor.
Acute Toxicity, Oral, category 4	H301	Toxic if swallowed.
Acute Toxicity, Dermal, category 3	H311	Toxic in contact with skin.
Skin Irritation, category 2	H314	Causes severe skin burns and eye damage.
Serious Eye Damage, category 1	H318	Causes serious eye damage.
Acute Toxicity, Inhalation, category 3	H331	Toxic if inhaled.
STOT, single exposure, category 1	H370	Causes damage to organs.

2.6 Precautionary Statements

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/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink, or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician if you feel unwell.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P302+P352	IF ON SKIN: Wash with plenty of water
P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
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+P311	IF exposed or concerned: Call a POISON CENTER/doctor/physician
P310	Immediately call a POISON CENTER/doctor
P321	Specific treatment (see first aid section on this label).
P330	Rinse mouth.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P361+P364	Take off immediately all contaminated clothing and wash it before reuse.
P370+P378	In case of fire: Use appropriate method 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 in accordance with local/regional/national/international regulations.

2.7 Other hazards

Reacts with H₂O (water)

2. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical Formula Mixture

3.2 Hazardous components

Chemical Name	Concentration (%)	CAS Number
Methanol	Exact percentages are being withheld as a trade secret.	67-56-1
Potassium hydroxide	See row above.	1310-58-3

In accordance with paragraph (i) of §1910.1200, some information has been withheld as a trade secret.

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

3. FIRST AID MEASURES

4.1 General Information

First aider needs to protect himself. Remove affected person from source of contamination.

4.1.1 Eye Contact

After eye contact: rinse out with plenty of water. Immediately call-in ophthalmologist. Remove contact lenses.

4.1.2 Skin Contact

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

4.1.3 Inhalation

Rescues / Retrievers of the victim should make sure to put on the proper protective equipment before helping. After inhalation: get fresh air as soon as possible. Immediately call a physician. If breathing stops: immediately apply artificial respiration, if necessary, also oxygen. Get prompt medical attention, while doing so keep the victim calm and in a warm environment.

4.1.4 Ingestion

After getting fresh air. Make victim drink ethanol (e.g., 1 drinking glass of a 40% alcoholic beverage). Call a doctor immediately (mention methanol ingestion). Only in exceptional cases, if no medical care is available within one hour or by the instruction of a medical professional, induce vomiting (only in fully conscious persons) and make victim drink ethanol again (approx. 0.3 ml of a 40% alcoholic beverage/kg body weight/hour). Risk of perforation! Do not attempt to neutralize.

Never give anything by mouth to an unconscious person.

4.2 Important symptoms and effects(acute and delayed)

Irritation and corrosion, Cough, Shortness of breath, Dizziness, narcosis, agitation, spasms, inebriation, Nausea, Vomiting, Headache, Impairment of vision, Coma
Irritation and corrosion, Cough, Shortness of breath
Risk of blindness!

4.3 Indication of any immediate medical

No information available.

**attention and special
treatment needed**

4. FIRE-FIGHTING MEASURES

**5.1 Suitable Extinguishing
Media**

CO₂, and dry powder

**5.2 Unsuitable
Extinguishing Media**

H₂O, and foam

**5.3 Specific Hazards
Arising from the chemical
or mixture**

Combustible.

May not get in touch with: Water

Vapors are heavier than air and may spread along floors. Vapor can also travel to a source of ignition and then flash back.

Forms explosive mixtures with air at elevated temperatures.

Development of hazardous combustion gases or vapors possible in the event of fire.

**5.4 Special Fire Fighting
Procedures**

As in any fire, special protective equipment needs to be used by the fire-fighters.

Stay in danger area only with self-contained breathing apparatus.

Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4.1 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system by placing down dykes or by other preventative measures.

5. ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, and consult an expert.

Advice for emergency responders: Protective equipment see section 8!

**6.2 Environmental
Precautions**

Do not let product enter drains. Risk of explosion.

**6.3 Methods for
Containment and Clean Up**

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material. Dispose of properly. Clean up affected area. Lastly, follow said clean up by putting down a liberal amount of sodium carbonate that will then be washed away with a water spray.

6. HANDLING AND STORAGE

7.1 Precautions for safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapors/aerosols.

Keep workplace dry and well-ventilated. Do not allow product to encounter water. Observe label precautions.

Work under hood. Do not inhale substance/mixture. Avoid generation of vapors/aerosols. Keep workplace dry. Do not allow product to encounter water.

7.1.1 Advice on protection against fire and explosion

Keep away from open flames, hot surfaces, and sources of ignition. Take precautionary measures against static electricity discharge.

7.2 Hygiene measures

Handle in accordance with good industrial hygiene and safety procedures. Use good personal hygiene practices.

7.3 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Store below +30 °C (+86 °F).

7. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control parameters

Exposure guidelines, ingredients with workplace control parameters.

Exposure limit(s) <i>Ingredients</i> Basis <i>methanol 67-56-1</i>	Value	Threshold limits	Remarks
8.1.1 ACGIH	Time Weighted Average (TWA):	200 ppm	
	Short Term Exposure Limit (STEL):	200 ppm	
	Skin designation:		Can be absorbed through the skin.
8.1.2 NIOSH/GUIDE	Recommended exposure limit (REL):	200 ppm 260 mg/m ³	
	Skin designation:		Can be absorbed through the skin.
8.1.3 OSHA_TRANS	PEL:	200 ppm 260 mg/m ³	
8.1.4 Z1A	Time Weighted	200 ppm	

Average (TWA):	260 mg/m ³	
Skin designation (Final Rule Limit applies):		Can be absorbed through the skin.
Short Term Exposure Limit (STEL):	250 ppm 325 mg/m ³	

8.2 Engineering measures

Technical measures and appropriate working operations should be given priority over the use of personal protective equipment.

8.3 Individual protection measures

Protective clothing should be selected specifically for the workplace, depending on concentration and quantity of the hazardous substances handled. The chemical resistance of the protective equipment should be inquired at the respective supplier.

8.3.1 Hygiene measures

Immediately change contaminated clothing. Apply skin- protective barrier cream. Wash hands and face after working with substance.

8.3.2 Eye/face protection

Tightly fitting safety goggles (see categorizations below):

Hand protection

full contact:

Glove material:	butyl-rubber
Glove thickness:	0.7 mm
Break through time:	> 480 min

splash contact:

Glove material:	Viton®
Glove thickness:	0.70 mm
Break through time:	> 120 min

8.4 Exposure Control

Protective equipment



8.4.1 Appropriate engineering controls

Provide adequate general and local exhaust ventilation to maintain worker exposure below exposure limits. Ground/bond the container receiving equipment during transfer or on-site mixing. Performing mixing outside so that you have adequate ventilation. Maintain eye wash fountain and quick-drench shower in work area. Observe any

occupational exposure limits for the product or ingredients. Do not allow uncontrolled discharge of product into the environment.

If used indoors, a system of local and / or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details. Use explosion-proof equipment.

In addition to the information in this SDS, Methanol Institute has published the following guidelines on Drum Handling and Liquid Transfer. Please read through it to understand these guidelines properly.

To move a full drum, it is necessary to use a mechanical means such as a barrel hoist or forklift. If no mechanical means is available, then individual drums can be moved by tipping the drum on its side and rolling it to a designated curbed storage area.

If it is necessary to remove a measured quantity of methanol from the drum without using mechanical means such as low pressure inerting, or a siphon, then it is possible to lay the drum on its side and roll the drum into a slanted position with some form of a prop such as a short section of board under the bunged end of the drum. Position the drum with the small bung in a 12 o'clock position and verify that the drum is chocked in a stable position. The drum and the receiving container must be bonded and grounded.

In the 12 o'clock position, the small bung is now in the vapor space of the drum. Replace the bung with a threaded, alcohol compatible hose. Be careful not to breathe the escaping vapors, which are toxic, and may be flammable. Methanol can be removed from the drum in a controlled manner by carefully rolling the drum to the side so the small bung is in the 1 o'clock position, slightly below the liquid level within the drum. Methanol will now flow out of the drum in a controlled manner. Flow can be terminated by returning the drum to the 12 o'clock position. Replace the transfer hose with the bung and return the drum to an upright position. Extreme care must be taken to not drop or otherwise damage totes, drums, cans, and 1-gallon containers during handling.

Methanol is toxic, especially when breathed or ingested. Siphon transfer of methanol must never be started by mouth-suction. Do not breathe the vapor, ingest the liquid, or allow bare skin to contact the liquid.

8.4.2 Eye/face protection

The following protection should be worn: Chemical splash goggles.

8.4.3 Respiratory protection

If the exposure limit is exceeded, and engineering controls are not feasible, 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. Use a positive-pressure

air-supplied respirator if there is an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

8.4.4 Hand protection

Butyl-rubber, Viton® (see table in section 8.3.2 above)

8.4.5 Other skin and body protection

Wear appropriate clothing to prevent any possibility of skin contact.
Flame retardant antistatic protective clothing.

8.4.6 Hygiene measures

Wash promptly if skin becomes contaminated. Wash hands at the end of each work shift and before eating, smoking, and using the toilet. When using do not eat, drink, or smoke.

8. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Color	Colorless
Odor	Methanolic
Odor Threshold	No information available.
pH	ca. 11
Melting point	< -4 °F (< -20 °C)
Boiling point/boiling range	200.3 °F (93.5 °C) at 1,013 hPa
Flash point	51F (29.7 °C)
Evaporation rate	No information available.
Flammability (solid, gas)	No information available.
Lower explosion limit	5.5 %(V) Methanol
Upper explosion limit	36.5 %(V) Methanol
Vapor pressure	180 hPa at 122 °F (50 °C) 36 hPa at 68 °F (20 °C)
Relative vapor density	No information available.
Density	0.849 g/cm ³ (7.085 lbs./gallon) at 77 °F (25 °C)
Relative density	No information available.
Water solubility	at 68 °F (20 °C) (decomposition)
Partition coefficient: n octanol/water	log Pow: -0.74 (20 °C) Methanol Bioaccumulation is not expected.
Autoignition temperature	No information available.
Decomposition temperature	No information available.
Viscosity, dynamic	18 mPa.s at 68 °F (20 °C)
Explosive properties	Not classified as explosive.
Oxidizing properties	none
Ignition temperature	779 °F (415 °C) DIN 51794

9. STABILITY AND REACTIVITY

10.1 Reactivity

Hydrolyzes
Vapor/air-mixtures are explosive at intense warming.

10.2 Chemical stability

Sensitive to moisture

10.3 Possibility of hazardous reactions

Violent reactions possible with oxidizing agents, acids, water
Possible decomposition products in case of hydrolysis are corrosive base, methanol

10.4 Conditions to avoid

Heat, impact, friction, sparks, or other forms of ignition

10.5 Incompatible materials

Avoid contact with hydrogen peroxide, chromic anhydride, nitric acid, mixed nitric/sulfuric acid, nitrosyl perchlorate, permonosulfuric acids, potassium tert-butoxide, sodium hypobromite, and chlorinated melamine

10.6 Hazardous decomposition products

Toxic fumes and gases are given off during burning or thermal decomposition. During combustion, carbon monoxide, carbon dioxide, formaldehyde, or formic acid may be formed.

10. TOXICOLOGICAL INFORMATION**11.1 Likely route of exposure**

Inhalation, Eye contact, Skin contact

11.2 Target Organs

Eyes

Skin

Respiratory system

Central nervous system

Gastrointestinal tract

11.3 Acute oral toxicity

Symptoms: Nausea, Vomiting, If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Acute toxicity estimate: 142.86 mg/kg Calculation method

11.4 Acute inhalation toxicity

Symptoms: mucosal irritations, Cough, Shortness of breath,

Possible damages: damage of respiratory tract

11.5 Absorption

Acute toxicity estimate: 4.29 mg/l; 4 h; vapor Calculation method

Symptoms: mucosal irritations, Cough, Shortness of breath

Possible damages: damage of respiratory tract

11.6 Acute dermal toxicity

Acute toxicity estimate: 428.57 mg/kg Calculation method

11.7 Skin irritation

Mixture causes burns.

11.8 Eye irritation

Mixture causes serious eye damage. Risk of blindness!

11.9 Specific target organ systemic toxicity - Single exposure

Causes damage to organs.

Target Organs: Eyes

11.10 Specific target organ systemic toxicity - Repeated exposure

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

11.11 Aspiration hazard

Regarding the available data the classification criteria are not fulfilled.

11.12 Carcinogenicity

- 11.12.1 IARC** No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
- 11.12.2 OSHA** No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.
- 11.12.3 NTP** No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
- 11.12.4 ACGIH** No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

11.13 Further information

11.13.1 After absorption:

Headache, Dizziness, inebriation, Impairment of vision

11.13.2 Systemic effects:

Acidosis, drop in blood pressure, agitation, spasms, narcosis, Coma, Irreversible damage of the optical nerve.

Symptoms may be delayed.

Handle in accordance with good industrial hygiene and safety practice.

Other dangerous properties cannot be excluded.

11.4 Ingredients

11.4.1 Methanol

Acute oral toxicity

LDLO human: 143 mg/kg (RTECS)

Acute toxicity estimate: 100.1 mg/kg Expert judgment

Acute inhalation toxicity

LC50 Rat: 131.25 mg/l; 4 h; vapor (ECHA)

Acute dermal toxicity

LD50 Rabbit: ca. 17,100 mg/kg (External MSDS)

Acute toxicity estimate: 300.1 mg/kg Expert judgment

Skin irritation

Rabbit

Result: No skin irritation (ECHA)

Eye irritation

Rabbit

Result: No eye irritation (ECHA)

Sensitization

Sensitization test: Guinea pig Result: negative
Method: OECD Test Guideline 406

Repeated dose toxicity

Rat
male and female
Inhalation
vapor 28 d
daily
NOAEL: 6.66 mg/l
OECD Test Guideline 412

Subacute toxicity

Rat
male and female
Inhalation
365 d
daily
NOAEL: 0.13 mg/l
LOAEL: 1.3 mg/l
OECD Test Guideline 453

Germ cell mutagenicity

Genotoxicity in vivo
Micronucleus test
Mouse
Result: negative
Method: OECD Test Guideline 474

Genotoxicity in vitro

Ames test
Salmonella typhimurium
Result: negative
Method: OECD Test Guideline 471
In vitro mammalian cell gene mutation test Chinese hamster lung cells
Result: negative
Method: OECD Test Guideline 476

11.4.2 Potassium hydroxide

No information available.

11. ECOLOGICAL INFORMATION**12.1 Ecotoxicity**

No information available.

12.2 Persistence and degradability

No information available.

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water

log Pow: -0.74 (20 °C)

Methanol Bioaccumulation is not expected.

12.4 Mobility in soil

No information available.

12.5 Additional ecological information

Harmful effect due to pH shift. Forms toxic and corrosive mixtures with water even if diluted. Discharge into the environment must be avoided.

12.5.1 Ingredient methanol

Toxicity to fish

Flow-through test LC50 *Lepomis macrochirus* (Bluegill sunfish): 15,400 mg/l; 96 h US-EPA

Toxicity to daphnia and other aquatic invertebrates

Static test EC50 *Daphnia magna* (Water flea): > 10,000 mg/l; 48 h DIN 38412

Toxicity to algae

Static test EC50 *Pseudokirchneriella subcapitata* (green algae): ca. 22,000 mg/l; 96 h OECD Test Guideline 201

Toxicity to bacteria

Static test IC50 activated sludge: > 1,000 mg/l; 3 h

Analytical monitoring: yes OECD Test Guideline 209

Toxicity to fish (Chronic toxicity)

NOEC *Oryzias latipes* (Orange-red killifish): 7,900 mg/l; 200 h (External MSDS)

Biodegradability

99 %; 30 d

OECD Test Guideline 301D Readily biodegradable.

Biochemical Oxygen Demand (BOD)

600 - 1,120 mg/g (5 d)

(IUCLID)

Chemical Oxygen Demand (COD)

1,420 mg/g

(IUCLID)

Theoretical oxygen demand (ThOD)

1,500 mg/g

(Lit.)

Ratio BOD/ThBOD

BOD5 76 %

Closed Bottle test

Partition coefficient: n-octanol/water

log Pow: -0.77
(experimental)
(Lit.) Bioaccumulation is not expected.

Substance does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.

Stability in water
2.2 year
reaction with hydroxyl radicals (IUCLID)

12.5.2 Ingredient potassium hydroxide

No information available.

12. DISPOSAL CONSIDERATIONS

13.1 Waste Disposal Methods

The information presented only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. Disposal should be in accordance with applicable regional, national, and local laws and regulations.

13. TRANSPORTATION INFORMATION

14.1 U.S. (D.O.T.) Land transport

Proper Shipping Name:	Flammable Liquids, Corrosive, n.o.s. (Methanol, Potassium Hydroxide)
Hazard Class:	3 (8)
UN/NA:	UN 2924
Packing group:	II
Hazardous Subclass (Level)	Unknown
Resp. Guide Page:	132

14. REGULATORY INFORMATION

15.1 United States of America

15.1.1 SARA 313

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

Methanol	67-56-1	70 %

15.1.2 SARA 302

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

15.1.3 Clean Water Act

This product does not contain any Hazardous Substances listed under the U.S. Clean Water Act, Section 311, Table 116.4A.

This product does not contain any Hazardous Chemicals listed under the U.S. Clean Water Act, Section 311, Table 117.3.

This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

15.1.4 DEA List I

Not listed

15.1.5 DEA List II

Not listed

15.2 US State Regulations**15.2.1 Massachusetts Right to Know**

Ingredients methanol

15.2.2 Pennsylvania Right to Know

Ingredients methanol

The following non-hazardous ingredients are present in the product at greater than 3%.

Chemical Name	CAS-No.
Water	7732-18-5

15.2.3 New Jersey Right to Know

Ingredients methanol

The following materials are non-hazardous but are among the top five components in this product.

Chemical Name	CAS-No.
Water	7732-18-5

15.2.4 California Prop 65 Components

WARNING: This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

Ingredients methanol

15.3 Notification status

15.3.1 TSCA: All components of the product are listed in the TSCA-inventory.

15.3.2 DSL: This product contains one or several components listed in the Canadian NDSL.

15. OTHER INFORMATION**16.1 Training Advice**

Provide adequate information, instruction, and training for operators.

16.2 HMIS Ratings

Health	3
Flammability	3
Reactivity	1

Personal Protection X

16.3 Volatile Organic Compounds, gr/ltr: 742

DISCLAIMER: THE VOLATILE ORGANIC COMPOUND (VOC) CONTENT REPORTED HEREIN, IF ANY, IS BASED ON A MATERIAL VOC CALCULATION. NOTE THAT SEVERAL METHODS ARE USED FOR CALCULATING VOC CONTENT AND THAT STANDARDS/REQUIREMENTS REGARDING VOC CONTENT VARY BY LOCATION/JURISDICTION. ACCORDINGLY, TERSUS ENVIRONMENTAL MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, REGARDING THIS MATERIAL'S COMPLIANCE WITH VOC STANDARDS/REQUIREMENTS APPLICABLE IN LOCATIONS/JURISDICTIONS WHERE THIS MATERIAL MAY BE SOLD OR USED.

16.4 Full text of H-Statements referred to under sections 2 and 3.

H225 Flammable liquid and vapor.
H301 Toxic if swallowed.
H311 Toxic in contact with skin.
H314 Causes severe skin burns and eye damage.
H318 Causes serious eye damage.
H331 Toxic if inhaled.
H370 Causes damage to organs.

16.5 Icons for GHS Pictograms shown in Section 3 describing each ingredient:

GHS02



GHS05



GHS06



GHS07



GHS08



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All recommendations for the use of our products, whether given by us, orally or to be implied from data or lab tests results by us, are based on the current state of our knowledge at the time those recommendations are made. When additional information is obtained, these recommendations may be updated. They may also be influenced by circumstances outside our control. Notwithstanding, such recommendation the user is responsible that the product as supplied by us is suitable to the process or purpose he/she intends to use it.

Due to the proliferation of sources for information such as manufacturer specific SDSs, we are not and cannot be responsible for SDSs obtained from any source other than ourselves. If you have obtained an SDS from another source or if you are not sure that the SDS you have is current, please contact us for the most current version.

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End of Safety Data Sheet

SAFETY DATA SHEET

IronGEL™



Creation Date: 9/5/2022
Revision Date: 6/14/2024
Version 1.2
SDS # 36A

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifier

Product Name: Iron-GEL

Chemical name: Iron-suspension

1.2 Recommended Use of the Chemical and Restrictions on Use

Recommended Use: Remediation of chlorinated solvents in groundwater and soil via in-situ chemical reduction (for both professional and industrial use)

Restrictions on Use: Use as recommended by label

1.3 Details of the Supplier and of the Safety Data Sheet

Supplier Tersus Environmental, LLC
 1116 Colonial Club Rd
 Wake Forest, NC 27587
 Phone: +1-919-453-5577
 Email: info@tersusenv.com

1.4 Emergency Telephone Number

For leak, fire, spill or accident emergencies, call:

+1-919-453-5577 (Tersus Office Hours, 8:00 AM to 5:00 PM Eastern)

+1-919-638-7892 (Tersus Outside office hours)

+1-800-424-9300 (Chemtrec 24 Hour Service – Emergency Only)

2. HAZARD IDENTIFICATION

2.1 Relevant identified uses of the substance or mixture

This chemical is considered non-hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

2.3 Classification system



2.3.1 Other Dangers

A small amount of explosive hydrogen gas may be released (less than 1 L/kg per hour) when in contact with water.

2.3.2 Acute and chronic effects on organs and systems/clinical symptoms on target organs

The information relating to the exact identification of the action of the components of the mixture are either not available or are not significantly relevant in relation to the dangerousness of the product.

2.3.3 More info

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at concentrations of 0.1% or higher.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Chemical Formula Fe⁰ and FeO

3.2 Chemical Composition

Chemical Name	Concentration (%)	CAS Number
Iron	40-50	7439-89-6
Iron (II) Oxide	1-5	1345-25-1
Biodegradable Carbohydrates	50-60	Proprietary

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of the product composition has been withheld as a trade secret.

Synonyms are provided in Section 1.

Occupational exposure limits, if available, are listed in Section 8.

4. FIRST AID MEASURES

4.1 General Information

Please see the section to follow: Eye Contact, Skin Contact, Inhalation, and Ingestion for more information on what to do in an event of these types of exposure.

4.1.1 Eye Contact

IN CASE OF CONTACT WITH EYES: wash immediately with plenty of water or saline, with the eyelid open, for at least 15 minutes.

4.1.2 Skin Contact

IN CASE OF CONTACT WITH SKIN: the matter is not classified as dangerous for this route of contact. However, it is advisable to remove impregnated clothes, wash the skin with plenty of soap and water.

4.1.3 Inhalation

IN CASE OF INHALATION: the matter is not classified as dangerous for this route of contact due to exposure to high concentrations of mists or vapors, transport the injured person in a clean environment, and contact a doctor. Administer oxygen and ventilate, if necessary. Do not carry out operations that also endanger rescuers.

4.1.4 Ingestion

IN CASE OF INGESTION: consult your doctor for appropriate treatment.

4.2 Important Symptoms and Effects (Acute and Delayed)

It is not expected to present a significant hazard under the normal intended conditions of use.

**4.3 Indication of
any immediate
medical attention
and special
treatment needed**

Contact a doctor if symptoms are present. The sheet may not include data relating to substances/mixtures present at low concentrations. If in doubt, consult the information relating to the individual substances (see section 3 of the sheet). Maintain vital signs if necessary.

5. FIRE-FIGHTING MEASURES**5.1 Suitable
Extinguishing
Media**

General information Remove containers from the fire area if this is possible without risk. Contain and collect the extinguishing water for subsequent disposal. In case of fire, keep upwind and avoid being hit by fumes or vapors. Use the following extinguishing media: carbon dioxide, foam, water (preferably nebulized), chemical powders or sand (for small fires).

**5.2 Specific
Hazards Arising
from the Chemical
or Mixture**

The vapors may cause dizziness, fainting or choking.

**5.3 Special
Firefighting
procedures**

Wear:

- gas mask with breathing apparatus
- complete equipment consisting of helmet with visor and neck protection, fireproof jacket, and trouser with bands around the arms, legs and waist.

6. ACCIDENTAL RELEASE MEASURES

For anything not covered in this section, refer to the protective devices recommended in section 8 of this sheet.

**6.1 Personal
Precautions**

For those who do not intervene directly

The following indications are aimed at duly trained personnel working in the plant units in which the substance is normally used and are intended to ensure, when possible, without risk, the preliminary safety operations before leaving and waiting for the intervention of the team of emergency.

Stop the leak if doing so without risk.

Keep people not involved in the emergency intervention away from the area affected by the spill.

If possible, always operate upwind. For more information on personal protective equipment, please see section 8.

For those who intervene directly

The following indications are addressed to expert personnel such as personnel belonging to the emergency team and, for this purpose, specially trained; they are added to the indications referred to in the point referring to personnel who do not intervene directly; the indications relating to environmental precautions and methods of containment and reclamation refer to the same personnel.

Expert personnel, such as personnel belonging to the emergency team and specially trained for this purpose, must comply with the indications referred to in the point referring to personnel who do not intervene directly and with the indications relating to environmental precautions and methods of containment and remediation.

6.2 Environmental Precautions

Water mist can be used to dilute vapors.

6.3 Methods for Containment and Clean up

Wash the floor with water after collecting the span. Place the collected material in clean and labelled containers.

7. HANDLING AND STORAGE**7.1 Precautions for Safe Handling**

Check the integrity of the containers before handling them.
Handle the containers with care and do not open them at temperatures above 35°C.
If you carry out operations with the material outdoors, operate upwind.
Always avoid:
- contact with skin and eyes
- inhalation of vapors and fumes
Handle in a well-ventilated place.
Provide for the use, where necessary and particularly in emptying or transfer areas, of localized aspiration systems.
Once the containers have been emptied, they must be transferred without delay to the area identified for the collection of the same pending disposal or re-use.
Never reuse empty containers before they have undergone industrial cleaning or reconditioning.
Before carrying out operations of transfer into other containers, make sure that there are no residues of incompatible substances inside them.
No smoking in work and storage areas.
Food and drink must be consumed only in specially identified areas after removing contaminated clothing and protective devices and after washing hands. In any case, wash your hands after handling the substance.

7.2 Hygiene Measures

Avoid inhalation, ingestion and contact with skin and eyes.
General occupational hygiene measures are required to ensure safe handling of the substance. The measures involve good personal and housekeeping practices (i.e., regular cleaning with suitable cleaning devices), no drinking, eating, and smoking at the workplace. Shower and change clothes at the end of work shift.

7.3 Specific end users

Recommendations referring to uses must be evaluated on a case-by-case basis, also in relation to the possible composition of the commercial product that contains the substance, in the light of the sector of activity for which the substance or mixture is intended and of the technological and production cycle of use.

7.4 Conditions for Safe Storage (with Incompatibilities)

Conditions for safe storage, including any incompatibilities
Protect containers from damage.
Protect the container from knocks and falls.

Adequately ventilate the storage area so that any vapor escaping from containers can be diluted.

Store in a well-ventilated, dry and cool place at a temperature of 1-5°C. Do not freeze.

Store in closed and labeled containers.

Store any unused material protected with an inert gas (such as nitrogen or argon).

Minimize all possible sources of material loss through appropriate procedural and plant engineering interventions.

Keep away from food, feed and drink.

Store away from incompatible materials, such as oxidizing agents, acids, acetylene, ammonia.

Keep only in the original container.

Keep containers tightly sealed in dry places to avoid oxidation. Make sure the product also doesn't come into contact with any acids or strong oxidizers.

8. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control Parameters

For occupational exposure limits of the substances in the mixture, reference shall be made to the information of each component. The values currently available and updated for the constituent substances listed in Section 3 of the fiche are reported. No substances for which there are known exposure limit values shall be mentioned. Information on Occupational Exposure Limits for the components of the mixture is either not available or is not significantly relevant to the hazardousness of the product.

8.1.1 Components with Occupational Exposure Limits

Data not available.

8.2 Exposure Controls



8.2.1 Appropriate Engineering Controls

Ensure adequate ventilation of the area. Do not eat or drink or smoke in the workplace.

8.2.2 Eye Protection

For PPE for the eyes/face of the substances/mixtures that make up the product, reference should be made to the information of each component. Use of ANSI safety glasses, or protective goggles.

8.2.3 Respiratory Protection

For PPE for the respiratory tract of the substances/mixtures that make up the product, reference should be made to the information of each component. If exposure limits are high, or if respiratory irritation begins to occur (cough / shortness of breath), then MSHA-approved respiratory equipment should be worn.

8.2.4 Hand Protection

For PPE for the skin of the substances/mixtures that make up the product, reference must be made to the information of each component. In case of fire additionally use black glasses (to prevent a risk of damage to the retina). Use of canvass gloves.

8.2.5 Other Skin and Body Protection

Apron or suit resistant to chemicals. The information on skin PPE for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product.

Do not eat or drink or smoke in the workplace.

8.3 Hygiene Measures

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on Basic Physical and Chemical Properties (Information for This Section Is Currently Unknown)

Appearance	Black or metallic gray
Odor	Odorless
Odor threshold	N/A
pH	8-10.5
Melting point /Freezing Point	Data not Available
Initial Boiling point and boiling point range	Data not Available
Flash Point	Data not Available
Evaporation rate	Data not Available
Flammability (solid; gas)	Not flammable
Upper/lower flammability or explosive limits	Data not Available
Vapor pressure	Data not Available
Vapor density	Data not Available
Relative density	1.7-1.8 g/cm ³
Solubility (ies)	Data not Available
Partition coefficient: n-octanol/water	Data not Available
Initial Boiling point and boiling point range	Data not Available
Auto-ignition temperature	Data not Available
Decomposition temperature	Data not Available
Viscosity	Data not Available
Particle size	Diameter 1-100 µm

10. STABILITY AND REACTIVITY

10.1 Reactivity

A small amount of hydrogen (less than 1L/kg/hr) is produced in contact with water.

10.2 Chemical stability

Stable under the conditions of use and storage recommended in section 7.

10.3 Possibility of Hazardous Reactions

None under normal processing.

10.4 Conditions to Avoid

Avoid generating dust and high temperatures.

10.5 Incompatible Materials

To not mix with or keep around strong acids, oxidizing agents, acetylene and ammonia.

10.6 Hazardous Decomposition Products

None under normal use.

11. TOXICOLOGICAL INFORMATION**11.1 Information on toxicological effects**

No experimental studies have been performed on the mixture as such. For human toxicity aspects, the individual constituents mentioned in section 3 of the fiche should therefore be evaluated. This contains currently available information for components for which specific effects are known.

11.2 Acute toxicity

Oral LD50 toxicity (rat): 30 g/kg BW/day

11.3 Respiratory corrosion

The information on the corrosive and/or irritating power for the respiratory tract for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product. The mixture does not have corrosive and/or irritating power for the respiratory tract.

11.4 Corrosive and/or irritating skin

The information relating to the corrosive and/or irritating power for the skin for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product. The mixture does not have corrosive and/or irritating power for the skin.

11.5 Serious damage and/or irritant to the eyes

Information on the corrosive and/or irritating power for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product. The mixture does not have corrosive and/or irritating power for the eyes.

11.6 Respiratory

The information on respiratory sensitizing power for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product. The substance has shown sensitizing power for the respiratory tract.

11.7 Skin sensitizing power

The information relating to the sensitizing power for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product. No skin sensitizing power of the mixture has been demonstrated.

11.8 Specific target organ toxicity (STOT) - single exposure

Specific target organ toxicity (STOT) information - single exposure for the components of the mixture is either not available or is not significantly relevant to the hazardousness of the product. The mixture is considered to have no proven or potential target organ specific toxicity (STOT) effects following single exposure.

11.9 Specific target organ toxicity (STOT) - repeated exposure

Information on specific target organ toxicity (STOT) - repeated exposure to the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product. The mixture is considered to have no proven or potential target organ specific toxicity (STOT) effects following repeated exposure.

11.10 Carcinogenicity

Carcinogenicity assessments for the components of the mixture are either not available or are not significantly relevant in relation to the hazardousness of the product. The mixture is considered to have no proven or potential carcinogenic effects for humans.

11.11 Germ cell mutagenicity

Evaluations for the components of the mixture are either not available or are not significantly relevant in relation to the hazardousness of the product. The mixture is considered to have no proven or potential mutagenic effects for humans.

11.12 Reproductive toxicity

Evaluations of reproductive toxicity for the components of the mixture are either not available or are not significantly relevant in relation to the hazardousness of the product.

The mixture is considered to have no proven or potential effects of reproductive toxicity to humans.

11.13 Hazard in case of suction

Evaluations for the components of the mixture are either not available or are not significantly relevant in relation to the hazardousness of the product.

It is considered that the mixture has no proven or potential effects in case of aspiration.

11.14 Other: metabolism, kinetics, mechanism of action

Information related to metabolism, kinetics, mechanism of action, etc. for the components of the mixture, is either not available or is not significantly relevant in relation to the hazardousness of the product.

11.15 Potential routes of exposure

Inhalation, skin contact and ingestion.

11.16 General information

Inhalation of dust can irritate the respiratory system.

12. ECOLOGICAL INFORMATION**12.1 Ecotoxicity**

CL50	Pisces		2,976 mg/l
EC50	Crustaceans (Daphnia)		13,248 mg/l
EC50	Alga	72 hours	1,080 mg/l

12.2 Ecotoxicity: long-term effects

The long-term aquatic toxicity studies for the individual substances/mixtures that make up the product and referred to in section 3 of the fiche are either not known or are not significantly relevant in relation to the hazard of the mixture.

12.3 Persistence and degradability

Information on persistence and degradability for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product.

12.4 Bioaccumulation potential

Information on the bioaccumulation potential for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product.

12.5 Mobility in soil

Soil mobility information for the components of the mixture is either not available or is not significantly relevant in relation to the hazardousness of the product.

12.6 Results of PBT and vPvB assessment

Not relevant: inorganic substance

12.7 Endocrine-disrupting properties

This mixture does not contain substances with endocrine-disrupting properties.

12.8 Other adverse effects

No other adverse effects of the mixture are known.

13. DISPOSAL CONSIDERATIONS**13.1 Waste Disposal Methods**

In the event of disposal as such, the material must be classified as non-hazardous waste in accordance with Directive 98/2008/EC and Regulation 1357/2014/EU.

Waste EWC code: 06 03 99 - waste not otherwise specified
Burnt waste EWC code: 06 03 16 - metal oxides, other than those mentioned in item 06 03 15

EWC code for contaminated packaging: 15 01 04 - metallic packaging

EWC codes are recommended based on the likely use of this product. The other EWC codes can also be used, depending on the specific use or specific packaging defined by the user.
Packaging disposal: Packaging that cannot be cleaned should be disposed as special waste in compliance with local, state, and national regulations.

In the event of disposal as such, the material must be classified as non-hazardous waste in accordance with Directive 98/2008/EC and Regulation 1357/2014/EU.

14. TRANSPORTATION INFORMATION**14.1 U.S. (D.O.T.)**

Proper Shipping Name:	N/A
Hazard Class:	N/A
UN/NA:	N/A
Labels:	N/A

14.2 Canada (T.D.G.)

Proper Shipping Name:	N/A
Hazard Class:	N/A
UN/NA:	N/A

Labels: N/A

14.3 IMDG

Proper Shipping Name: N/A
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

14.4 IATA

Proper Shipping Name: N/A
Hazard Class: N/A
UN/NA: N/A
Labels: N/A

15. REGULATORY INFORMATION

15.1 United States Federal Regulations

This product follows all applicable US Federal Regulations.

The list of legislative references is indicative and not exhaustive. In each specific case, the user of the product is required to investigate the legislation and the recommendations relating to the correct use of the product.

- Regulation (EC) n. 1907/2006 of 18 December 2006 and subsequent amendments (Registration, Evaluation, Authorization and Restriction of Chemicals - REACH Regulation)
- Regulation (EU) n. 2015/830 of 28 May 2015 amending regulation (EC) no. 1907/2006 of 18 December 2006 and subsequent amendments (Registration, Evaluation, Authorization and Restriction of Chemicals - REACH Regulation).
- Regulation (EC) n. 1272/2008 of the European Parliament and of the Council, of 16 December 2008, relating to the classification, labeling and packaging of substances and mixtures which amends and repeals directives 67/548/EEC and 1999/45/EC and which modifies Regulation (EC) no. 1907/2006.
- Legislative Decree 26 June 2015, n. 105 - Implementation of directive 2012/18/EU. (Major accident risks - "Seveso" directive)
- Ministerial Decree 9 April 2008 and subsequent amendments (List of occupational diseases in industry and agriculture)
- Legislative Decree 9 April 2008, n. 81 and subsequent amendments (Protection of health and safety in the workplace)
- Legislative Decree 3 April 2006, n. 152 and subsequent amendments (Environmental regulations - Waste and hazardous packaging - Protection of water from pollution)
- Legislative Decree 3 December 2010, n 205 and subsequent amendments - implementation of Directive 98/2008/EC (waste)
- Reg. 1357/2014/EU (Hazardous characteristics of waste)
- Presidential Decree 5 April 1989, no. 250 (Detergent biodegradability)
- Reg. 648/2004/CE and Reg. 907/2006/CE (detergents)

15.2 SARA 311/312 Hazards Regulation

Consider the chemical safety assessment especially taking into account the physico-chemical properties, the way and circumstances of use of the substance or mixture. If handled properly with safety requirements in place, the following apply:

Acute Health Hazard: No
Chronic Pain Hazard: No
Fire Hazard: No
Sudden Release of Pressure Hazard: No
Reactive Hazard: No

15.3 SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

15.4 California Prop. 65

The product doesn't contain any Prop. 65 chemicals.

15.4 The Components of the Product Are Reported in the Following Inventories

CH INV: Complies
DSL: Complies
AICS: Complies
NZIoC: Complies
ENCS: -
KECI: Complies
PICCS: Complies
IECSC: Complies
TCSI: Complies
TSCA: Complies

16. OTHER INFORMATION

This sheet cancels and replaces any previous version.

The information provided is based on the compiler's best knowledge on the date indicated in the introduction. They are to be understood exclusively as referring to the product indicated.

They may therefore be irrelevant in the case of combinations or mixtures. The user must comply with the regulations in force, and ensure the updating, suitability and completeness of the information contained; this in relation to the specific use that must be made of the product.

Safety data sheet revision

Below are the changes made to this information sheet, compared to the previous version of the same.
Data not applicable

Hazard statement codes and Supplemental hazard statement codes: full text (Reg. 1272/2008)

Below is the full text of the hazard statement codes (H codes) and supplemental hazard statement codes (EUH codes) used to compile this information sheet.

Nobody

Precautionary statements: full text (Reg. 1272/2008)

The complete text of the precautionary statements (P codes) used for the compilation of this information sheet is shown below.

Nobody

Abbreviations and acronyms

ACGIH: American Conference of Governmental Industrial Hygienists.

ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways.

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road under Directive 94/55/EC.

BEI: Biological Exposure Limit: indicates the biological level of the relative agent or one of its metabolites established by the ACGIH.

EC50: Median effective concentration: concentration that produces an effect other than death in 50% of individuals (immobilization, growth arrest, etc.) in both acute and chronic assays.

CL0: Highest dose used that does not cause any deaths.

DFG: German commission for the study of health hazards of chemical compounds in the workplace

LD50: single dose of substance, statistically evaluated, which is expected to cause the death of 50% of treated animals.

DNEL: Derived No Effect Levels

PPE: Personal protective equipment.

IARC: International Agency for Research on Cancer.

IBC: International code for the construction and equipment of ships carrying dangerous chemicals in bulk.

ICAO: International Civil Aviation Organization, (Safety of the transport of dangerous goods by air).

IMDG: International Maritime Dangerous Goods Code for the carriage of dangerous goods by sea.

IMO: International Maritime Organization.

Kow: partition coefficient between n-octanol and water (Kow). It is the ratio between the equilibrium concentrations of a substance dissolved in a system consisting of n-octanol and water. It is a measure of the lipophilicity of the substance.

LOAEL: Lowest Observed Adverse Effect Level – The lowest dose at which an adverse effect was observed.

MAK: maximum concentration in the air in the workplace to which a chemical substance (such as gas, vapor or particulate matter) generally does not cause adverse effects on workers' health or cause discomfort even if the person is repeatedly exposed for long periods.

MARPOL: Protocol relating to the transport of bulk according to the IMO.

NOEC: No Observed Effect Concentration – Concentration with no observed effect.

NOEL: No Observed Effect Level - Dose with no observed effect represents the highest level (concentration or dose) at which no effect has occurred. As a rule, it refers to long-term chronic assays.

PNEC: Predicted No Effect Concentration

RID: European Agreement concerning the International Carriage of Dangerous Goods by Rail.

SCN: central nervous system.

STEL: Threshold Limit Value - Short Time Exposure Limit (TLV-TWA): the concentration to which it is believed that the worker can be exposed for 15 minutes for a maximum of 4 times a day with an interval of 60 minutes between exposures.

TLV: Threshold Limit Value established by the ACGIH

TWA: Threshold Limit Value - Time Weighted Average (TLV-TWA) of the concentration over a conventional 8-hour working day, to which it is believed that nearly all workers may be repeatedly exposed, day after day over a working life, without negative effects.

Data sources

The sources consulted for the compilation of this form are indicated below:

- HSDB Hazardous Substances Data Bank. Bethesda, MD: National Library of Medicine Files online
- ACGIH Threshold limit values for chemical substances and physical agents and biological exposure indices (TLVs and BEIs).

- Lewis, Richard J. Sr. Wiley (2000) Sax's Dangerous Properties of Industrial Materials - Interscience Publication. Tenth Edition.

- RTECS - Registry of Toxic Effects of Chemical Substances - National Library of Medicine of Bethesda (USA) by National Institute for Occupational Safety and Health (NIOSH) file on-line

- DFG (Deutsche Forschungsgemeinschaft) List of MAK and BAT Values. Maximum Concentrations and Biological Tolerance Values at the Workplace.
- GESTIS-database on hazardous substances - Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung (IFA, Institute for Occupational Safety and Health of the German Social Accident Insurance).
- United Nations. Restructured ADR. European Agreement concerning the International Carriage of Dangerous Goods by Road.
- United Nations. European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN).
- Organization Intergouvernementale pour les Transports Internationaux Ferroviaires (OTIF). Règlement concerning the transport international ferroviaire des marchandises dangereuses (RID).
- International Civil Aviation Organization (ICAO). Technical Instructions for the Safe Transport of Dangerous Goods by Air.
- International Maritime Organization (IMO). International Maritime Dangerous Goods Code.

Components not precisely identified are proprietary or non-hazardous. Mixture classified as not dangerous according to Regulation (EC) 1272/2008. Observe employment restrictions for people. The product is not listed with IARC, NTP, ACGIH or OSHA as a carcinogen.

Disclaimer: The information contained in this Safety Data Sheet (SDS), as of the issue date, is believed to be true and correct. However, the accuracy or completeness of this information and any recommendations or suggestions are made without warranty, express or implied, or guarantee. Tersus Environmental, LLC urges each customer or recipient of this SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this SDS and any hazards associated with the product. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. Since we cannot control the application, use or processing of the product, we do not accept responsibility. Therefore, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product and ensure that the intended use of the product will not infringe any party's intellectual property right. The information presented here pertains only to the product as shipped.

All recommendations for the use of our products, whether given by us, orally or to be implied from data or lab tests results by us, are based on the current state of our knowledge at the time those recommendations are made. When additional information is obtained, these recommendations may be updated. They may also be influenced by circumstances outside our control. Notwithstanding such recommendation the user is responsible for ensuring that the product supplied by us is suitable for the process or purpose he/she intends to use it.

Due to the proliferation of sources for information such as manufacturer specific SDSs, we are not and cannot be responsible for SDSs obtained from any source other than ourselves. If you have obtained an SDS from another source or if you are not sure that the SDS you have is current, please contact us for the most current version.



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End of Safety Data Sheet

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

1.1 PRODUCT NAME:	KB-1® Primer
PRODUCT CODE:	N/A
CHEMICAL FAMILY NAME:	Mixture
U.N. NUMBER:	None
U.N. DANGEROUS GOODS CLASS:	Not Regulated
1.2 PRODUCT USE:	For preparation of anaerobic water for use in groundwater remediation. KB-1® products are intended for laboratory research and field applications for groundwater remediation, and are not intended to be used as human or animal therapeutics, cosmetics, agricultural or pesticidal products, food additives, or as household chemicals.
1.3 SUPPLIER/MANUFACTURER'S NAME:	SiREM
ADDRESS:	130 Stone Road, West, Guelph, Ontario Canada N1G 3Z2
1.4 EMERGENCY PHONE:	519-515-0840
BUSINESS PHONE:	519-515-0840 (Product Information)
WEB SITE:	www.siremlab.com
1.5 DATE OF PREPARATION:	December 05, 2018
DATE OF LAST REVISION:	New

SECTION 2 - HAZARDS IDENTIFICATION

2.1 Classification of the mixture:

This product does meet the definition of a hazardous substance or preparation as defined by 29 CFR 1910. 1200 AND the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC, 2015/830/EU and subsequent Directives.

Component(s) Contributing to Classification(s)

L-Cysteine

2.2 GHS Label elements, including precautionary statements:

Pictogram(s):

None applicable.

Signal Word:

Warning!

GHS Hazard Classification(s):

Acute Toxicity Category 5 (Oral)

Hazard Statement(s):

H303: May be harmful if swallowed

Prevention Statement(s):

None Applicable

Response Statement(s):

P312: Call a POISON CENTER/doctor if you feel unwell.

Storage Statement(s):

None Applicable

Disposal Statement(s):

None Applicable.

2.3 Other Hazards:

This mixture does not meet the criteria for PBT or vPvB in accordance with Annex VII.

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

3.1 Substances: Not applicable

3.2 Mixtures:

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	Index #	WT %	GHS CLASSIFICATION
L-Cysteine	52-90-4	200-158-2	Not Listed	1-10%	ACUTE TOX. CAT 4 (ORAL)
Balance of other ingredients are non-hazardous or hazardous below the applicable cut-off level.					

Additional Information: See SECTION 16 for full classification phrases.

SECTION 4 - FIRST-AID MEASURES

4.1 Description of 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 SDS 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.

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 SDS with the victim to the health professional.

4.2 Most important symptoms and effects, both acute and delayed:

May be harmful if swallowed. See section 11 for additional information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin problems may be aggravated by prolonged or repeated contact.

4.3 Indication of immediate medical attention and special treatment needed:

Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

5.1 Extinguishing media:

Use media suitable for surrounding area. Carbon dioxide, foam, dry chemical, halon, water spray.

5.2 Specific hazards arising from the chemical:

No data available for this product.

Explosion Sensitivity to Mechanical Impact:

Not Sensitive.

Explosion Sensitivity to Static Discharge:

Not Sensitive

Minimum Ignition Energy (M.I.E.)

No Data at this time

5.3 Special firefighting Procedure:

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.

SECTION 6 - ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures:**

No action shall be taken involving any personal risk or without suitable training. Do not touch or walk through spilled material. Avoid breathing dust. Provide adequate ventilation. Use appropriate respirator when ventilation is inadequate and use personal protective clothing as described in Section 8 of this safety data sheet. See section 11 for additional information on health hazards.

6.2 Environmental precautions:

No specific data available for this product.

6.3 Methods and material for containment and cleaning up:

Wear suitable protective clothing. Avoid dust formation. Avoid breathing dust. Carefully sweep up and remove. Place material in a dry container and cover. Remove from the area. Flush spill area with water. Do not let products enter drains. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE**7.1 Precautions for safe handling:**

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. Use in a well-ventilated location. Remove contaminated clothing immediately.

7.2 Conditions for safe storage, including any incompatibilities:

Store in a tightly sealed container in a cool, dry and well-ventilated place. Store away from direct light. Avoid generation of dust. Do not breathe dust. Wash thoroughly after handling. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing. Segregate from strong oxidizing agents, acids, bases.

7.3 Specific end uses:

See section 1.2.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION**8.1. Control parameters:**

EXPOSURE LIMITS/GUIDELINES: None established for this product.

8.2 Exposure Controls:

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: Generally not required under normal conditions of use. If method of use will result in significant dust generation, use in lab hood or under conditions of adequate ventilation.

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: 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 or chemical goggles as appropriate to prevent eye contact. 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

9.1 Information on basic physical and chemical properties:

PHYSICAL STATE:	Solid (Granules)
APPEARANCE:	White to off-white powder or granules
ODOR:	Odorless
ODOR THRESHOLD (PPM):	Not Available
pH:	6-8 (aqueous solution)
MELTING / FREEZING POINT (C°):	Not Available
BOILING POINT (C°):	Not Available
FLASH POINT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Available
FLAMMABILITY (solid, gas):	Not Available
FLAMMABLE LIMITS (in air by volume, %):	Not Available
VAPOR PRESSURE (mmHg):	Not Available
VAPOR DENSITY (AIR=1):	Not Available
RELATIVE DENSITY	2.4 to 2.6 g/cm ³ , depending on formulation
SOLUBILITY IN WATER (%)	Soluble
PARTITION COEFFICIENT: N-OCTANOL/WATER:	Not Available
AUTOIGNITION TEMPERATURE:	Not Available
DECOMPOSITION TEMPERATURE:	Not Available
VISCOSITY:	Not Available
EXPLOSIVE PROPERTIES:	Not Available
OXIDISING PROPERTIES:	Not Available

9.2 Other Information:

PACKING DENSITY:	Not Available
VOC:	Not Available

SECTION 10 - STABILITY and REACTIVITY

10.1 Reactivity: See section 10.5.

10.2 Chemical Stability: Product is stable.

10.3 Possibility of Hazardous Reactions: Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid: Contact with incompatibles, exposure to light, and moist air.

10.5 Incompatible materials: Strong oxidizing agents, bases.

10.6 Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, nitrogen oxides, sulfur oxides, potassium oxides.

SECTION 11 - TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects:

TOXICITY DATA:

L-Cysteine CAS# 52-90-4
 Oral LD50 1890 mg/kg Rat
 Oral LD50 660 mg/kg Mouse

11.1.2 Mixtures:

Acute toxicity	Acute Toxicity Category 5 (Oral)
Skin corrosion / irritation	Based on available data, the classification criteria are not met
Serious eye damage / irritation	Based on available data, the classification criteria are not met
Respiratory or skin sensitization	Based on available data, the classification criteria are not met
Germ cell mutagenicity	Based on available data, the classification criteria are not met
Carcinogenicity	Based on available data, the classification criteria are not met
Reproductive toxicity	Based on available data, the classification criteria are not met
STOT-single exposure	Based on available data, the classification criteria are not met
STOT-repeated exposure	Based on available data, the classification criteria are not met
Aspiration hazard	Based on available data, the classification criteria are not met

Other Information

POTENTIAL HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE:

EYE CONTACT: Eye exposure may produce irritation.

SKIN CONTACT: Prolonged or repeated skin exposure may cause irritation.

INHALATION HAZARDS: Inhalation of dusts may cause irritation.

INGESTION HAZARDS: May be harmful if swallowed. May cause gastrointestinal tract irritation.

CHRONIC: None Known

TARGET ORGANS:

ACUTE: Organs

CHRONIC: None Known

CARCINOGENICITY: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore are 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 skin and eyes.

SENSITIZATION OF PRODUCT: This product is not considered a skin sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

MUTAGENICITY INFORMATION: This product does not contain a component that is suspected to be a mutagenicity hazard.

SPECIFIC TARGET ORGAN TOXICITY – SINGLE EXPOSURE: Data not sufficient for classification.

SPECIFIC TARGET ORGAN TOXICITY – REPEATED EXPOSURE: Data not sufficient for classification.

ASPIRATION HAZARD: Not applicable

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.1 Toxicity:

No specific data available on this product.

12.2 Persistence and Degradability:

No specific data available on this product.

12.3 Bioaccumulative Potential:

No specific data available on this product.

12.4 Mobility in Soil:

No specific data available on this product.

12.5 Results of PBT and vPvB Assessment:

No specific data available on this product.

12.6 Other Adverse Effects:

No specific data available on this product.

12.7 Water Endangerment Class:

Not believed to be water endangering in accordance with EU Guideline 91/155-EWG. At present there are no ecotoxicological assessments for this product.

SECTION 13 - DISPOSAL CONSIDERATIONS

13.1 Waste Treatment Methods:

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

14.1 Transport Information:

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT CLASSIFIED AS DANGEROUS GOODS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: None

HAZARD CLASS NUMBER and DESCRIPTION: Not Regulated

UN IDENTIFICATION NUMBER: None

PACKING GROUP: None

DOT LABEL(S) REQUIRED: None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2016): None

MARINE POLLUTANT: This product does not contain ingredients that are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

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 SHIPPING and MARITIME DANGEROUS GOODS CODE SHIPPING INFORMATION (IMO / IMDG):

This product is not classified as Dangerous Goods.

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

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture:

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: No 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 SDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as per WHMIS 2015 Hazardous 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: Components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPAN INDUSTRIAL SAFETY AND HEALTH LAW: This product has been classified per the Japan Industrial Safety and Health Law. See Section 2 for the GHS Classification.

KOREA ACT ON REGISTRATION AND EVALUATION OF CHEMICAL SUBSTANCES (K-REACH): This product has been classified per K-REACH. See Section 2 for the GHS Classification.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

15.2 Chemical Safety Assessment:

A chemical safety assessment has not been performed on this product.

SECTION 16 - OTHER INFORMATION

HMIS Rating (Scale 0-4)

Health hazard: 1
Flammability: 0
Physical Hazard: 0

NFPA Rating (Scale 0-4)

Health hazard: 1
Flammability: 0
Physical Hazard: 0

Caution: HMIS and NFPA ratings are based on a 0-4 rating scale

0= Minimal Hazard

1= Slight

2= Moderate

3= High

4= Extreme

Abbreviations and acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
CFR	Code of Federal Regulations
DOT	Federal Department of Transportation
GHS	The Globally Harmonized System of Classification and Labelling of Chemicals
HMIS	Hazardous Material Identification System
HCS	Hazard Communication Standard
IARC	International Agency for Research on Cancer
IATA	The International Air Transport Association
ICAO	The International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
LD50/LC50	Lethal Concentration/Dose, 50 percent
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health

NTP	<i>National Toxicology Program</i>
OSHA	<i>Occupational Safety and Health</i>
PEL	<i>OSHA Permissible Exposure Limit</i>
SARA	<i>Superfund Amendments and Reauthorization Act</i>
TLV	<i>ACGIH Threshold Limit Value</i>
TWA	<i>Time-Weighted Average</i>
Acute Tox	<i>Acute Toxicity</i>
Skin Corr	<i>Skin Corrosion</i>

PREPARED BY: Chris Eigbrett

MSDS to GHS Compliance

History Log:

December 05, 2018

- Document creation

End of SDS Sheet

SAFETY DATA SHEET

1. CHEMICAL IDENTIFICATION AND COMPANY INFORMATION

Product Name: KB-1®
Company Info: SiREM
130 Stone Rd. W., Guelph, Ontario, Canada, N1G 3Z2
Phone: 519-822-2265
Toll Free, North America: 1-866-251-1747
Fax: 888-635-3470
www.siremlab.com

Emergency Phone Number: 519-822-2265 (for 24/7 assistance, contact poison center hotline in your jurisdiction).

Description: Microbial inoculum (non-pathogenic, non-hazardous) in growth media consisting of a dilute aqueous solution of mineral salts and nutrients.

Recommended Use: Bioremediation of contaminated groundwater.

Restrictions on Use: KB-1® product intended for laboratory research and field applications for cleanup of contaminated groundwater. Products are not intended to be used as human or animal therapeutics, cosmetics, agricultural or pesticide products, food additives, or as household chemicals.

2. HAZARDS IDENTIFICATION

GHS Classification: Not classified as "hazardous" per OSHA 29 CFR 1910.1200, "Hazard Communication".

GHS Label elements, including hazard and precautionary statements: Not Applicable.

HMIS Rating:	Health	Flammability	Physical Hazard	Personal Protection
	1	0	0	B*
NFPA Rating:	Health	Flammability	Reactivity	Special Hazard
	1	0	0	N/A

* B = Safety Glasses, Gloves.

A review of available data indicates minimal potential for health effects related to normal use of this product. Microbial components are non-pathogenic. The product is not expected to be a health hazard as a result of inhalation of mists, ingestion or skin contact. Eye contact may result in mild irritation/redness. Normal hygiene precautions should be observed, including eye protection, skin protection, and hand washing. The potential exists for individuals with hypersensitivity to biological materials to exhibit allergic sensitivity to biological components of this product (see Section 4, "First Aid Measures").

3. COMPOSITION/INFORMATION ON INGREDIENTS

KB-1[®] is a microbial culture grown in an aqueous dilute solution of mineral salts and nutrients classified as non-hazardous in accordance with provisions of OSHA 29 CFR 1910.1200, "Hazard Communication."

The microbial composition of KB-1[®], as determined by phylogenetic analysis, includes:

Dehalococcoides sp.
Geobacter sp.
Methanomethylovorans sp.

Identification of organisms was obtained by matching 16S rRNA gene sequence of organisms in KB-1[®] to other known organisms. The characteristics of related organisms can be used to identify potential or likely characteristics of organisms in KB-1[®].

4. FIRST AID MEASURES

Avoid direct contact with skin and eyes. In any case of any exposure which elicits a response, a physician should be consulted immediately.

Route of Entry	Symptoms	First Aid Procedures
Ingestion	Upset stomach, irritation of digestive tract.	Do not induce vomiting. Drink several cups of water. Seek medical attention.
Skin contact	Skin irritation – reddening, itching or inflammation.	Remove contaminated clothes. Wash skin with plenty of water and soap. Seek medical attention if irritation develops or open wounds are present.
Eye contact	Eye irritation – redness, tearing, blurred vision.	Rinse immediately with plenty of water for 15 – 20 minutes, lifting lower and upper eyelids occasionally (remove contact lenses if easily possible). Seek medical attention if undue irritation or redness occurs.
Inhalation of mist	Respiratory irritation, coughing, breathing difficulty.	Remove victim to fresh air. Administer first aid as appropriate for symptoms. Seek medical attention if serious symptoms occur.

5. FIRE FIGHTING MEASURES

General:	This material is non-flammable, consisting primarily of water, and poses no special hazards if involved in a fire situation.
Suitable extinguishing media:	If material is involved in fire situation, use extinguishing media suitable for surrounding fire.
Special protective equipment and precautions for firefighters:	No special equipment necessary; use equipment appropriate for surrounding fire.
Hazardous combustion products:	Not applicable.
Toxic gases produced:	Not applicable.
Shock/impact sensitivity:	Not shock sensitive.

6. ACCIDENTAL RELEASE MEASURES

Method of containment and cleanup:

Spilled KB-1[®] should be soaked up with sorbent and saturated with a 10% bleach solution (prepared by making a one in ten dilution of diluted standard bleach [normally sold at a strength of 5.25% sodium hypochlorite] to disinfect affected surfaces. Sorbent should be double bagged and disposed of as indicated in Section 13. After removal of sorbent, area should be washed with 10% bleach solution to disinfect. If liquid from the culture vessel is present on the fittings, non-designated tubing or exterior of the stainless steel pressure vessel liquid should be wiped off and the area washed with 10% bleach solution.

Ventilation:

No special ventilation is required in the event of the spill, as the material consists of water and non-volatile constituents. If the potential for generation of mist exists, open windows and provide adequate ventilation. If high levels of mist are encountered, use personal protective equipment indicated below.

Eye/skin protection:

Have eye-washing facilities readily available where eye contact can occur. Wash skin with soap and water. Use appropriate protective gloves when handling. Showering and changing into street clothes after work is recommended.

Protective equipment for airborne mist:

A NIOSH/MSHA approved dust mask or air purifying respirator with dust/mist filter is recommended where elevated concentrations of airborne mist are expected.

7. HANDLING AND STORAGE

Handling and storage precautions:

Use personal protective equipment (eye & skin protection) and hygiene measures (hand washing) to minimize contact with the material.

KB-1[®] is shipped in stainless steel pressure vessels and connected to injection lines and inert gas is used to pressurize the vessel to displace the contents. KB-1[®] should be handled with care to avoid any spillage. Vessels are shipped with 1 to 5 pound per square inch (psi) pressure; valves should not be opened until connections to appropriate lines for subsurface injection are in place.

During storage, avoid exposing stainless steel pressure vessels to undue temperature extremes (i.e., temperatures less than 0°C or greater than 30°C may result in harm to the microbial cultures and damage to the vessels). All valves should be in the closed position when the vessel is not pressurized to prevent the escape of gases and to maintain anaerobic conditions in the vessel.

Incompatibilities:

Avoid exposure of the culture to air as the presence of oxygen will kill the microbes.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OSHA Permissible Exposure Limits (PELs):	No occupational exposure limits are established for microbial constituents. Mixture is not classified as "hazardous" in accordance with 29 CFR 1910.1200 "Hazard Communication," exceedance of exposure limits is not anticipated either under normal conditions of use, or as the result of an accidental release.
ACHIH Threshold Limit Values (TLVs):	
Engineering controls:	Generally not required under normal conditions of use. If method of use will result in significant mist generation, use under conditions of adequate ventilation.
Work practices:	Use good hygiene practices, avoid mist generation, and minimize contact with the material as a general precautionary measure.
Personal protective equipment:	Under normal conditions of use, wear safety glasses, protective gloves (latex, vinyl or nitrile) and steel toed footwear as general precautionary measures, particularly when opening pressure vessel valves or when pressurizing vessels to inject contents into the subsurface environment. For laboratory use, also wear lab coat. For higher risk of eye contact, wear safety goggles or face shield, as appropriate. Respiratory protection is not required under normal conditions of use (see Section 6, "Accidental Release Measures."

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, physical state:	Aqueous liquid, dark grey, slightly turbid under anaerobic conditions, pink if exposed to air (oxygen).
Odor:	Pungent ("skunky") odor.
Solubility:	Soluble in water.
pH:	6.5 – 7.5
Melting range	Not determined, approximately equivalent to water.
Vapor density:	Not determined, approximately equivalent to water.
Vapor pressure:	Not determined, approximately equivalent to water.
Relative density:	Not determined, approximately equivalent to water.
Evaporation rate:	Not determined, approximately equivalent to water.
Initial Boiling point, boiling range	Not determined, approximately equivalent to water.
Flammability	Not flammable.
Partition coefficient	Not applicable
Auto-ignition temperature	Not applicable
Decomposition temperature:	No data, bacterial contents will decompose by heating.
Flash point	N/A

10. STABILITY AND REACTIVITY

Chemical stability and reactivity:	Stable and non-reactive.
Possibility of hazardous reactions:	Stable. Spontaneous hazardous chemical reactions / decomposition will not occur.
Conditions to avoid:	Maintain under anaerobic conditions to preserve product integrity (exposure to air/oxygen will kill microbes).
Incompatible materials:	Strong oxidizers, acids, water reactive materials.
Hazardous decomposition products:	Not applicable.
Shock sensitivity:	Not shock sensitive; will not decompose and form shock sensitive compounds.

11. TOXICOLOGICAL INFORMATION

Potential for pathogenicity: KB-1[®] has tested **negative** (i.e., the organisms are not present) for a variety of pathogenic organisms indicated below:

Pathogenic Organisms	Disease(s) Caused	Test Results
<i>Salmonella sp.</i>	<i>Typhoid fever, gastroenteritis</i>	Not Detected
<i>Listeria monocytogenes</i>	<i>Listerioses</i>	"
<i>Vibrio sp.,</i>	<i>Cholera, gastroenteritis</i>	"
<i>Campylobacter sp.,</i>	<i>Bacterial diarrhea</i>	"
<i>Clostridia sp.,</i>	<i>Food poisoning, botulism, tetanus, gas gangrene</i>	"
<i>Bacillus anthracis</i>	<i>Anthrax</i>	"
<i>Pseudomonas aeruginosa</i>	<i>Wound infection</i>	"
<i>Yersinia sp.,</i>	<i>Bubonic plague, intestinal infection</i>	"
<i>Yeast and Mold</i>	<i>Candidiasis, yeast infection etc.</i>	"
<i>Fecal coliforms</i>	<i>Indicator organisms for many human pathogens diarrhea, urinary tract infections</i>	"
<i>Enterococci</i>	<i>Various opportunistic infections</i>	"

While there is no evidence that virulent pathogenic organisms are present in KB-1[®], there is potential that certain organisms in KB-1[®] may have the potential to act as opportunistic (mild) pathogens, particularly in individuals with open wounds and/or compromised immune systems. For this reason standard hygienic procedures such as hand washing after use should be observed.

12. ECOLOGICAL INFORMATION

This product is not rated as "hazardous" as either an acute or chronic ecological hazard, in accordance with the OSHA Hazard Communication standard, 29 CFR 1910.1200.

13. DISPOSAL CONSIDERATION

Material must be disinfected or sterilized prior to disposal. Consult local regulations prior to disposal.

14. TRANSPORT INFORMATION

U.S. (D.O.T.):	Proper Shipping Name:	Culture of Micro-organisms
	Hazard Class:	Not applicable
	UN/NA:	Not applicable
	Labels:	Not applicable

Canada (T.D.G.)	Proper Shipping Name:	Culture of Micro-organisms
	Hazard Class:	Not applicable
	UN/NA:	Not applicable
	Labels:	Not applicable

International: IMDG:	Proper Shipping Name:	Culture of Micro-organisms
	Hazard Class:	Not applicable
	UN/NA:	Not applicable
	Labels:	Not applicable

IATA:	Proper Shipping Name:	Culture of Micro-organisms
	Hazard Class:	Not applicable
	UN/NA:	Not applicable
	Labels:	Not applicable

15. REGULATORY INFORMATION

TSCA:	No

SARA TITLE III

Section 302 (EHS) Ingredients:	No

Section 313 Ingredients:	No

Section 304 (EHS/CERCLA) Ingredients:	No

SARA TITLE III NOTIFICATION INFORMATION

Acute Health Hazard:	No

Chronic Health Hazard:	No

Fire Hazard:	No

Sudden Release of Pressure Hazard:	No

16. OTHER INFORMATION

SiREM provides the information contained herein for hazard communication and safety planning purposes, based on existing information on each of the product components available in the literature; no independent testing was conducted on the final product. The above information is intended to be used only as a guide to the appropriate precautionary handling of this material by a properly trained person.