State of Wisconsin
Department of Natural Resources
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Technical Assistance, Environmental Liability Clarification or Post-Closure Modification Request

Form 4400-237 (R 12/18)

Notice: Use this form to request **a written response (on agency letterhead)** from the Department of Natural Resources (DNR) regarding technical assistance, a post-closure change to a site, a specialized agreement or liability clarification for Property with known or suspected environmental contamination. A fee will be required as is authorized by s. 292.55, Wis. Stats., and NR 749, Wis. Adm. Code., unless noted in the instructions below. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Definitions

"Property" refers to the subject Property that is perceived to have been or has been impacted by the discharge of hazardous substances.

"Liability Clarification" refers to a written determination by the Department provided in response to a request made on this form. The response clarifies whether a person is or may become liable for the environmental contamination of a Property, as provided in s. 292.55, Wis. Stats.

"Technical Assistance" refers to the Department's assistance or comments on the planning and implementation of an environmental investigation or environmental cleanup on a Property in response to a request made on this form as provided in s. 292.55, Wis. Stats.

"Post-closure modification" refers to changes to Property boundaries and/or continuing obligations for Properties or sites that received closure letters for which continuing obligations have been applied or where contamination remains. Many, but not all, of these sites are included on the GIS Registry layer of RR Sites Map to provide public notice of residual contamination and continuing obligations.

Select the Correct Form

This from should be used to request the following from the DNR:

- Technical Assistance
- Liability Clarification
- Post-Closure Modifications
- Specialized Agreements (tax cancellation, negotiated agreements, etc.)

Do not use this form if one of the following applies:

- Request for an **off-site liability exemption or clarification** for Property that has been or is perceived to be contaminated by one or more hazardous substances that originated on another Property containing the source of the contamination. Use DNR's Off-Site Liability Exemption and Liability Clarification Application Form 4400-201.
- Submittal of an Environmental Assessment for the **Lender Liability Exemption**, s 292.21, Wis. Stats., **if no response or review by DNR is requested**. Use the Lender Liability Exemption Environmental Assessment Tracking Form 4400-196.
- Request for an **exemption to develop on a historic fill site** or licensed landfill. Use DNR's Form 4400-226 or 4400-226A.
- **Request for closure** for Property where the investigation and cleanup actions are completed. Use DNR's Case Closure - GIS Registry Form 4400-202.

All forms, publications and additional information are available on the internet at: dnr.wi.gov/topic/Brownfields/Pubs.html.

Instructions

1. Complete sections 1, 2, 6 and 7 for all requests. Be sure to provide adequate and complete information.
2. Select the type of assistance requested: Section 3 for technical assistance or post-closure modifications, Section 4 for a written determination or clarification of environmental liabilities; or Section 5 for a specialized agreement.
3. Include the fee payment that is listed in Section 3, 4, or 5, unless you are a "Voluntary Party" enrolled in the Voluntary Party Liability Exemption Program **and** the questions in Section 2 direct otherwise. Information on to whom and where to send the fee is found in Section 8 of this form.
4. Send the completed request, supporting materials and the fee to the appropriate DNR regional office where the Property is located. See the map on the last page of this form. A paper copy of the signed form and all reports and supporting materials shall be sent with an electronic copy of the form and supporting materials on a compact disk. For electronic document submittal requirements see: http://dnr.wi.gov/files/PDF/pubs/rr/RR690.pdf"

The time required for DNR's determination varies depending on the complexity of the site, and the clarity and completeness of the request and supporting documentation.

Section 1. Contact and Recipient Information

Requester Information

This is the person requesting technical assistance or a post-closure modification review, that his or her liability be clarified or a specialized agreement and is identified as the requester in Section 7. DNR will address its response letter to this person.

Last Name	First	MI	Organization/ Business Name		
Kultgen	Ray		Gardner Denver - Thomas Products Division		
Mailing Address			City	State	ZIP Code
1419 Illinois Avenue			Sheboygan	WI	53081
Phone # (include area code)	Fax # (include area code)		Email		
(920) 451-4273	(920) 451-8569		Ray.Kultgen@GardnerDenver.com		

The requester listed above: (select all that apply)

- ☒ Is currently the owner
- ☐ Is considering selling the Property
- ☐ Is renting or leasing the Property
- ☐ Is considering acquiring the Property
- ☐ Is a lender with a mortgagee interest in the Property
- ☐ Other. Explain the status of the Property with respect to the applicant:

Contact Information (to be contacted with questions about this request)

☐ Select if same as requester

Contact Last Name	First	MI	Organization/ Business Name		
Mailing Address			City	State	ZIP Code
Phone # (include area code)	Fax # (include area code)		Email		

Environmental Consultant (if applicable)

Contact Last Name	First	MI	Organization/ Business Name		
Goetz	Staci		Ramboll		
Mailing Address			City	State	ZIP Code
234 W. Florida			Milwaukee	WI	54302
Phone # (include area code)	Fax # (include area code)		Email		
(414) 335-3563			staci.goetz@ramboll.com		

Section 2. Property Information

Property Name			FID No. (if known)		
Gardner Denver - Thomas Products Division,			460034190		
BRRTS No. (if known)			Parcel Identification Number		
02-60-584466			59281506360		
Street Address			City	State	ZIP Code
1419 ILLINOIS AVE			Sheboygan	WI	53081
County	Municipality where the Property is located		Property is composed of:		Property Size Acres
Sheboygan	◉ City ○ Town ○ Village of Sheboygan		◉ Single tax parcel ○ Multiple tax parcels		

1. Is a response needed by a specific date? (e.g., Property closing date) Note: Most requests are completed within 60 days. Please plan accordingly.

◯ No ◉ Yes

Date requested by: 11/01/2019

Reason: There is an open excavation on-site and equipment needs to be installed over the open excavation

2. Is the "Requester" enrolled as a Voluntary Party in the Voluntary Party Liability Exemption (VPLE) program?

◉ No. **Include the fee that is required for your request in Section 3, 4 or 5.**

◯ Yes. **Do not include a separate fee.** This request will be billed separately through the VPLE Program.

Fill out the information in Section 3, 4 or 5 which corresponds with the type of request:
Section 3. Technical Assistance or Post-Closure Modifications;
Section 4. Liability Clarification; or Section 5. Specialized Agreement.

Section 3. Request for Technical Assistance or Post-Closure Modification

Select the type of technical assistance requested: **[Numbers in brackets are for WI DNR Use]**

- ☐ No Further Action Letter (NFA) (Immediate Actions) - NR 708.09, [183] - **Include a fee of $350.** Use for a written response to an immediate action after a discharge of a hazardous substance occurs. Generally, these are for a one-time spill event.
- ☒ Review of Site Investigation Work Plan - NR 716.09, [135] - **Include a fee of $700.**
- ☐ Review of Site Investigation Report - NR 716.15, [137] - **Include a fee of $1050.**
- ☐ Approval of a Site-Specific Soil Cleanup Standard - NR 720.10 or 12, [67] - **Include a fee of $1050.**
- ☐ Review of a Remedial Action Options Report - NR 722.13, [143] - **Include a fee of $1050.**
- ☐ Review of a Remedial Action Design Report - NR 724.09, [148] - **Include a fee of $1050.**
- ☐ Review of a Remedial Action Documentation Report - NR 724.15, [152] - **Include a fee of $350**
- ☐ Review of a Long-term Monitoring Plan - NR 724.17, [25] - **Include a fee of $425.**
- ☐ Review of an Operation and Maintenance Plan - NR 724.13, [192] - **Include a fee of $425.**

Other Technical Assistance - s. 292.55, Wis. Stats. [97] (For request to build on an abandoned landfill use Form 4400-226)

- ☐ Schedule a Technical Assistance Meeting - **Include a fee of $700.**
- ☐ Hazardous Waste Determination - **Include a fee of $700.**
- ☐ Other Technical Assistance - **Include a fee of $700.** Explain your request in an attachment.

Post-Closure Modifications - NR 727, **[181]**

- ☐ Post-Closure Modifications: Modification to Property boundaries and/or continuing obligations of a closed site or Property; sites may be on the GIS Registry. This also includes removal of a site or Property from the GIS Registry. **Include a fee of $1050, and:**
  - ☐ Include a fee of $300 for sites with residual soil contamination; and
  - ☐ Include a fee of $350 for sites with residual groundwater contamination, monitoring wells or for vapor intrusion continuing obligations.

Attach a description of the changes you are proposing, and documentation as to why the changes are needed (if the change to a Property, site or continuing obligation will result in revised maps, maintenance plans or photographs, those documents may be submitted later in the approval process, on a case-by-case basis).

Skip Sections 4 and 5 if the technical assistance you are requesting is listed above and complete Sections 6 and 7 of this form.

Section 5. Request for a Specialized Agreement

Select the type of agreement needed. Include the appropriate draft agreements and supporting materials. Complete Sections 6 and 7 of this form. More information and model draft agreements are available at: dnr.wi.gov/topic/Brownfields/lgu.html#tabx4.

☐ Tax cancellation agreement - s. 75.105(2)(d), Wis. Stats. [654]

- ❖ **Include a fee of $700, and the information listed below:**

(1) Phase I and II Environmental Site Assessment Reports,
(2) a copy of the Property deed with the correct legal description.

☐ Agreement for assignment of tax foreclosure judgement - s.75.106, Wis. Stats. [666]

- ❖ **Include a fee of $700, and the information listed below:**

(1) Phase I and II Environmental Site Assessment Reports,
(2) a copy of the Property deed with the correct legal description.

☐ Negotiated agreement - Enforceable contract for non-emergency remediation - s. 292.11(7)(d) and (e), Wis. Stats. [630]

- ❖ **Include a fee of $1400, and the information listed below:**

(1) a draft schedule for remediation; and,
(2) the name, mailing address, phone and email for each party to the agreement.

Section 6. Other Information Submitted

Identify all materials that are included with this request.

Send both a paper copy of the signed form and all reports and supporting materials, and an electronic copy of the form and all reports, including Environmental Site Assessment Reports, and supporting materials on a compact disk.

Include one copy of any document from any state agency files that you want the Department to review as part of this request. The person submitting this request is responsible for contacting other state agencies to obtain appropriate reports or information.

☐ Phase I Environmental Site Assessment Report - Date: _____
☐ Phase II Environmental Site Assessment Report - Date: _____
☐ Legal Description of Property (required for all liability requests and specialized agreements)
☐ Map of the Property (required for all liability requests and specialized agreements)

Analytical results of the following sampled media: Select all that apply and include date of collection.

☐ Groundwater ☒ Soil ☐ Sediment ☐ Other medium - Describe: _____

Date of Collection: 10/09/2019

☐ A copy of the closure letter and submittal materials
☐ Draft tax cancellation agreement
☐ Draft agreement for assignment of tax foreclosure judgment
☒ Other report(s) or information - Describe: NR 716 Investigation Work Plan and Sampling Results

For Property with newly identified discharges of hazardous substances only: Has a notification of a discharge of a hazardous substance been sent to the DNR as required by s. NR 706.05(1)(b), Wis. Adm. Code?

◉ Yes - Date (if known): 10/03/2019
○ No

Note: The Notification for Hazardous Substance Discharge (non-emergency) form is available at: dnr.wi.gov/files/PDF/forms/4400/4400-225.pdf.

Section 7. Certification by the Person who completed this form

☐ I am the person submitting this request (requester)

☒ I prepared this request for: Ray Kultgen
Requester Name

I certify that I am familiar with the information submitted on this request, and that the information on and included with this request is true, accurate and complete to the best of my knowledge. I also certify I have the legal authority and the applicant's permission to make this request.

Stacie L Goetz

Signature

10/25/2019

Date Signed

Managing Geologist

Title

(414) 335-3563

Telephone Number (include area code)

Section 8. DNR Contacts and Addresses for Request Submittals

Send or deliver one paper copy and one electronic copy on a compact disk of the completed request, supporting materials, and fee to the region where the property is located to the address below. Contact a DNR regional brownfields specialist with any questions about this form or a specific situation involving a contaminated property. For electronic document submittal requirements see: http://dnr.wi.gov/files/PDF/pubs/rr/RR690.pdf.

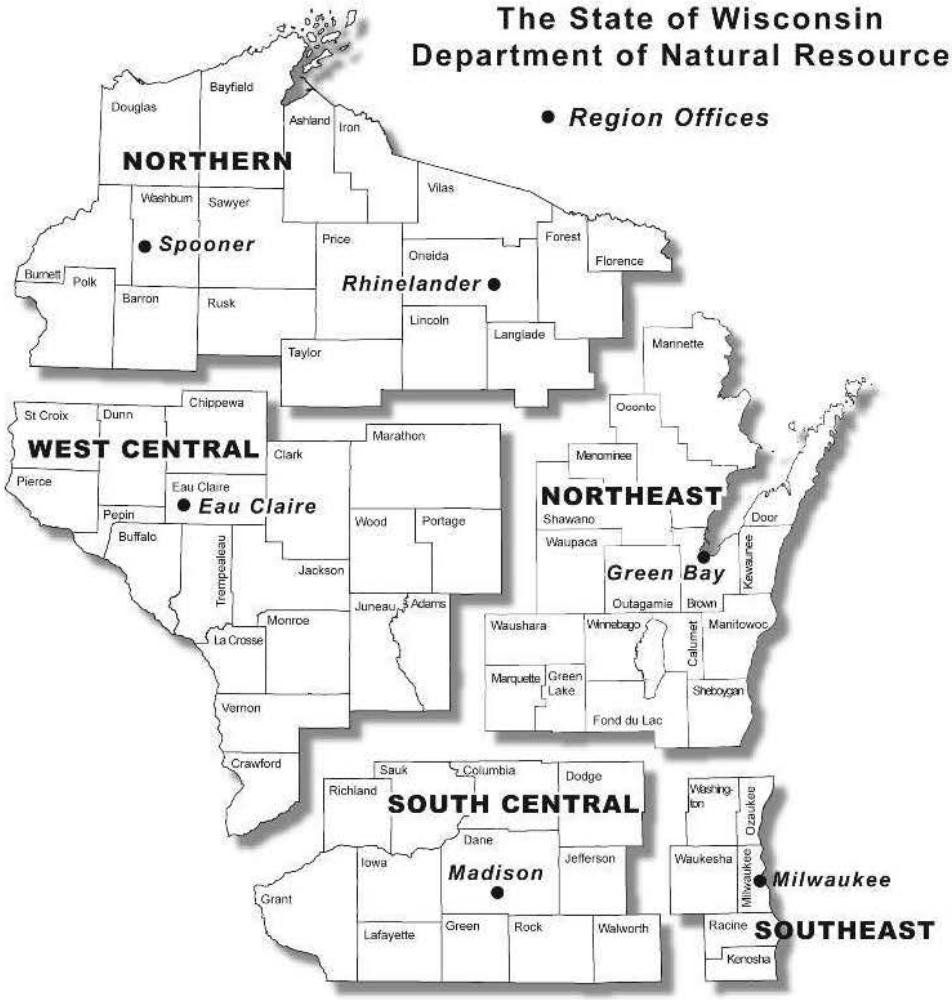
DNR NORTHERN REGION
Attn: RR Program Assistant
Department of Natural Resources
223 E Steinfest Rd Antigo, WI 54409

DNR NORTHEAST REGION
Attn: RR Program Assistant
Department of Natural Resources
2984 Shawano Avenue
Green Bay WI 54313

DNR SOUTH CENTRAL REGION
Attn: RR Program Assistant
Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg WI 53711

DNR SOUTHEAST REGION
Attn: RR Program Assistant
Department of Natural Resources
2300 North Martin Luther King Drive
Milwaukee WI 53212

DNR WEST CENTRAL REGION
Attn: RR Program Assistant
Department of Natural Resources
1300 Clairemont Ave.
Eau Claire WI 54702



Note: These are the Remediation and Redevelopment Program's designated regions. Other DNR program regional boundaries may be different.

DNR Use Only			
Date Received	Date Assigned	BRRTS Activity Code	BRRTS No. (if used)
DNR Reviewer	Comments		
Fee Enclosed? ◯ Yes ◯ No	Fee Amount $	Date Additional Information Requested	Date Requested for DNR Response Letter
Date Approved	Final Determination		

Confidential

Prepared for:
Gardner Denver – Thomas Products Division

Prepared by:
Ramboll US Corporation
Milwaukee, Wisconsin

Date:
October 2019

Project Number:
1690010224

NR 716 SITE INVESTIGATION WORK PLAN

GARDNER DENVER - THOMAS PRODUCTS DIVISION
1419 ILLINOIS AVENUE
SHEBOYGAN, WISCONSIN

BRRTS NO: 02-60-584466

FID #460034190

RAMBOLL

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Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA
T +1 414 837 3607
www.ramboll.com

CERTIFICATION

I, Staci Goetz, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.

Staci Goetz, PG, PhD
License No. G-1258-13

Date:
October 25, 2019

1. INTRODUCTION

Ramboll US Corporation (Ramboll) is submitting this Wisconsin Administrative Code (WAC) NR 716 Work Plan for site investigation activities for the Gardner Denver Thomas, Inc. property (the "site" or "property") located at 1419 Illinois Avenue in Sheboygan, Sheboygan County, Wisconsin. The site is located at the closed, Former Thomas Compressors location, Wisconsin Department of Natural Resources (WDNR) Bureau of Remediation and Redevelopment Tracking System (BRRTS) ID No. 02-60-232232 (Figure 1). The scope and detail of the field investigation were established based on the requirements outlined in Title 40 of the Code of Federal Regulations (40 CFR) §761.61(a)(6) – Clean-up Site Characterization Sampling for Polychlorinated Biphenyl (PCB) Remediation Waste and in accordance with WDNR guidance RR-786, PCB Remediation in Wisconsin under the One Cleanup Program Memorandum of Agreement.

The investigation activities include collecting soil samples from the floor and sidewalls of an excavated area where PCB soil impacts were identified during waste characterization activities of soils excavated during a press machine installation project. There was no known release nor environmental contamination suspected at the time of project initiation and as such, the source and timing of the impacts are unknown. Based on the recalcitrant nature of PCBs and fine-grained soils present within the soil, impacts to groundwater are not anticipated. However, groundwater sampling is included in the proposed investigation activities based on information to date.

The WDNR was notified of a historical release using Form 4400-225 (Notification for Hazardous Substance Discharge) on October 3, 2019. It is anticipated that the WDNR will issue a Responsible Party letter to Gardner Denver – Thomas Products Division (operator) and may assign a separate BRRTS Activity Number and Federal Identification Number.

1.1 Site Location

The subject site is located at 1419 Illinois Avenue Sheboygan, Sheboygan County, Wisconsin. The location of the property is depicted on Figure 1 and general work area is shown on Figure 2. The property is located in the northeast ¼ of the NE ¼ of Section 27, Township 15N, Range 23E. The site is bounded by Illinois Avenue right-of-way (north); South 14th Street right-of-way (east); commercial properties 1434-1422 Indiana Avenue and 1030 South 14th Street (south); and South 15th Street right-of-way (west). The Parcel ID number and legal description obtained from the Sheboygan County Land Records Web Portal is as follows.

> Parcel ID Number: 59281506360
>
> Legal Description: ORIGINAL PLAT LOTS 1-2-3-4-5 & 6; ALSO THE N 65' OF LOT 9 AND THE N 1/2 OF LOTS 7, 8 & 10 & VAC ALLEY ADJ. BLK 248

1.2 Involved Parties

Site Owner: Gardner Denver Thomas, Inc.
1419 Illinois Avenue
Sheboygan, WI 53081
Site Contact: Mr. Ray Kultgen, (920) 457-4891

Site Operator: Gardner Denver – Thomas Products Division
Site Contact: Mr. Ray Kultgen, (920) 457-4891

Consultant: Ramboll US Corporation
234 W. Florida Street
Milwaukee, WI 53204
Contact: Ms. Staci Goetz, (414) 335-3563

Agency: Remediation and Redevelopment Program
Wisconsin Department of Natural Resources
625 E CTH Y STE 700
Oshkosh, WI 54901-9731
richard.joslin@wisconsin.gov
Contact: Richard Joslin, Hydrogeologist, (920) 424-7077

1.3 Background

The subject property consists of a combined total of approximately 1.7 acres. The property is currently developed with a 47,000-square foot building. The existing building is situated over the majority of the property with the exception of an asphalt-paved parking lot locate in the northeast corner of the site. The site currently operates as a manufacturer of compressors, vacuum pumps, liquid pumps for medical, laboratory, environmental and industrial industries.

The facility (under Thomas Compressors) is listed on WDNR's BRRTS database as a closed Environmental Repair Program (ERP) site (No. 02-60-232232). According to the BRRTS listing and the Continuing Obligations packet obtained from the BRRTS database, petroleum soil contamination was discovered in October 1999 while conducting utility installation outside the south side of the building and north of a gasoline service station. Subsequent site investigation activities conducted between April 2000 and January 2001 delineated the hot spot areas of petroleum contamination in soil and as such, *in-situ* chemical treatment was conducted in December 2001. Verification soil and groundwater sampling was conducted in March 2002 and April 2003, which indicated the lateral and vertical extent of petroleum soil contamination had been delineated and that *in-situ* treatment had resulted in a reduction of petroleum constituents; however, petroleum constituents remained in soil at concentrations exceeding Residual Contaminant Levels (RCLs) and/or Soil Screening Levels (SSLs). As part of the verification activities, six additional groundwater monitoring wells were installed in 2002 and 2004 and the analysis was expanded to include non-petroleum volatile organic compound (VOCs). Although some petroleum constituents were present in groundwater above WAC NR 140 Enforcement Standards (ES) during the April 2003 investigations, none were detected above their respective ES during the most recent groundwater sampling event in June 2010. Vinyl chloride was consistently detected in three of the six wells on site at concentrations that exceeded the ES during six groundwater monitoring events that occurred from July 2002 to June 2010. No petroleum or chlorinated VOCs were detected in two piezometers or the downgradient well and as such, it was concluded that the fine-grained low permeability silty clay unit underlying the site was preventing the lateral and vertical migration of contaminants in groundwater. Furthermore, all contaminated soil was covered by asphalt pavement. Based on these site conditions, the site was granted closure in 2011 with continuing obligations (cap maintenance plan and off-site property notification).

A hazardous substance spill occurred at the site on April 16, 2014 (BRRTS No. 04-60-561887). According to the BRRTS listing, the Sheboygan Fire Department responded to report that a strong odor of an unidentified flammable fluid was emanating from the floor drains in the facility and storm drains on the property. The storm drains were flushed with fresh water by the Fire Department and spill listing was closed on April 21, 2014.

In September 2019, a construction project was initiated related to the installation of a new press machine inside the building. The installation project included the saw cutting and removal of the existing concrete floor and excavation of subgrade soils to facilitate the installation of the press machine. The excavation construction crew indicated to facility personnel that the soil appeared to be impacted and contained a noticeable odor. The excavated soil and concrete were separated and immediately placed in roll off waste containers that are currently stored on site including nine containers of soil and five containers concrete. The excavation was backfilled with 6 inches of with crushed stone for drainage; and on September 12 ,2019, Cardinal Environmental was retained to sample and characterize the soil and concrete material in the roll-off containers for disposal. The waste profile samples were collected and analysed for Toxicity Characteristic Leaching Procedure (TCLP) metals, TCLP VOCs, and total PCBs

The composite soil sample analytical results documented total PCBs at a concentration of 104 milligrams per kilogram (mg/kg) in soil, exceeding the exceeding the WAC NR 720 RCLs for industrial direct contact (0.967 mg/kg) and migration to groundwater (0.0094 mg/kg) pathways. The concrete sample analytical results documented total PCBs at a concentration of 798 mg/kg in concrete. The individual composite concrete and soil samples were collected from the roll-off containers staged on site. The laboratory analytical reports for the composite waste characterization samples are included as Appendix A.

Based on the detection of PCBs in the soils, a *Notification for Hazardous Substance Discharge* (WDNR Form 4400-225) was submitted to the WDNR on October 4, 2019. The detection of total PCBs above applicable standards requires further investigation to verify PCB-impacted soils have been adequately removed and are properly managed and to delineate the nature and extent of potentially remaining impacts to soils at the site. In response to the submission, WNDR provided Gardner Denver with a Responsible Party letter on October 23, 2019 outlining how to initiate the investigation and clean-up process.

In October 2019, Ramboll was retained to conduct additional soil sampling activities including: 1) sampling of the base and sides of the in-place soil in the excavation for the press machine pit and, 2) re-sample the soil and concrete materials in the roll off boxes for disposal characterization.

1.4 NR 716 Site Investigation Approach Overview

Based on the anticipated construction schedule, Ramboll proposes to conduct site investigation activities in a phased approach. The first phase, which is the subject of this Work Plan, focuses on assessing the magnitude and extent of soil impacts, as required under WAC NR 716 and verifying adequate removal of PCB-impacted removal under 40 CFR §761.61(a)(6). In order for sampling to achieve both of these goals, sampling will include:

1) verification scheme set forth by 40 CFR §761.283 to characterize adequate removal;
2) sample compositing scheme set forth by 40 CFR §761.289; and
3) WAC NR 716 requirements for discrete samples.

As referenced previously, based on the nature and degree of the known contaminant of concern (i.e9., PCBs), impacts to groundwater are not anticipated. The need for future groundwater assessment activities will be evaluated following completion of the soil investigation activities. Soil results will be screened using the WAC NR 720 RCL worksheets to determine if the soil to groundwater pathway requires further evaluation. If a groundwater investigation is considered necessary, a Work Plan Addendum will be provided to the WDNR.

Per WAC NR 716.07(7), currently available information and the impacts identified to date do not pose a risk of impacting public or private water supplies. In accordance with WAC NR 716.07(8), the soil impacts are also not believed to pose an immediate risk of impact to species, habitat, or ecosystems sensitive to contamination, wetlands, or outstanding, exceptional resource waters, or site or facilities of historical or archaeological significance. The following summarizes the site investigation activities that will be performed prior to the initiation of construction activities.

2. SITE SETTING

2.1 Geologic Setting

Site-specific soil conditions were not readily available for the site. Regional soils are mapped as the Kewaunee silt Loam consisting of adequately drained, silty-clay loams and silty clays with slow infiltration rates.

The regional surface geology is the product of Quaternary deposits. These deposits consist of postglacial wave-cut terraces and associated river terraces along the shore of Lake Michigan. Based on a public well search of the area, stratified variations of clay, silt, sand, and gravel sediments extend to approximately 50 feet below ground surface (bgs). The unconsolidated deposits are underlain by limestone bedrock. This stratigraphic interpretation is consistent with geologic mapping conducted by the Wisconsin Geologic Natural History Survey of Sheboygan County (WGNHS, 2011).

The site is located within the Sheboygan River watershed. The depth to the water table within the area is estimated to be between 10 to 12 feet bgs, (based on the EPR site closure information for the site) but may vary somewhat across the site based on varying surface elevation. It is assumed the gradient of the shallow groundwater table is a reflection of surface topography, with the direction of groundwater flow coinciding with the general site topography. The site is located near a topographic divide, such that the ground surface slopes to the west and the east away from the site, toward the Sheboygan River.

2.2 Potential Migration Pathways and Receptors

The subject site is zoned as industrial use. The City of Sheboygan provides municipal potable water supply. Shallow groundwater is a potentially complete contaminant migration pathway; as previously noted, it is not anticipated. This conclusion will be evaluated. The Sheboygan River is located approximately 0.3 miles to the west (or 0.4 mile to the east) of the subject property and is a potential receptor concern; however, based on the type of contaminant identified and distance from the site, the potential for surface water impacts is not anticipated. Subsurface utilities that could represent contaminant migration pathways may include any subsurface utilities such as municipal water, gas, storm sewer, and sanitary sewer lines. Based on the type of contaminants identified at the site, vapor intrusion is not anticipated to be a concern.

3. SITE INVESTIGATION METHODOLOGY

The objective of the investigation was to determine if soil impacted with PCBs remain in-place within the machine pit excavation in accordance with WAC NR 716, and to gather the information needed to develop and appropriate WAC NR 718 Soil Management Plan (SMP) to ensure that impacted soil encountered during development are handled appropriately. Because of the partially open excavation within the interior of the facility and postponed plan to install new flooring and equipment in the area, the soil sampling work has already been conducted. The excavation will remain partially open until receipt of the soil investigation results, and the need for a groundwater investigation will be determined based on the results of the soil investigation. If warranted and appropriate, the groundwater investigation will be performed following completion of the construction activities.

3.1 Soil Sampling

Prior to initiating field activities, a site-specific Health and Safety Plan (HASP) was developed and followed by all Ramboll field personnel for the on-site work (Appendix B). Additionally, Ramboll notified the state underground utility protection service (Digger's Hotline) to identify on-site commercial utilities. Ramboll, with the assistance of on-site personnel, reviewed the proposed soil borings locations on site, prior to the subsurface utility clearance activities, to have these areas cleared for utilities.

Following the completion of the subsurface clearance activities, Ramboll laid out a 1.5-meter grid sampling system and collect a series of soil samples collected from the base and sidewalls of the existing machine pit excavation.

The approximate locations of the proposed soil auger aliquots for composite samples and discrete sample locations are depicted on the soil sample location figure (Figure 3). Based on the size of the machine pit excavation (3.7 meters [12 feet] by 9 meters [30 feet]), ten discrete soil samples and seven composite soil samples were collected from the machine pit excavation. The layout of the samples is consistent with what is thought to have been a point-source of the PCB release.

The excavation has been partially backfilled with crushed stone for drainage, which was cleared at each sample location prior to augering. Soil aliquots or discrete samples were collected from approximately 0 to 6 inches below the base of the native soil excavation grade. Debris, crushed stone, or other items that may cause matrix interference (e.g., wood) were removed. Samples that are to be composited were combined and homogenized in the field, quartered, and subsampled for placement into sample jars.

Quality assurance/quality control (QA/QC) samples were collected to assess cross-contamination and laboratory instrumentation precision. Duplicate samples were collected at a frequency of 1:10 and matrix spike/matrix spike duplicates will be collected at a frequency of 1:20. An equipment blank was collected at the end of each sample day.

The soil samples were collected, labelled, and placed in appropriately preserved, laboratory-supplied containers. Soil samples will be submitted for analysis of PCBs using United States Environmental Protection Agency (USEPA) Method 8082 based on the previously identified impacts.

The samples were collected, sealed, labelled, and placed on ice pending for delivery under chain-of-custody procedures to the laboratory for analysis. Samples were submitted to Pace Analytical Services, Inc. (Pace), a Wisconsin-certified laboratory.

3.2 Preliminary Investigation Results

The soil sample laboratory analytical results were compared to the WAC NR 720 RCLs. RCLs are those calculated by the WDNR (June 2018) using the USEPA Regional Screening Level Web Calculator in accordance with WDNR Draft PUB-RR-890. RCLs were developed based on risks to human health associated with direct contact at both industrial and non-industrial sites and risks associated with contaminant migration from soil to groundwater. Based on the laboratory analytical results, PCBs were detected in the soil samples analyzed. Soil sample locations from the excavation area are depicted on Figure 3. Laboratory reports including chain-of-custody forms are provided in Appendix A, and the soil analytical results are summarized in Table 1 and discussed further below.

The detected concentrations of PCBs in the machine pit excavation area ranged between 0.782 mg/kg and 481 mg/kg. The highest concentrations of PCBs were detected at discrete soil sample locations Dc-02 (402 mg/kg) and Dc-03 (481 mg/kg), centrally located along the north sidewall and west base sample of the excavation, respectively. PCB concentrations that are greater than 50 mg/kg included discrete sample Dc-05 (57 mg/kg) and Dc-07 (71.3 mg/kg) located along the southwest and northeast sidewalls, respectively. The remaining discrete samples were less than 50 mg/kg with discrete sample Dc-09 reported as 0.782 mg/kg.

With respect to composite sampling, PCB concentrations at locations C-01 through C-04 were above 50 mg/kg with concentrations ranging between 105 and 251 mg/kg. These composite locations generally correlate to the west half of the machine pit excavation and southwest and the entire north sidewalls of the excavation. The remainder of the composite samples collected from the eastern portion of the excavation (C-05 through C-07) were less than 50 mg/kg and range between 7.49 and 14.1 mg/kg.

As compared to NR 720 RCLs, each of the discrete and composite soil samples exceed the industrial direct contact and groundwater pathway RCL, with the exception of discrete sample DC-09.

3.3 Proposed Soil Boring Advancement and Screening

To the extent feasible, deeper samples will be collected to delineate the vertical extent of PCB impacts at Dc-03 and Dc-04, where levels were detected above 50 mg/kg. A boring will be advanced at each area utilizing direct-push technology (DPT) with a GeoProbe drill rig with a 2-inch diameter drive rod to collect a continuous soil sample or hand auger to a depth of 2 to 3 feet below the excavation or to groundwater, whichever is encountered first. If it is determined that the DPT drill rig cannot gain access to the excavation and/or hand auger is not feasible, the vertical extent of impacts at DC-03 and DC-04 will be assessed by the co-located and step out borings.

Co-located borings will be advanced adjacent to machine pit excavation discrete soil sample locations with levels of PCBs equal to or higher than 50 mg/kg to evaluate the vertical extent of contamination; namely Dc-02, Dc-03, Dc-05, Dc-06 and Dc-07. In addition, two step-out soil borings will be advanced at a lateral distance of approximately 1.5 meters (5 feet) and 3 meters (10 feet) in each direction and in consideration of facility equipment and infrastructure, as well as

below-grade utilities. The soil borings will be advanced to approximately 15 feet below bgs or just above the groundwater table, whichever is encountered first utilizing DPT with a GeoProbe drill rig with a 2-inch diameter drive rod to collect a continuous soil sample. To prevent cross-contamination caused by drag-down, only the innermost portion of the soil boring will be retained for sample collection (i.e., the skin in contact with the liner will not be collected). The proposed soil boring locations are shown on the attached Sample Location Diagram (Figure 4). A total of 15 borings is estimated.

Soil samples will be continuously collected from the excavation, co-located and step-out borings for classification and field screening. The soil samples will be described in the field with respect to the soil type, grain size distribution, and color (or discoloration), odor, and moisture content. The soil samples will be screened using a 10.6 electron volt (EV) photoionization detector (PID), following standard procedure. The PID will be calibrated in the field according to manufacturer's instructions, using 100 parts per million (ppm) isobutylene span gas and air (zero gas), and checked between each screening event for proper response. The PID readings and visual/olfactory evidence of contamination will be recorded on the boring logs. Soil samples will be collected at 1-foot intervals until termination of the boring or groundwater. The soil samples will be analysed for total PCBs for Method 8082.

3.4 Proposed Temporary Groundwater Monitoring Well Installation and Sampling

A temporary monitoring well will be installed as close as possible to DC-03 (i.e., the co-located boring) to a depth of approximately 15 to 20 feet bgs or 5 feet below the groundwater table, whichever is encountered first. The wells will be constructed using 1-inch diameter polyvinyl chloride (PVC) and 0.010-inch slot size, well screen (ten foot length). The temporary monitoring wells will be purged with a peristaltic pump to remove residual sediment remaining in the wells after installation and to re-establish the natural hydraulic flow conditions of the formations, which may have been disturbed by the well construction.

Prior to the groundwater sampling activities, depth to groundwater measurements will be made using a Heron electronic water level sensor, Model ET-94 (accuracy 0.01 feet) or similar equipment. The depth to groundwater, as well as the total well depth, will be recorded in a bound field notebook. The temporary wells will be sampled utilizing a peristaltic pump with disposable polyethylene tubing. The temporary wells will be purged until sediment free water is produced. Groundwater sampling equipment will be thoroughly decontaminated between each sampling location using an Alconox© solution and rinsed in deionized water. New disposable polyethylene tubing or bailers will be utilized for sample collection for each well location. A new pair of nitrile gloves will be used during the collection of each sample to minimize the potential for cross-contamination.

The samples collected will be containerized in laboratory-provided sample containers, preserved appropriately, and kept on ice, cooling to 4 degrees Celsius. Following sample collection, each sample container will be labelled with the sample location identification, date of sample collection, and intended analysis. The sample containers will then be placed in re-sealable plastic bags and packed in an iced, insulated container. The groundwater samples will be analysed for total PCBs Method 82.

3.5 Investigation-Derived Waste and Soil Management

While hand auger residuals (i.e., soil cuttings and wash water) were minimal, excess materials and other investigative-derived waste were placed in trash bags and for disposal along with the

PCB-containing soil/concrete material. Soil sampling equipment will be decontaminated between sampling locations using a solution of Pipe X-Metal X.

Following soil and groundwater sample collection from soil boring activities, the borings and temporary monitoring wells will be properly abandoned with bentonite and include a surface patch matching the surrounding material (i.e. concrete). Excess groundwater generated during the investigation will be placed into 55-gallon drums, which will be temporarily staged on site until appropriate disposal methods are determined. Soil cuttings will be placed in one of the on-site roll-off box containers designated for disposal at a TSCA-permitted landfill.

Excavated soil and crushed concrete debris temporarily stored in roll-off containers has been characterized for PCBs per container and results are summarized in Table 2. Waste profiles will be developed in accordance with landfill and permitting agency requirements. Gardner Denver is seeking permission to dispose of the TSCA material at US Ecology Landfill in Belleville, MI. Approximately, 33 are estimated TSCA. The remaining commingled soil and crushed concrete, approximately 9 tons, will be disposed of at Advanced Disposal's Hickory Meadows Landfill.

3.6 Reporting

Following completion of the investigation activities described above and receipt of all the analytical results, Ramboll will review the data collected as part of the investigation activities and compare that information to applicable WAC NR 720 RCLs. A brief site investigation data transmittal packet will be prepared to provide the WDNR with the results shortly after results. The results will more formally be incorporated into a Site Investigation (SI) Report prepared in conformance with WAC NR 716. The SI Report will include the site investigation results, including documentation of field activities, soil boring logs, site and boring location figures, tabulated analytical laboratory results, geologic cross-sections, an evaluation of the data, conclusions, and recommendations.

3.7 Schedule

Because of the partially open excavation within the interior of the facility and postponed plan to install new flooring and equipment in the area, the soil sampling work was conducted on October 9, 2019 following the methods described in this Work Plan and the results are presented herein. Co-located and step-out sampling will occur within 7 to 10 business days of plan approval pending driller contractor availability. As stipulated in WAC NR 716.15, the SI Report will be completed and submitted to the WDNR within 60 days of the completion of field activities and receipt of laboratory analytical data. Based on the expedited nature of this construction project, all efforts will be made to submit the SI Report within 30 days. If additional investigation is warranted based on the results (e.g., groundwater sampling), a Work Plan Addendum will be provided to the WDNR and the SI Report will be prepared following the completion of the site investigation activities.

If additional excavation is warranted based on the results, the following preliminary removal plan will be the proposed remedial plan for the PCB-contaminated soil is as follows:

- ≥ 50 mg/kg PCBs: Soils containing concentrations greater than or equal to 50 mg/kg will be disposed at a TSCA waste disposal facility; the likely disposal facility is EQ Wayne Disposal in Belleville, Michigan. Remedial verification sampling for excavation floor samples will occur as outlined in this Work Plan and as required by Subpart O of 40 CFR 761 in a two-dimensional grid that overlays the clean-up area, with sampling points oriented to the grid axes at 5-foot (1.5 meter) intervals. A sample will be collected at each point within the clean-up area, and

laboratory analysis of the floor samples will occur per a compositing scheme provided in 40 CFR 761.289(b)(1)(i) (i.e., up to nine samples collected at the same depth will be composited into one sample for laboratory analysis [for sites with multiple point sources of contamination or unknown sources]). For sidewall samples, the same grid axes will be used (projected to the sidewall) with three sample locations making up each composite sample, and all collected in the depth interval of the known highest concentrations (typically 0.5 to 1.5 feet).

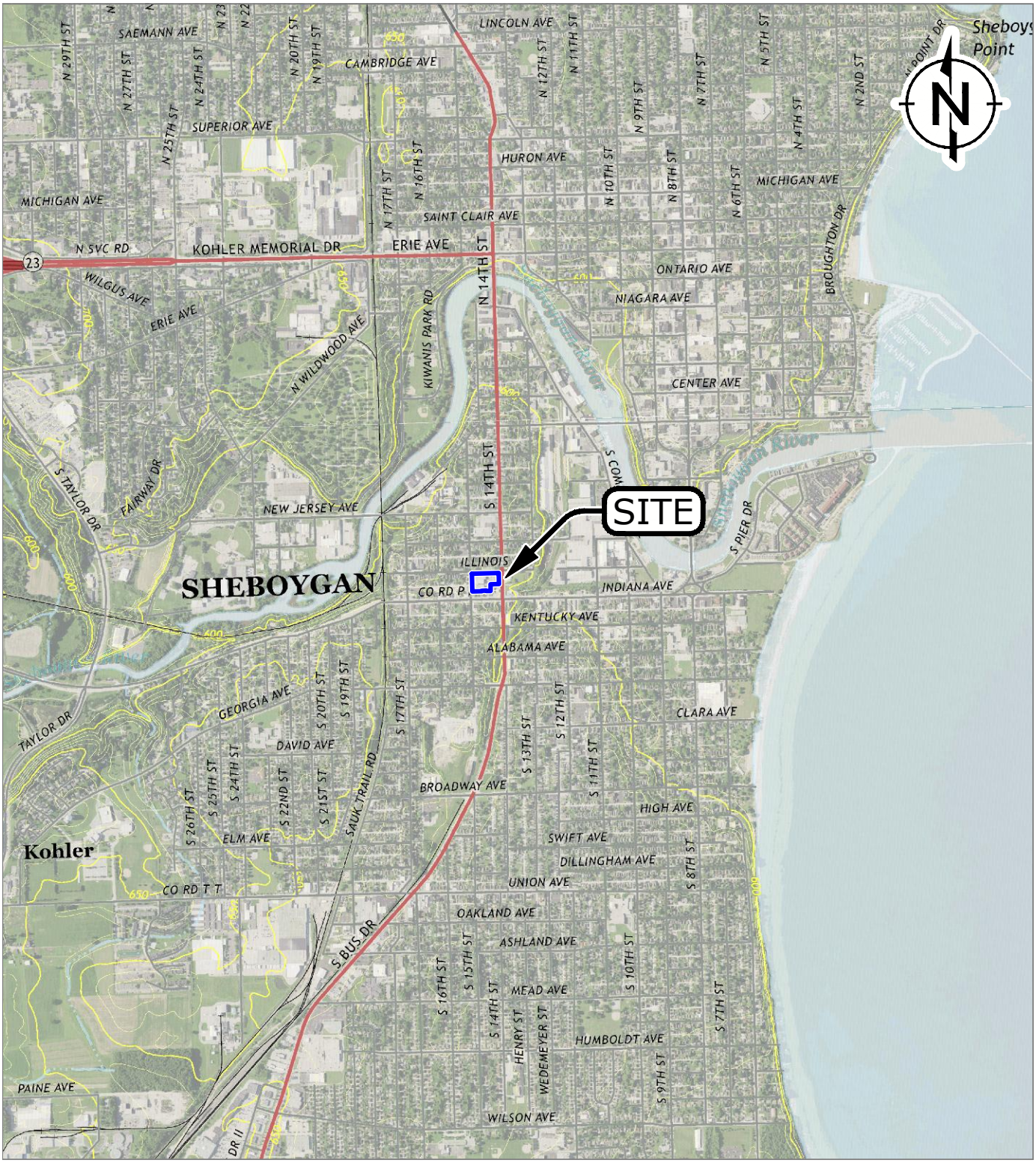
- ≥ 10 mg/kg to < 50 mg/kg PCBs: Soils containing greater than or equal to 10 mg/kg and less than 50 mg/kg PCBs will be disposed at a local Subtitle D landfill. Remediation verification sampling analysis will occur using the same grid interval spacing and compositing scheme as soils ≥ 50 mg/kg PCBs.
- ≥ 1 mg/kg to <10 mg/kg PCBs: Soils containing greater than or equal to 1 mg/kg and less than 1 mg/kg PCBs will require a deed notice and a cover, which requires a continuing obligation and maintenance plan.

3.8 Contingency Plan

If deemed necessary, a remedial approach using mechanical excavation with soils placed in an appropriately lined disposal container, typically either a roll-off box or dump truck, and disposal per the above disposal plan and verification sampling plan. The primary scenario requiring a contingency plan would be if a remediation verification sample analysis does not meet the less than 50 mg/kg criteria. In this case, the contingency measure will be to continue excavation in the area (either sidewall or floor or both) until the new remediation verification sample analytical result is below the 1 mg/kg criteria.

If soils are encountered that are too wet for transport and/or disposal, these soils will be mixed with drier soils of "like" concentrations until deemed acceptable.

FIGURES



CONTOUR INTERVAL 10 FEET

0 1/2 1 MILE

0 2000 4000 FEET

LEGEND:

PROPERTY BOUNDARY (APPROXIMATE)

QUADRANGLE LOCATION

SOURCE:
2018 USGS 7.5 Minute Series Sheboygan South and Sheboygan North, Wisconsin Topographic Quadrangles.
Site Location; N: 43.743994° W: 87.723964° WGS84

RAMBOLL

SITE LOCATION MAP

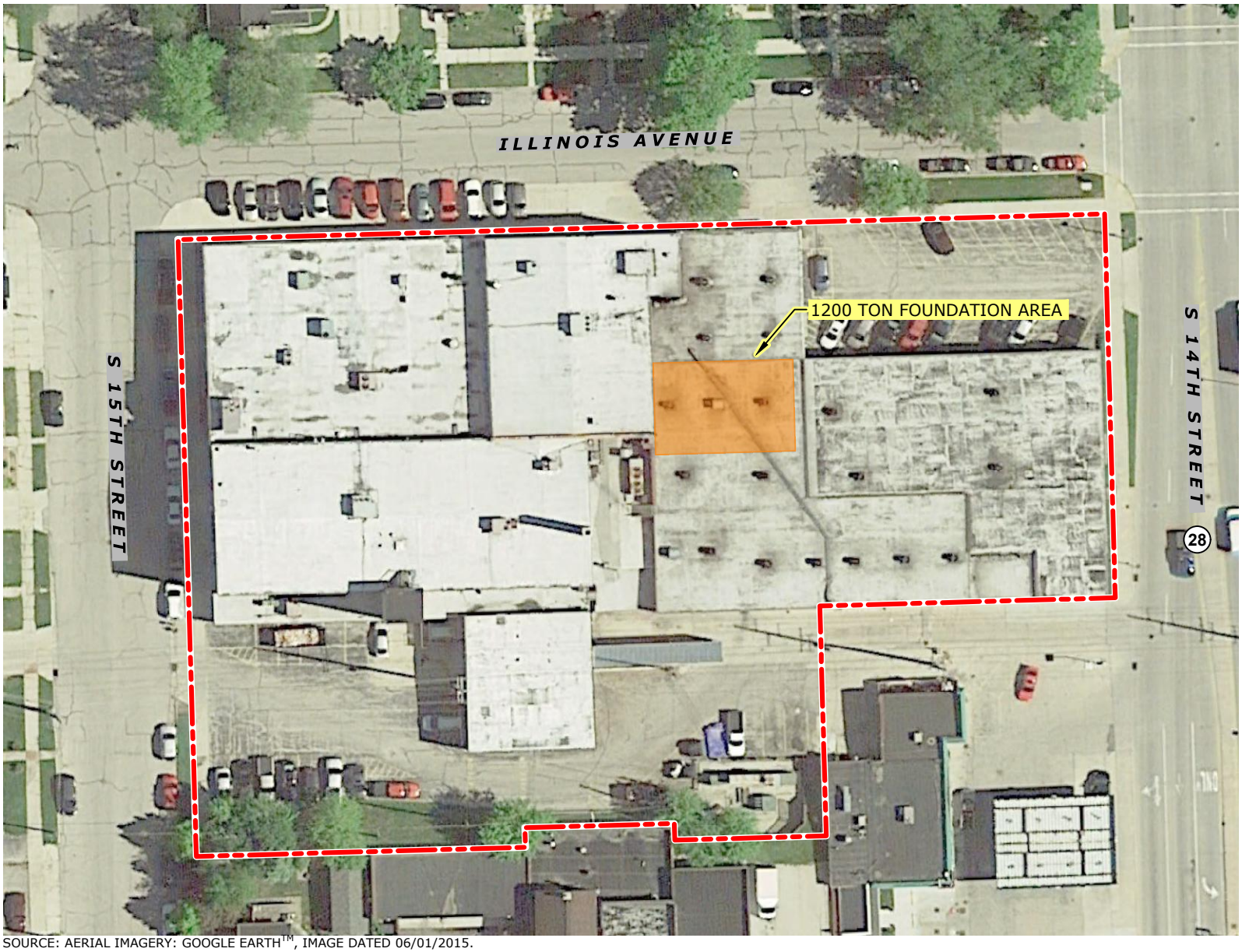
THOMAS PRODUCTS
1419 ILLINOIS AVE
SHEBOYGAN, WISCONSIN

FIGURE 1

DRAFTED BY: HJW	DATE: 10/8/19	1690010224

M:\CAD\1690010224_PHI\01_Site Location Map (Sheboygan WI).dwg

M:\CAD\1690010224_PHI\02_Site Layout (Sheboygan WI).dwg



N

LEGEND

PROPERTY BOUNDARY (APPROXIMATE)

NEW EXCAVATION AREA

0 60

SCALE IN FEET

SOURCE: AERIAL IMAGERY: GOOGLE EARTH™, IMAGE DATED 06/01/2015.

RAMBOLL

DRAFTED BY: HJW | DATE: 10/8/19

SITE LAYOUT

THOMAS PRODUCTS
1419 ILLINOIS AVE
SHEBOYGAN, WISCONSIN

FIGURE
2

1690010224

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N

LEGEND

NEW EXCAVATION AREA

COMPOSITE SAMPLE LOCATIONS:

- C-01 198
- C-02 105
- C-03 181
- C-04 251
- C-05 14.1
- C-06 7.49
- C-07 10.1

● Dc-01 DISCRETE SAMPLE LOCATION

17.7 POLYCHLORINATED BIPHENYLS (PCBs) CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/Kg)

0 15

SCALE IN FEET

SOURCE: AERIAL IMAGERY: GOOGLE EARTH™, IMAGE DATED 06/01/2015.

RAMBOLL

DRAFTED BY: HJW | DATE: 10/25/19

OCTOBER 9 SAMPLE RESULTS

THOMAS PRODUCTS
1419 ILLINOIS AVE
SHEBOYGAN, WISCONSIN

FIGURE
3

1690015145

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LEGEND

NEW EXCAVATION AREA

COMPOSITE SAMPLE LOCATIONS:

- C-01
- C-02
- C-03
- C-04
- C-05
- C-06
- C-07

Dc-01 DISCRETE SAMPLE LOCATION

PROPOSED ADDITIONAL EXCAVATION SAMPLE LOCATION

PROPOSED CO-LOCATED SAMPLE LOCATION

PROPOSED STEP-OUT SAMPLE LOCATION

0 15

SCALE IN FEET

SOURCE: AERIAL IMAGERY: GOOGLE EARTH™, IMAGE DATED 06/01/2015.

RAMBOLL

DRAFTED BY: HJW | DATE: 10/25/19

PROPOSED SAMPLE LOCATION DIAGRAM

THOMAS PRODUCTS
1419 ILLINOIS AVE
SHEBOYGAN, WISCONSIN

FIGURE
4

1690010224

TABLES

Table 1: Soil Sample Results
Thomas Products
1419 Illinois Avenue Sheboygan, Wisconsin
Ramboll Project No. 1690010224

Parameters	Soil RCLs			BTV	DC-01 Discrete Sample Northwest - Sidewall 10/9/2019		DC-02 Discrete Sample Northwest - Sidewall 10/9/2019		DC-03 Discrete Sample West - Floor 10/9/2019		DC-04 Discrete Sample West - Floor 10/9/2019		DC-05 Discrete Sample Southwest - Sidewall 10/9/2019		DC-06 Discrete Sample Southwest - Sidewall 10/9/2019	
	Non-Industrial Direct Contact	Industrial Direct Contact	Groundwater Pathway													
PCBs (mg/kg)																
PCB-1016 (Aroclor 1016)	4.11	28.0	0.0094	--	<0.581		<27.1		<26.2		<14.9		<13.3		<5.71	
PCB-1221 (Aroclor 1221)	0.21	0.883	0.0094	--	<0.581		<27.1		<26.2		<14.9		<13.3		<5.71	
PCB-1232 (Aroclor 1232)	0.19	0.792	0.0094	--	<0.581		<27.1		<26.2		<14.9		<13.3		<5.71	
PCB-1242 (Aroclor 1242)	0.24	0.972	0.0094	--	**17.7**	**A,B,C**	**402**	**A,B,C**	**481**	**A,B,C**	**77.6**	**A,B,C**	<13.3		**24.4**	**A,B,C**
PCB-1248 (Aroclor 1248)	0.24	0.975	0.0094	--	<0.581		<27.1		<26.2		<14.9		**57.0**	**A,B,C**	<5.71	
PCB-1254 (Aroclor 1254)	0.239	0.988	0.0094	--	<0.581		<27.1		<26.2		<14.9		<13.3		<5.71	
PCB-1260 (Aroclor 1260)	0.243	1	0.0094	--	<0.581		<27.1		<26.2	M6	<14.9		<13.3		<5.71	
Polychlorinated Biphenyls (High Risk)	0.234	0.967	0.0094	--	**17.7**	**A,B,C**	**402**	**A,B,C**	**481**	**A,B,C**	**77.6**	**A,B,C**	**57.0**	**A,B,C**	**24.4**	**A,B,C**

Notes:

PCBs = Polychlorinated Biphenyls
RCL = Residual Contaminant Level
BTV = Background Threshold Value
mg/kg = milligrams per kilogram
A Parameter exceeds NR 720 Residual Contaminant Level (RCL) for Non-Industrial Direct Contact.
B Parameter exceeds NR 720 RCL for Industrial Direct Contact.
C Parameter exceeds NR 720 RCL for Groundwater Pathway.
M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.
-- No RCL or Surficial BTV established.
#N/A = Not analyzed
Direct contact RCL exceedances apply to soil from 0 to 4 feet below ground surface.
Soil RCLs and surficial BTVs established by the WDNR RR program using the EPA's RSL web-calculator with WAC NR 720 default parameters (WDNR PUB-RR-890, June 2014 - updated RCL spreadsheet, December 2018).

Table 1: Soil Sample Results
Thomas Products
1419 Illinois Avenue Sheboygan, Wisconsin
Ramboll Project No. 1690010224

Parameters	Soil RCLs			BTV	DC-07 Discrete Sample Northeast - Sidewall 10/9/2019		DC-08 Discrete Sample East - Floor 10/9/2019		DC-08-DUP Discrete Sample East - Floor 10/9/2019	
	Non-Industrial Direct Contact	Industrial Direct Contact	Groundwater Pathway							
PCBs (mg/kg)										
PCB-1016 (Aroclor 1016)	4.11	28.0	0.0094	--	<26.5		<0.952		<0.63	
PCB-1221 (Aroclor 1221)	0.21	0.883	0.0094	--	<26.5		<0.952		<0.63	
PCB-1232 (Aroclor 1232)	0.19	0.792	0.0094	--	<26.5		<0.952		<0.63	
PCB-1242 (Aroclor 1242)	0.24	0.972	0.0094	--	<26.5		**10.8**	**A,B,C**	**9.53**	**A,B,C**
PCB-1248 (Aroclor 1248)	0.24	0.975	0.0094	--	**71.3**	**A,B,C**	<0.952		<0.63	
PCB-1254 (Aroclor 1254)	0.239	0.988	0.0094	--	<26.5		<0.952		<0.63	
PCB-1260 (Aroclor 1260)	0.243	1	0.0094	--	<26.5		<0.952	M6	<0.63	
Polychlorinated Biphenyls (High Risk)	0.234	0.967	0.0094	--	**71.3**	**A,B,C**	**10.8**	**A,B,C**	**9.53**	**A,B,C**

Notes:

PCBs = Polychlorinated Biphenyls
RCL = Residual Contaminant Level
BTV = Background Threshold Value
mg/kg = milligrams per kilogram
A Parameter exceeds NR 720 Residual Contaminant Level (RCL) for Non-Industrial Direct Contact.
B Parameter exceeds NR 720 RCL for Industrial Direct Contact.
C Parameter exceeds NR 720 RCL for Groundwater Pathway.
M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.
-- No RCL or Surficial BTV established.
#N/A = Not analyzed
Direct contact RCL exceedances apply to soil from 0 to 4 feet below ground surface.
Soil RCLs and surficial BTVs established by the WDNR RR program using the EPA's RSL web-calculator with WAC NR 720 default parameters (WDNR PUB-RR-890, June 2014 - updated RCL spreadsheet, December 2018).

Table 1: Soil Sample Results
Thomas Products
1419 Illinois Avenue Sheboygan, Wisconsin
Ramboll Project No. 1690010224

Parameters	Soil RCLs			BTV	DC-09		DC-10		C-01		C-02		C-02-DUP		C-03	
	Non-Industrial Direct Contact	Industrial Direct Contact	Groundwater Pathway		Discrete Sample Southeast - Sidewall 10/9/2019		Discrete Sample East - Sidewall 10/9/2019		Composite Sample Northwest - Sidewall 10/9/2019		Composite Sample West - Floor 10/9/2019		Composite Sample West - Floor 10/9/2019		Composite Sample Southwest - Sidewall 10/9/2019	
PCBs (mg/kg)																
PCB-1016 (Aroclor 1016)	4.11	28.0	0.0094	--	<0.0569		<0.872		<28		<15.1		<15		<26.9	
PCB-1221 (Aroclor 1221)	0.21	0.883	0.0094	--	<0.0569		<0.872		<28		<15.1		<15		<26.9	
PCB-1232 (Aroclor 1232)	0.19	0.792	0.0094	--	<0.0569		<0.872		<28		<15.1		<15		<26.9	
PCB-1242 (Aroclor 1242)	0.24	0.972	0.0094	--	**0.782**	**A,C**	**18.7**	**A,B,C**	**198**	**A,B,C**	**105**	**A,B,C**	**145**	**A,B,C**	**181**	**A,B,C**
PCB-1248 (Aroclor 1248)	0.24	0.975	0.0094	--	<0.0569		<0.872		<28		<15.1		<15		<26.9	
PCB-1254 (Aroclor 1254)	0.239	0.988	0.0094	--	<0.0569		<0.872		<28		<15.1		<15		<26.9	
PCB-1260 (Aroclor 1260)	0.243	1	0.0094	--	<0.0569		<0.872		<28		<15.1		<15		<26.9	
Polychlorinated Biphenyls (High Risk)	0.234	0.967	0.0094	--	**0.782**	**A,C**	**18.7**	**A,B,C**	**198**	**A,B,C**	**105**	**A,B,C**	**145**	**A,B,C**	**181**	**A,B,C**

Notes:

PCBs = Polychlorinated Biphenyls
RCL = Residual Contaminant Level
BTV = Background Threshold Value
mg/kg = milligrams per kilogram
A Parameter exceeds NR 720 Residual Contaminant Level (RCL) for Non-Industrial Direct Contact.
B Parameter exceeds NR 720 RCL for Industrial Direct Contact.
C Parameter exceeds NR 720 RCL for Groundwater Pathway.
M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.
-- No RCL or Surficial BTV established.
#N/A = Not analyzed
Direct contact RCL exceedances apply to soil from 0 to 4 feet below ground surface.
Soil RCLs and surficial BTVs established by the WDNR RR program using the EPA's RSL web-calculator with WAC NR 720 default parameters (WDNR PUB-RR-890, June 2014 - updated RCL spreadsheet, December 2018).

Table 1: Soil Sample Results
Thomas Products
1419 Illinois Avenue Sheboygan, Wisconsin
Ramboll Project No. 1690010224

Parameters	Soil RCLs			BTV	C-04 Composite Sample Northeast - Sidewall 10/9/2019		C-05 Composite Sample East- Floor 10/9/2019		C-06 Composite Sample Southeast - Sidewall 10/9/2019		C-07 Composite Sample East - Sidewall 10/9/2019	
	Non-Industrial Direct Contact	Industrial Direct Contact	Groundwater Pathway									
PCBs (mg/kg)												
PCB-1016 (Aroclor 1016)	4.11	28.0	0.0094	--	<27.2		<0.584		<0.448		<0.413	
PCB-1221 (Aroclor 1221)	0.21	0.883	0.0094	--	<27.2		<0.584		<0.448		<0.413	
PCB-1232 (Aroclor 1232)	0.19	0.792	0.0094	--	<27.2		<0.584		<0.448		<0.413	
PCB-1242 (Aroclor 1242)	0.24	0.972	0.0094	--	**251**	**A,B,C**	**14.1**	**A,B,C**	<0.448		**10.1**	**A,B,C**
PCB-1248 (Aroclor 1248)	0.24	0.975	0.0094	--	<27.2		<0.584		**7.49**	**A,B,C**	<0.413	
PCB-1254 (Aroclor 1254)	0.239	0.988	0.0094	--	<27.2		<0.584		<0.448		<0.413	
PCB-1260 (Aroclor 1260)	0.243	1	0.0094	--	<27.2		<0.584		<0.448		<0.413	
Polychlorinated Biphenyls (High Risk)	0.234	0.967	0.0094	--	**251**	**A,B,C**	**14.1**	**A,B,C**	**7.49**	**A,B,C**	**10.1**	**A,B,C**

Notes:

PCBs = Polychlorinated Biphenyls
RCL = Residual Contaminant Level
BTV = Background Threshold Value
mg/kg = milligrams per kilogram
A Parameter exceeds NR 720 Residual Contaminant Level (RCL) for Non-Industrial Direct Contact.
B Parameter exceeds NR 720 RCL for Industrial Direct Contact.
C Parameter exceeds NR 720 RCL for Groundwater Pathway.
M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.
-- No RCL or Surficial BTV established.
#N/A = Not analyzed
Direct contact RCL exceedances apply to soil from 0 to 4 feet below ground surface.
Soil RCLs and surficial BTVs established by the WDNR RR program using the EPA's RSL web-calculator with WAC NR 720 default parameters (WDNR PUB-RR-890, June 2014 - updated RCL spreadsheet, December 2018).

Table 2: Roll-Off Container Results
Gardner Denver - Thomas Products Division
1419 Illinois Avenue, Sheboygan, Wisconsin
Ramboll Project No. 1690010224

Parameters	RB-01 10/9/2019	RB-02 10/9/2019	RB-03 10/9/2019	RB-04 10/9/2019	RB-05 10/9/2019	RB-06 10/9/2019	RB-07 10/9/2019	RB-08 10/9/2019	RB-09 10/9/2019	RB-10 10/9/2019	RB-11 10/9/2019	RB-12 10/9/2019	RB-13 10/9/2019	RB-14 10/9/2019
PCBs (mg/kg)														
PCB-1016 (Aroclor 1016)	<25.6	<2.56	<53.1	<27.3	<78.3	<0.918	<29.4	<5.99	<9.19	<61.5	<28.9	<27.3	<30.1	<3.01
PCB-1221 (Aroclor 1221)	<25.6	<2.56	<53.1	<27.3	<78.3	<0.918	<29.4	<5.99	<9.19	<61.5	<28.9	<27.3	<30.1	<3.01
PCB-1232 (Aroclor 1232)	<25.6	<2.56	<53.1	<27.3	<78.3	<0.918	<29.4	<5.99	<9.19	<61.5	<28.9	<27.3	<30.1	<3.01
PCB-1242 (Aroclor 1242)	<25.6	<2.56	<53.1	<27.3	<78.3	27.2	154	51.3	<9.19	360	85.1	<27.3	247	40.8
PCB-1248 (Aroclor 1248)	140	21.7	277	200	337	<0.918	<29.4	<5.99	137	<61.5	<28.9	295	<30.1	<3.01
PCB-1254 (Aroclor 1254)	<25.6	<2.56	<53.1	<27.3	<78.3	<0.918	<29.4	<5.99	<9.19	<61.5	<28.9	<27.3	<30.1	<3.01
PCB-1260 (Aroclor 1260)	<25.6	<2.56	<53.1	<27.3	<78.3	<0.918	<29.4	<5.99	<9.19	<61.5	<28.9	<27.3	<30.1	<3.01
Polychlorinated Biphenyls (High Risk)	140	21.7	277	200	337	27.2	154	51.3	137	360	85.1	295	247	40.8

Notes:

PCBs = Polychlorinated Biphenyls

mg/kg = milligrams per kilogram

Composite samples collected from containerized soils temporarily staged on site in roll-off boxes.

APPENDIX A

LABORATORY ANALYTICAL RESULTS

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

October 18, 2019

Staci Goetz
Ramboll

,

RE: Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Dear Staci Goetz:
Enclosed are the analytical results for sample(s) received by the laboratory on October 11, 2019. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Laurie Woelfel

Laurie Woelfel for
Steven Mleczko
steve.mleczko@pacelabs.com
(920)469-2436
Project Manager

Enclosures

cc: David L. Markelz, Ramboll Environ
Erin Veder, Ramboll

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

CERTIFICATIONS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Green Bay Certification IDs

1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky UST Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 12064
North Dakota Certification #: R-150
Virginia VELAP ID: 460263
South Carolina Certification #: 83006001
Texas Certification #: T104704529-14-1
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444
USDA Soil Permit #: P330-16-00157
Federal Fish & Wildlife Permit #: LE51774A-0

Pace Analytical Services, LLC
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Green Bay, WI 54302
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SAMPLE SUMMARY

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab ID	Sample ID	Matrix	Date Collected	Date Received
40197032001	**C-01**	Solid	10/09/19 09:49	10/11/19 08:10
40197032002	**C-02**	Solid	10/09/19 11:00	10/11/19 08:10
40197032003	**C-03**	Solid	10/09/19 10:30	10/11/19 08:10
40197032004	**C-04**	Solid	10/09/19 09:55	10/11/19 08:10
40197032005	**C-05**	Solid	10/09/19 11:24	10/11/19 08:10
40197032006	**C-06**	Solid	10/09/19 10:14	10/11/19 08:10
40197032007	**C-07**	Solid	10/09/19 10:05	10/11/19 08:10
40197032008	**C-02-DUP**	Solid	10/09/19 11:00	10/11/19 08:10
40197032009	**DC-01**	Solid	10/09/19 09:42	10/11/19 08:10
40197032010	**DC-02**	Solid	10/09/19 09:45	10/11/19 08:10
40197032011	**DC-03**	Solid	10/09/19 10:37	10/11/19 08:10
40197032012	**DC-04**	Solid	10/09/19 10:46	10/11/19 08:10
40197032013	**DC-05**	Solid	10/09/19 10:26	10/11/19 08:10
40197032014	**DC-06**	Solid	10/09/19 10:20	10/11/19 08:10
40197032015	**DC-07**	Solid	10/09/19 09:53	10/11/19 08:10
40197032016	**DC-08**	Solid	10/09/19 11:14	10/11/19 08:10
40197032017	**DC-08-DUP**	Solid	10/09/19 11:14	10/11/19 08:10
40197032018	**DC-09**	Solid	10/09/19 10:09	10/11/19 08:10
40197032019	**DC-10**	Solid	10/09/19 10:01	10/11/19 08:10
40197032020	**RB-01**	Solid	10/09/19 12:42	10/11/19 08:10
40197032021	**RB-02**	Solid	10/09/19 13:00	10/11/19 08:10
40197032022	**RB-03**	Solid	10/09/19 13:14	10/11/19 08:10
40197032023	**RB-04**	Solid	10/09/19 13:31	10/11/19 08:10
40197032024	**RB-05**	Solid	10/09/19 13:43	10/11/19 08:10
40197032025	**RB-06**	Solid	10/09/19 13:57	10/11/19 08:10
40197032026	**RB-07**	Solid	10/09/19 14:04	10/11/19 08:10
40197032027	**RB-08**	Solid	10/09/19 14:11	10/11/19 08:10
40197032028	**RB-09**	Solid	10/09/19 14:17	10/11/19 08:10
40197032029	**RB-10**	Solid	10/09/19 14:24	10/11/19 08:10
40197032030	**RB-11**	Solid	10/09/19 14:33	10/11/19 08:10
40197032031	**RB-12**	Solid	10/09/19 14:40	10/11/19 08:10
40197032032	**RB-13**	Solid	10/09/19 14:46	10/11/19 08:10
40197032033	**RB-14**	Solid	10/09/19 14:53	10/11/19 08:10
40197032034	**EB-01**	Water	10/09/19 11:38	10/11/19 08:10

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

SAMPLE ANALYTE COUNT

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
40197032001	**C-01**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AH	1	PASI-G
40197032002	**C-02**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AH	1	PASI-G
40197032003	**C-03**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AH	1	PASI-G
40197032004	**C-04**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AH	1	PASI-G
40197032005	**C-05**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AH	1	PASI-G
40197032006	**C-06**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AH	1	PASI-G
40197032007	**C-07**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AH	1	PASI-G
40197032008	**C-02-DUP**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AH	1	PASI-G
40197032009	**DC-01**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032010	**DC-02**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032011	**DC-03**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032012	**DC-04**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032013	**DC-05**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032014	**DC-06**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032015	**DC-07**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032016	**DC-08**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032017	**DC-08-DUP**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032018	**DC-09**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032019	**DC-10**	EPA 8082	BLM	10	PASI-G

Pace Analytical Services, LLC
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SAMPLE ANALYTE COUNT

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		ASTM D2974-87	AMS	1	PASI-G
40197032020	**RB-01**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032021	**RB-02**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032022	**RB-03**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032023	**RB-04**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032024	**RB-05**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032025	**RB-06**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032026	**RB-07**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032027	**RB-08**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032028	**RB-09**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032029	**RB-10**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032030	**RB-11**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032031	**RB-12**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032032	**RB-13**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032033	**RB-14**	EPA 8082	BLM	10	PASI-G
		ASTM D2974-87	AMS	1	PASI-G
40197032034	**EB-01**	EPA 8082	BLM	10	PASI-G

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

SUMMARY OF DETECTION

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
40197032001	**C-01**					
EPA 8082	PCB-1242 (Aroclor 1242)	198000	ug/kg	56100	10/17/19 10:16	
EPA 8082	PCB, Total	198000	ug/kg	56100	10/17/19 10:16	
ASTM D2974-87	Percent Moisture	10.9	%	0.10	10/18/19 08:47	
40197032002	**C-02**					
EPA 8082	PCB-1242 (Aroclor 1242)	105000	ug/kg	30200	10/17/19 10:53	
EPA 8082	PCB, Total	105000	ug/kg	30200	10/17/19 10:53	
ASTM D2974-87	Percent Moisture	17.5	%	0.10	10/18/19 08:47	
40197032003	**C-03**					
EPA 8082	PCB-1242 (Aroclor 1242)	181000	ug/kg	53900	10/17/19 11:11	
EPA 8082	PCB, Total	181000	ug/kg	53900	10/17/19 11:11	
ASTM D2974-87	Percent Moisture	7.5	%	0.10	10/18/19 08:47	
40197032004	**C-04**					
EPA 8082	PCB-1242 (Aroclor 1242)	251000	ug/kg	54300	10/17/19 11:29	
EPA 8082	PCB, Total	251000	ug/kg	54300	10/17/19 11:29	
ASTM D2974-87	Percent Moisture	8.1	%	0.10	10/18/19 08:47	
40197032005	**C-05**					
EPA 8082	PCB-1242 (Aroclor 1242)	14100	ug/kg	1170	10/17/19 11:47	
EPA 8082	PCB, Total	14100	ug/kg	1170	10/17/19 11:47	
ASTM D2974-87	Percent Moisture	14.4	%	0.10	10/18/19 08:47	
40197032006	**C-06**					
EPA 8082	PCB-1248 (Aroclor 1248)	7490	ug/kg	896	10/17/19 12:05	
EPA 8082	PCB, Total	7490	ug/kg	896	10/17/19 12:05	
ASTM D2974-87	Percent Moisture	16.3	%	0.10	10/18/19 08:47	
40197032007	**C-07**					
EPA 8082	PCB-1242 (Aroclor 1242)	10100	ug/kg	827	10/17/19 12:24	
EPA 8082	PCB, Total	10100	ug/kg	827	10/17/19 12:24	
ASTM D2974-87	Percent Moisture	9.2	%	0.10	10/18/19 08:47	
40197032008	**C-02-DUP**					
EPA 8082	PCB-1242 (Aroclor 1242)	145000	ug/kg	30000	10/17/19 12:42	
EPA 8082	PCB, Total	145000	ug/kg	30000	10/17/19 12:42	
ASTM D2974-87	Percent Moisture	16.6	%	0.10	10/18/19 08:47	
40197032009	**DC-01**					
EPA 8082	PCB-1242 (Aroclor 1242)	17700	ug/kg	1160	10/17/19 13:00	
EPA 8082	PCB, Total	17700	ug/kg	1160	10/17/19 13:00	
ASTM D2974-87	Percent Moisture	14.2	%	0.10	10/17/19 16:24	
40197032010	**DC-02**					
EPA 8082	PCB-1242 (Aroclor 1242)	402000	ug/kg	54300	10/17/19 13:18	
EPA 8082	PCB, Total	402000	ug/kg	54300	10/17/19 13:18	
ASTM D2974-87	Percent Moisture	8.2	%	0.10	10/17/19 16:24	
40197032011	**DC-03**					
EPA 8082	PCB-1242 (Aroclor 1242)	481000	ug/kg	52400	10/17/19 13:36	

Pace Analytical Services, LLC
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SUMMARY OF DETECTION

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
40197032011	**DC-03**					
EPA 8082	PCB, Total	481000	ug/kg	52400	10/17/19 13:36	
ASTM D2974-87	Percent Moisture	4.4	%	0.10	10/17/19 16:24	
40197032012	**DC-04**					
EPA 8082	PCB-1242 (Aroclor 1242)	77600	ug/kg	29800	10/17/19 13:55	
EPA 8082	PCB, Total	77600	ug/kg	29800	10/17/19 13:55	
ASTM D2974-87	Percent Moisture	15.7	%	0.10	10/17/19 16:24	
40197032013	**DC-05**					
EPA 8082	PCB-1248 (Aroclor 1248)	57000	ug/kg	26700	10/17/19 14:13	
EPA 8082	PCB, Total	57000	ug/kg	26700	10/17/19 14:13	
ASTM D2974-87	Percent Moisture	6.5	%	0.10	10/17/19 16:24	
40197032014	**DC-06**					
EPA 8082	PCB-1242 (Aroclor 1242)	24400	ug/kg	11400	10/17/19 16:57	
EPA 8082	PCB, Total	24400	ug/kg	11400	10/17/19 16:57	
ASTM D2974-87	Percent Moisture	12.4	%	0.10	10/17/19 16:25	
40197032015	**DC-07**					
EPA 8082	PCB-1248 (Aroclor 1248)	71300	ug/kg	52900	10/17/19 17:15	
EPA 8082	PCB, Total	71300	ug/kg	52900	10/17/19 17:15	
ASTM D2974-87	Percent Moisture	5.5	%	0.10	10/17/19 16:25	
40197032016	**DC-08**					
EPA 8082	PCB-1242 (Aroclor 1242)	10800	ug/kg	1900	10/17/19 17:33	
EPA 8082	PCB, Total	10800	ug/kg	1900	10/17/19 17:33	
ASTM D2974-87	Percent Moisture	21.2	%	0.10	10/17/19 16:25	
40197032017	**DC-08-DUP**					
EPA 8082	PCB-1242 (Aroclor 1242)	9530	ug/kg	1260	10/18/19 11:31	
EPA 8082	PCB, Total	9530	ug/kg	1260	10/18/19 11:31	
ASTM D2974-87	Percent Moisture	20.7	%	0.10	10/17/19 16:25	
40197032018	**DC-09**					
EPA 8082	PCB-1242 (Aroclor 1242)	782	ug/kg	114	10/18/19 11:53	
EPA 8082	PCB, Total	782	ug/kg	114	10/18/19 11:53	
ASTM D2974-87	Percent Moisture	12.2	%	0.10	10/17/19 16:25	
40197032019	**DC-10**					
EPA 8082	PCB-1242 (Aroclor 1242)	18700	ug/kg	1740	10/17/19 18:27	
EPA 8082	PCB, Total	18700	ug/kg	1740	10/17/19 18:27	
ASTM D2974-87	Percent Moisture	13.9	%	0.10	10/17/19 16:25	
40197032020	**RB-01**					
EPA 8082	PCB-1248 (Aroclor 1248)	140000	ug/kg	51100	10/18/19 12:15	
EPA 8082	PCB, Total	140000	ug/kg	51100	10/18/19 12:15	
ASTM D2974-87	Percent Moisture	2.2	%	0.10	10/17/19 16:25	
40197032021	**RB-02**					
EPA 8082	PCB-1248 (Aroclor 1248)	21700	ug/kg	5130	10/17/19 19:04	
EPA 8082	PCB, Total	21700	ug/kg	5130	10/17/19 19:04	

REPORT OF LABORATORY ANALYSIS

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SUMMARY OF DETECTION

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
40197032021	**RB-02**					
ASTM D2974-87	Percent Moisture	2.4	%	0.10	10/17/19 16:26	
40197032022	**RB-03**					
EPA 8082	PCB-1248 (Aroclor 1248)	277000	ug/kg	106000	10/18/19 07:20	
EPA 8082	PCB, Total	277000	ug/kg	106000	10/18/19 07:20	
ASTM D2974-87	Percent Moisture	5.9	%	0.10	10/17/19 16:26	
40197032023	**RB-04**					
EPA 8082	PCB-1248 (Aroclor 1248)	200000	ug/kg	54600	10/18/19 07:38	
EPA 8082	PCB, Total	200000	ug/kg	54600	10/18/19 07:38	
ASTM D2974-87	Percent Moisture	8.4	%	0.10	10/17/19 16:26	
40197032024	**RB-05**					
EPA 8082	PCB-1248 (Aroclor 1248)	337000	ug/kg	157000	10/18/19 07:56	
EPA 8082	PCB, Total	337000	ug/kg	157000	10/18/19 07:56	
ASTM D2974-87	Percent Moisture	4.2	%	0.10	10/17/19 16:26	
40197032025	**RB-06**					
EPA 8082	PCB-1242 (Aroclor 1242)	27200	ug/kg	1840	10/18/19 08:14	
EPA 8082	PCB, Total	27200	ug/kg	1840	10/18/19 08:14	
ASTM D2974-87	Percent Moisture	18.3	%	0.10	10/17/19 16:26	
40197032026	**RB-07**					
EPA 8082	PCB-1242 (Aroclor 1242)	154000	ug/kg	58800	10/18/19 08:33	
EPA 8082	PCB, Total	154000	ug/kg	58800	10/18/19 08:33	
ASTM D2974-87	Percent Moisture	15.0	%	0.10	10/17/19 16:26	
40197032027	**RB-08**					
EPA 8082	PCB-1242 (Aroclor 1242)	51300	ug/kg	12000	10/18/19 08:55	
EPA 8082	PCB, Total	51300	ug/kg	12000	10/18/19 08:55	
ASTM D2974-87	Percent Moisture	16.6	%	0.10	10/17/19 16:26	
40197032028	**RB-09**					
EPA 8082	PCB-1248 (Aroclor 1248)	137000	ug/kg	18400	10/18/19 09:17	
EPA 8082	PCB, Total	137000	ug/kg	18400	10/18/19 09:17	
ASTM D2974-87	Percent Moisture	18.4	%	0.10	10/17/19 16:26	
40197032029	**RB-10**					
EPA 8082	PCB-1242 (Aroclor 1242)	360000	ug/kg	123000	10/18/19 09:39	
EPA 8082	PCB, Total	360000	ug/kg	123000	10/18/19 09:39	
ASTM D2974-87	Percent Moisture	18.7	%	0.10	10/17/19 16:54	
40197032030	**RB-11**					
EPA 8082	PCB-1242 (Aroclor 1242)	85100	ug/kg	57800	10/18/19 10:02	
EPA 8082	PCB, Total	85100	ug/kg	57800	10/18/19 10:02	
ASTM D2974-87	Percent Moisture	13.6	%	0.10	10/17/19 16:54	
40197032031	**RB-12**					
EPA 8082	PCB-1248 (Aroclor 1248)	295000	ug/kg	54700	10/18/19 10:24	
EPA 8082	PCB, Total	295000	ug/kg	54700	10/18/19 10:24	
ASTM D2974-87	Percent Moisture	8.6	%	0.10	10/17/19 16:55	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

SUMMARY OF DETECTION

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab Sample ID / Method	Client Sample ID / Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
40197032032	**RB-13**					
EPA 8082	PCB-1242 (Aroclor 1242)	247000	ug/kg	60300	10/18/19 10:46	
EPA 8082	PCB, Total	247000	ug/kg	60300	10/18/19 10:46	
ASTM D2974-87	Percent Moisture	17.0	%	0.10	10/17/19 16:55	
40197032033	**RB-14**					
EPA 8082	PCB-1242 (Aroclor 1242)	40800	ug/kg	6010	10/18/19 11:08	
EPA 8082	PCB, Total	40800	ug/kg	6010	10/18/19 11:08	
ASTM D2974-87	Percent Moisture	16.9	%	0.10	10/17/19 16:55	

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: C-01 **Lab ID: 40197032001** Collected: 10/09/19 09:49 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<28000**	ug/kg	56100	28000	1000	10/15/19 12:44	10/17/19 10:16	12674-11-2	
PCB-1221 (Aroclor 1221)	**<28000**	ug/kg	56100	28000	1000	10/15/19 12:44	10/17/19 10:16	11104-28-2	
PCB-1232 (Aroclor 1232)	**<28000**	ug/kg	56100	28000	1000	10/15/19 12:44	10/17/19 10:16	11141-16-5	
PCB-1242 (Aroclor 1242)	**198000**	ug/kg	56100	28000	1000	10/15/19 12:44	10/17/19 10:16	53469-21-9	
PCB-1248 (Aroclor 1248)	**<28000**	ug/kg	56100	28000	1000	10/15/19 12:44	10/17/19 10:16	12672-29-6	
PCB-1254 (Aroclor 1254)	**<28000**	ug/kg	56100	28000	1000	10/15/19 12:44	10/17/19 10:16	11097-69-1	
PCB-1260 (Aroclor 1260)	**<28000**	ug/kg	56100	28000	1000	10/15/19 12:44	10/17/19 10:16	11096-82-5	
PCB, Total	**198000**	ug/kg	56100	28000	1000	10/15/19 12:44	10/17/19 10:16	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 12:44	10/17/19 10:16	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 12:44	10/17/19 10:16	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**10.9**	%	0.10	0.10	1		10/18/19 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: C-02 **Lab ID: 40197032002** Collected: 10/09/19 11:00 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<15100**	ug/kg	30200	15100	500	10/15/19 12:44	10/17/19 10:53	12674-11-2	
PCB-1221 (Aroclor 1221)	**<15100**	ug/kg	30200	15100	500	10/15/19 12:44	10/17/19 10:53	11104-28-2	
PCB-1232 (Aroclor 1232)	**<15100**	ug/kg	30200	15100	500	10/15/19 12:44	10/17/19 10:53	11141-16-5	
PCB-1242 (Aroclor 1242)	**105000**	ug/kg	30200	15100	500	10/15/19 12:44	10/17/19 10:53	53469-21-9	
PCB-1248 (Aroclor 1248)	**<15100**	ug/kg	30200	15100	500	10/15/19 12:44	10/17/19 10:53	12672-29-6	
PCB-1254 (Aroclor 1254)	**<15100**	ug/kg	30200	15100	500	10/15/19 12:44	10/17/19 10:53	11097-69-1	
PCB-1260 (Aroclor 1260)	**<15100**	ug/kg	30200	15100	500	10/15/19 12:44	10/17/19 10:53	11096-82-5	
PCB, Total	**105000**	ug/kg	30200	15100	500	10/15/19 12:44	10/17/19 10:53	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		500	10/15/19 12:44	10/17/19 10:53	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		500	10/15/19 12:44	10/17/19 10:53	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.5**	%	0.10	0.10	1		10/18/19 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: C-03 **Lab ID: 40197032003** Collected: 10/09/19 10:30 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<26900**	ug/kg	53900	26900	1000	10/15/19 12:44	10/17/19 11:11	12674-11-2	
PCB-1221 (Aroclor 1221)	**<26900**	ug/kg	53900	26900	1000	10/15/19 12:44	10/17/19 11:11	11104-28-2	
PCB-1232 (Aroclor 1232)	**<26900**	ug/kg	53900	26900	1000	10/15/19 12:44	10/17/19 11:11	11141-16-5	
PCB-1242 (Aroclor 1242)	**181000**	ug/kg	53900	26900	1000	10/15/19 12:44	10/17/19 11:11	53469-21-9	
PCB-1248 (Aroclor 1248)	**<26900**	ug/kg	53900	26900	1000	10/15/19 12:44	10/17/19 11:11	12672-29-6	
PCB-1254 (Aroclor 1254)	**<26900**	ug/kg	53900	26900	1000	10/15/19 12:44	10/17/19 11:11	11097-69-1	
PCB-1260 (Aroclor 1260)	**<26900**	ug/kg	53900	26900	1000	10/15/19 12:44	10/17/19 11:11	11096-82-5	
PCB, Total	**181000**	ug/kg	53900	26900	1000	10/15/19 12:44	10/17/19 11:11	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 12:44	10/17/19 11:11	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 12:44	10/17/19 11:11	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**7.5**	%	0.10	0.10	1		10/18/19 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: C-04 **Lab ID: 40197032004** Collected: 10/09/19 09:55 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<27200**	ug/kg	54300	27200	1000	10/15/19 12:44	10/17/19 11:29	12674-11-2	
PCB-1221 (Aroclor 1221)	**<27200**	ug/kg	54300	27200	1000	10/15/19 12:44	10/17/19 11:29	11104-28-2	
PCB-1232 (Aroclor 1232)	**<27200**	ug/kg	54300	27200	1000	10/15/19 12:44	10/17/19 11:29	11141-16-5	
PCB-1242 (Aroclor 1242)	**251000**	ug/kg	54300	27200	1000	10/15/19 12:44	10/17/19 11:29	53469-21-9	
PCB-1248 (Aroclor 1248)	**<27200**	ug/kg	54300	27200	1000	10/15/19 12:44	10/17/19 11:29	12672-29-6	
PCB-1254 (Aroclor 1254)	**<27200**	ug/kg	54300	27200	1000	10/15/19 12:44	10/17/19 11:29	11097-69-1	
PCB-1260 (Aroclor 1260)	**<27200**	ug/kg	54300	27200	1000	10/15/19 12:44	10/17/19 11:29	11096-82-5	
PCB, Total	**251000**	ug/kg	54300	27200	1000	10/15/19 12:44	10/17/19 11:29	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 12:44	10/17/19 11:29	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 12:44	10/17/19 11:29	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**8.1**	%	0.10	0.10	1		10/18/19 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: C-05 **Lab ID: 40197032005** Collected: 10/09/19 11:24 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<584**	ug/kg	1170	584	20	10/15/19 12:44	10/17/19 11:47	12674-11-2	
PCB-1221 (Aroclor 1221)	**<584**	ug/kg	1170	584	20	10/15/19 12:44	10/17/19 11:47	11104-28-2	
PCB-1232 (Aroclor 1232)	**<584**	ug/kg	1170	584	20	10/15/19 12:44	10/17/19 11:47	11141-16-5	
PCB-1242 (Aroclor 1242)	**14100**	ug/kg	1170	584	20	10/15/19 12:44	10/17/19 11:47	53469-21-9	
PCB-1248 (Aroclor 1248)	**<584**	ug/kg	1170	584	20	10/15/19 12:44	10/17/19 11:47	12672-29-6	
PCB-1254 (Aroclor 1254)	**<584**	ug/kg	1170	584	20	10/15/19 12:44	10/17/19 11:47	11097-69-1	
PCB-1260 (Aroclor 1260)	**<584**	ug/kg	1170	584	20	10/15/19 12:44	10/17/19 11:47	11096-82-5	
PCB, Total	**14100**	ug/kg	1170	584	20	10/15/19 12:44	10/17/19 11:47	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		20	10/15/19 12:44	10/17/19 11:47	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		20	10/15/19 12:44	10/17/19 11:47	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**14.4**	%	0.10	0.10	1		10/18/19 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: C-06 **Lab ID: 40197032006** Collected: 10/09/19 10:14 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<448**	ug/kg	896	448	15	10/15/19 12:44	10/17/19 12:05	12674-11-2	
PCB-1221 (Aroclor 1221)	**<448**	ug/kg	896	448	15	10/15/19 12:44	10/17/19 12:05	11104-28-2	
PCB-1232 (Aroclor 1232)	**<448**	ug/kg	896	448	15	10/15/19 12:44	10/17/19 12:05	11141-16-5	
PCB-1242 (Aroclor 1242)	**<448**	ug/kg	896	448	15	10/15/19 12:44	10/17/19 12:05	53469-21-9	
PCB-1248 (Aroclor 1248)	**7490**	ug/kg	896	448	15	10/15/19 12:44	10/17/19 12:05	12672-29-6	
PCB-1254 (Aroclor 1254)	**<448**	ug/kg	896	448	15	10/15/19 12:44	10/17/19 12:05	11097-69-1	
PCB-1260 (Aroclor 1260)	**<448**	ug/kg	896	448	15	10/15/19 12:44	10/17/19 12:05	11096-82-5	
PCB, Total	**7490**	ug/kg	896	448	15	10/15/19 12:44	10/17/19 12:05	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		15	10/15/19 12:44	10/17/19 12:05	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		15	10/15/19 12:44	10/17/19 12:05	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**16.3**	%	0.10	0.10	1		10/18/19 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: C-07 **Lab ID: 40197032007** Collected: 10/09/19 10:05 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<413**	ug/kg	827	413	15	10/15/19 12:44	10/17/19 12:24	12674-11-2	
PCB-1221 (Aroclor 1221)	**<413**	ug/kg	827	413	15	10/15/19 12:44	10/17/19 12:24	11104-28-2	
PCB-1232 (Aroclor 1232)	**<413**	ug/kg	827	413	15	10/15/19 12:44	10/17/19 12:24	11141-16-5	
PCB-1242 (Aroclor 1242)	**10100**	ug/kg	827	413	15	10/15/19 12:44	10/17/19 12:24	53469-21-9	
PCB-1248 (Aroclor 1248)	**<413**	ug/kg	827	413	15	10/15/19 12:44	10/17/19 12:24	12672-29-6	
PCB-1254 (Aroclor 1254)	**<413**	ug/kg	827	413	15	10/15/19 12:44	10/17/19 12:24	11097-69-1	
PCB-1260 (Aroclor 1260)	**<413**	ug/kg	827	413	15	10/15/19 12:44	10/17/19 12:24	11096-82-5	
PCB, Total	**10100**	ug/kg	827	413	15	10/15/19 12:44	10/17/19 12:24	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		15	10/15/19 12:44	10/17/19 12:24	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		15	10/15/19 12:44	10/17/19 12:24	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**9.2**	%	0.10	0.10	1		10/18/19 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: C-02-DUP **Lab ID: 40197032008** Collected: 10/09/19 11:00 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<15000**	ug/kg	30000	15000	500	10/15/19 12:44	10/17/19 12:42	12674-11-2	
PCB-1221 (Aroclor 1221)	**<15000**	ug/kg	30000	15000	500	10/15/19 12:44	10/17/19 12:42	11104-28-2	
PCB-1232 (Aroclor 1232)	**<15000**	ug/kg	30000	15000	500	10/15/19 12:44	10/17/19 12:42	11141-16-5	
PCB-1242 (Aroclor 1242)	**145000**	ug/kg	30000	15000	500	10/15/19 12:44	10/17/19 12:42	53469-21-9	
PCB-1248 (Aroclor 1248)	**<15000**	ug/kg	30000	15000	500	10/15/19 12:44	10/17/19 12:42	12672-29-6	
PCB-1254 (Aroclor 1254)	**<15000**	ug/kg	30000	15000	500	10/15/19 12:44	10/17/19 12:42	11097-69-1	
PCB-1260 (Aroclor 1260)	**<15000**	ug/kg	30000	15000	500	10/15/19 12:44	10/17/19 12:42	11096-82-5	
PCB, Total	**145000**	ug/kg	30000	15000	500	10/15/19 12:44	10/17/19 12:42	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		500	10/15/19 12:44	10/17/19 12:42	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		500	10/15/19 12:44	10/17/19 12:42	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**16.6**	%	0.10	0.10	1		10/18/19 08:47		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-01 **Lab ID: 40197032009** Collected: 10/09/19 09:42 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<581**	ug/kg	1160	581	20	10/15/19 12:44	10/17/19 13:00	12674-11-2	
PCB-1221 (Aroclor 1221)	**<581**	ug/kg	1160	581	20	10/15/19 12:44	10/17/19 13:00	11104-28-2	
PCB-1232 (Aroclor 1232)	**<581**	ug/kg	1160	581	20	10/15/19 12:44	10/17/19 13:00	11141-16-5	
PCB-1242 (Aroclor 1242)	**17700**	ug/kg	1160	581	20	10/15/19 12:44	10/17/19 13:00	53469-21-9	
PCB-1248 (Aroclor 1248)	**<581**	ug/kg	1160	581	20	10/15/19 12:44	10/17/19 13:00	12672-29-6	
PCB-1254 (Aroclor 1254)	**<581**	ug/kg	1160	581	20	10/15/19 12:44	10/17/19 13:00	11097-69-1	
PCB-1260 (Aroclor 1260)	**<581**	ug/kg	1160	581	20	10/15/19 12:44	10/17/19 13:00	11096-82-5	
PCB, Total	**17700**	ug/kg	1160	581	20	10/15/19 12:44	10/17/19 13:00	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		20	10/15/19 12:44	10/17/19 13:00	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		20	10/15/19 12:44	10/17/19 13:00	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**14.2**	%	0.10	0.10	1		10/17/19 16:24		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-02 **Lab ID: 40197032010** Collected: 10/09/19 09:45 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<27100**	ug/kg	54300	27100	1000	10/15/19 12:44	10/17/19 13:18	12674-11-2	
PCB-1221 (Aroclor 1221)	**<27100**	ug/kg	54300	27100	1000	10/15/19 12:44	10/17/19 13:18	11104-28-2	
PCB-1232 (Aroclor 1232)	**<27100**	ug/kg	54300	27100	1000	10/15/19 12:44	10/17/19 13:18	11141-16-5	
PCB-1242 (Aroclor 1242)	**402000**	ug/kg	54300	27100	1000	10/15/19 12:44	10/17/19 13:18	53469-21-9	
PCB-1248 (Aroclor 1248)	**<27100**	ug/kg	54300	27100	1000	10/15/19 12:44	10/17/19 13:18	12672-29-6	
PCB-1254 (Aroclor 1254)	**<27100**	ug/kg	54300	27100	1000	10/15/19 12:44	10/17/19 13:18	11097-69-1	
PCB-1260 (Aroclor 1260)	**<27100**	ug/kg	54300	27100	1000	10/15/19 12:44	10/17/19 13:18	11096-82-5	
PCB, Total	**402000**	ug/kg	54300	27100	1000	10/15/19 12:44	10/17/19 13:18	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 12:44	10/17/19 13:18	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 12:44	10/17/19 13:18	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**8.2**	%	0.10	0.10	1		10/17/19 16:24		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-03 **Lab ID: 40197032011** Collected: 10/09/19 10:37 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<26200**	ug/kg	52400	26200	1000	10/15/19 12:44	10/17/19 13:36	12674-11-2	
PCB-1221 (Aroclor 1221)	**<26200**	ug/kg	52400	26200	1000	10/15/19 12:44	10/17/19 13:36	11104-28-2	
PCB-1232 (Aroclor 1232)	**<26200**	ug/kg	52400	26200	1000	10/15/19 12:44	10/17/19 13:36	11141-16-5	
PCB-1242 (Aroclor 1242)	**481000**	ug/kg	52400	26200	1000	10/15/19 12:44	10/17/19 13:36	53469-21-9	
PCB-1248 (Aroclor 1248)	**<26200**	ug/kg	52400	26200	1000	10/15/19 12:44	10/17/19 13:36	12672-29-6	
PCB-1254 (Aroclor 1254)	**<26200**	ug/kg	52400	26200	1000	10/15/19 12:44	10/17/19 13:36	11097-69-1	
PCB-1260 (Aroclor 1260)	**<26200**	ug/kg	52400	26200	1000	10/15/19 12:44	10/17/19 13:36	11096-82-5	M6
PCB, Total	**481000**	ug/kg	52400	26200	1000	10/15/19 12:44	10/17/19 13:36	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 12:44	10/17/19 13:36	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 12:44	10/17/19 13:36	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**4.4**	%	0.10	0.10	1		10/17/19 16:24		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-04 **Lab ID: 40197032012** Collected: 10/09/19 10:46 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<14900**	ug/kg	29800	14900	500	10/15/19 12:44	10/17/19 13:55	12674-11-2	
PCB-1221 (Aroclor 1221)	**<14900**	ug/kg	29800	14900	500	10/15/19 12:44	10/17/19 13:55	11104-28-2	
PCB-1232 (Aroclor 1232)	**<14900**	ug/kg	29800	14900	500	10/15/19 12:44	10/17/19 13:55	11141-16-5	
PCB-1242 (Aroclor 1242)	**77600**	ug/kg	29800	14900	500	10/15/19 12:44	10/17/19 13:55	53469-21-9	
PCB-1248 (Aroclor 1248)	**<14900**	ug/kg	29800	14900	500	10/15/19 12:44	10/17/19 13:55	12672-29-6	
PCB-1254 (Aroclor 1254)	**<14900**	ug/kg	29800	14900	500	10/15/19 12:44	10/17/19 13:55	11097-69-1	
PCB-1260 (Aroclor 1260)	**<14900**	ug/kg	29800	14900	500	10/15/19 12:44	10/17/19 13:55	11096-82-5	
PCB, Total	**77600**	ug/kg	29800	14900	500	10/15/19 12:44	10/17/19 13:55	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		500	10/15/19 12:44	10/17/19 13:55	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		500	10/15/19 12:44	10/17/19 13:55	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**15.7**	%	0.10	0.10	1		10/17/19 16:24		

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-05 **Lab ID: 40197032013** Collected: 10/09/19 10:26 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<13300**	ug/kg	26700	13300	500	10/15/19 12:44	10/17/19 14:13	12674-11-2	
PCB-1221 (Aroclor 1221)	**<13300**	ug/kg	26700	13300	500	10/15/19 12:44	10/17/19 14:13	11104-28-2	
PCB-1232 (Aroclor 1232)	**<13300**	ug/kg	26700	13300	500	10/15/19 12:44	10/17/19 14:13	11141-16-5	
PCB-1242 (Aroclor 1242)	**<13300**	ug/kg	26700	13300	500	10/15/19 12:44	10/17/19 14:13	53469-21-9	
PCB-1248 (Aroclor 1248)	**57000**	ug/kg	26700	13300	500	10/15/19 12:44	10/17/19 14:13	12672-29-6	
PCB-1254 (Aroclor 1254)	**<13300**	ug/kg	26700	13300	500	10/15/19 12:44	10/17/19 14:13	11097-69-1	
PCB-1260 (Aroclor 1260)	**<13300**	ug/kg	26700	13300	500	10/15/19 12:44	10/17/19 14:13	11096-82-5	
PCB, Total	**57000**	ug/kg	26700	13300	500	10/15/19 12:44	10/17/19 14:13	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		500	10/15/19 12:44	10/17/19 14:13	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		500	10/15/19 12:44	10/17/19 14:13	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**6.5**	%	0.10	0.10	1		10/17/19 16:24		

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-06 **Lab ID: 40197032014** Collected: 10/09/19 10:20 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<5710**	ug/kg	11400	5710	200	10/15/19 18:53	10/17/19 16:57	12674-11-2	
PCB-1221 (Aroclor 1221)	**<5710**	ug/kg	11400	5710	200	10/15/19 18:53	10/17/19 16:57	11104-28-2	
PCB-1232 (Aroclor 1232)	**<5710**	ug/kg	11400	5710	200	10/15/19 18:53	10/17/19 16:57	11141-16-5	
PCB-1242 (Aroclor 1242)	**24400**	ug/kg	11400	5710	200	10/15/19 18:53	10/17/19 16:57	53469-21-9	
PCB-1248 (Aroclor 1248)	**<5710**	ug/kg	11400	5710	200	10/15/19 18:53	10/17/19 16:57	12672-29-6	
PCB-1254 (Aroclor 1254)	**<5710**	ug/kg	11400	5710	200	10/15/19 18:53	10/17/19 16:57	11097-69-1	
PCB-1260 (Aroclor 1260)	**<5710**	ug/kg	11400	5710	200	10/15/19 18:53	10/17/19 16:57	11096-82-5	
PCB, Total	**24400**	ug/kg	11400	5710	200	10/15/19 18:53	10/17/19 16:57	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		200	10/15/19 18:53	10/17/19 16:57	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		200	10/15/19 18:53	10/17/19 16:57	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**12.4**	%	0.10	0.10	1		10/17/19 16:25		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-07 **Lab ID: 40197032015** Collected: 10/09/19 09:53 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<26500**	ug/kg	52900	26500	1000	10/15/19 18:53	10/17/19 17:15	12674-11-2	
PCB-1221 (Aroclor 1221)	**<26500**	ug/kg	52900	26500	1000	10/15/19 18:53	10/17/19 17:15	11104-28-2	
PCB-1232 (Aroclor 1232)	**<26500**	ug/kg	52900	26500	1000	10/15/19 18:53	10/17/19 17:15	11141-16-5	
PCB-1242 (Aroclor 1242)	**<26500**	ug/kg	52900	26500	1000	10/15/19 18:53	10/17/19 17:15	53469-21-9	
PCB-1248 (Aroclor 1248)	**71300**	ug/kg	52900	26500	1000	10/15/19 18:53	10/17/19 17:15	12672-29-6	
PCB-1254 (Aroclor 1254)	**<26500**	ug/kg	52900	26500	1000	10/15/19 18:53	10/17/19 17:15	11097-69-1	
PCB-1260 (Aroclor 1260)	**<26500**	ug/kg	52900	26500	1000	10/15/19 18:53	10/17/19 17:15	11096-82-5	
PCB, Total	**71300**	ug/kg	52900	26500	1000	10/15/19 18:53	10/17/19 17:15	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 18:53	10/17/19 17:15	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 18:53	10/17/19 17:15	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**5.5**	%	0.10	0.10	1		10/17/19 16:25		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-08 **Lab ID: 40197032016** Collected: 10/09/19 11:14 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<952**	ug/kg	1900	952	30	10/15/19 18:53	10/17/19 17:33	12674-11-2	
PCB-1221 (Aroclor 1221)	**<952**	ug/kg	1900	952	30	10/15/19 18:53	10/17/19 17:33	11104-28-2	
PCB-1232 (Aroclor 1232)	**<952**	ug/kg	1900	952	30	10/15/19 18:53	10/17/19 17:33	11141-16-5	
PCB-1242 (Aroclor 1242)	**10800**	ug/kg	1900	952	30	10/15/19 18:53	10/17/19 17:33	53469-21-9	
PCB-1248 (Aroclor 1248)	**<952**	ug/kg	1900	952	30	10/15/19 18:53	10/17/19 17:33	12672-29-6	
PCB-1254 (Aroclor 1254)	**<952**	ug/kg	1900	952	30	10/15/19 18:53	10/17/19 17:33	11097-69-1	
PCB-1260 (Aroclor 1260)	**<952**	ug/kg	1900	952	30	10/15/19 18:53	10/17/19 17:33	11096-82-5	M6
PCB, Total	**10800**	ug/kg	1900	952	30	10/15/19 18:53	10/17/19 17:33	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		30	10/15/19 18:53	10/17/19 17:33	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		30	10/15/19 18:53	10/17/19 17:33	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**21.2**	%	0.10	0.10	1		10/17/19 16:25		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-08-DUP **Lab ID: 40197032017** Collected: 10/09/19 11:14 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<630**	ug/kg	1260	630	20	10/15/19 18:53	10/18/19 11:31	12674-11-2	
PCB-1221 (Aroclor 1221)	**<630**	ug/kg	1260	630	20	10/15/19 18:53	10/18/19 11:31	11104-28-2	
PCB-1232 (Aroclor 1232)	**<630**	ug/kg	1260	630	20	10/15/19 18:53	10/18/19 11:31	11141-16-5	
PCB-1242 (Aroclor 1242)	**9530**	ug/kg	1260	630	20	10/15/19 18:53	10/18/19 11:31	53469-21-9	
PCB-1248 (Aroclor 1248)	**<630**	ug/kg	1260	630	20	10/15/19 18:53	10/18/19 11:31	12672-29-6	
PCB-1254 (Aroclor 1254)	**<630**	ug/kg	1260	630	20	10/15/19 18:53	10/18/19 11:31	11097-69-1	
PCB-1260 (Aroclor 1260)	**<630**	ug/kg	1260	630	20	10/15/19 18:53	10/18/19 11:31	11096-82-5	
PCB, Total	**9530**	ug/kg	1260	630	20	10/15/19 18:53	10/18/19 11:31	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		20	10/15/19 18:53	10/18/19 11:31	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		20	10/15/19 18:53	10/18/19 11:31	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**20.7**	%	0.10	0.10	1		10/17/19 16:25		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-09 **Lab ID: 40197032018** Collected: 10/09/19 10:09 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<56.9**	ug/kg	114	56.9	2	10/15/19 18:53	10/18/19 11:53	12674-11-2	
PCB-1221 (Aroclor 1221)	**<56.9**	ug/kg	114	56.9	2	10/15/19 18:53	10/18/19 11:53	11104-28-2	
PCB-1232 (Aroclor 1232)	**<56.9**	ug/kg	114	56.9	2	10/15/19 18:53	10/18/19 11:53	11141-16-5	
PCB-1242 (Aroclor 1242)	**782**	ug/kg	114	56.9	2	10/15/19 18:53	10/18/19 11:53	53469-21-9	
PCB-1248 (Aroclor 1248)	**<56.9**	ug/kg	114	56.9	2	10/15/19 18:53	10/18/19 11:53	12672-29-6	
PCB-1254 (Aroclor 1254)	**<56.9**	ug/kg	114	56.9	2	10/15/19 18:53	10/18/19 11:53	11097-69-1	
PCB-1260 (Aroclor 1260)	**<56.9**	ug/kg	114	56.9	2	10/15/19 18:53	10/18/19 11:53	11096-82-5	
PCB, Total	**782**	ug/kg	114	56.9	2	10/15/19 18:53	10/18/19 11:53	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	89	%	57-115		2	10/15/19 18:53	10/18/19 11:53	877-09-8	
Decachlorobiphenyl (S)	90	%	47-97		2	10/15/19 18:53	10/18/19 11:53	2051-24-3	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**12.2**	%	0.10	0.10	1		10/17/19 16:25		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: DC-10 **Lab ID: 40197032019** Collected: 10/09/19 10:01 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<872**	ug/kg	1740	872	30	10/15/19 18:53	10/17/19 18:27	12674-11-2	
PCB-1221 (Aroclor 1221)	**<872**	ug/kg	1740	872	30	10/15/19 18:53	10/17/19 18:27	11104-28-2	
PCB-1232 (Aroclor 1232)	**<872**	ug/kg	1740	872	30	10/15/19 18:53	10/17/19 18:27	11141-16-5	
PCB-1242 (Aroclor 1242)	**18700**	ug/kg	1740	872	30	10/15/19 18:53	10/17/19 18:27	53469-21-9	
PCB-1248 (Aroclor 1248)	**<872**	ug/kg	1740	872	30	10/15/19 18:53	10/17/19 18:27	12672-29-6	
PCB-1254 (Aroclor 1254)	**<872**	ug/kg	1740	872	30	10/15/19 18:53	10/17/19 18:27	11097-69-1	
PCB-1260 (Aroclor 1260)	**<872**	ug/kg	1740	872	30	10/15/19 18:53	10/17/19 18:27	11096-82-5	
PCB, Total	**18700**	ug/kg	1740	872	30	10/15/19 18:53	10/17/19 18:27	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		30	10/15/19 18:53	10/17/19 18:27	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		30	10/15/19 18:53	10/17/19 18:27	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**13.9**	%	0.10	0.10	1		10/17/19 16:25		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-01 **Lab ID: 40197032020** Collected: 10/09/19 12:42 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<25600**	ug/kg	51100	25600	1000	10/15/19 18:53	10/18/19 12:15	12674-11-2	
PCB-1221 (Aroclor 1221)	**<25600**	ug/kg	51100	25600	1000	10/15/19 18:53	10/18/19 12:15	11104-28-2	
PCB-1232 (Aroclor 1232)	**<25600**	ug/kg	51100	25600	1000	10/15/19 18:53	10/18/19 12:15	11141-16-5	
PCB-1242 (Aroclor 1242)	**<25600**	ug/kg	51100	25600	1000	10/15/19 18:53	10/18/19 12:15	53469-21-9	
PCB-1248 (Aroclor 1248)	**140000**	ug/kg	51100	25600	1000	10/15/19 18:53	10/18/19 12:15	12672-29-6	
PCB-1254 (Aroclor 1254)	**<25600**	ug/kg	51100	25600	1000	10/15/19 18:53	10/18/19 12:15	11097-69-1	
PCB-1260 (Aroclor 1260)	**<25600**	ug/kg	51100	25600	1000	10/15/19 18:53	10/18/19 12:15	11096-82-5	
PCB, Total	**140000**	ug/kg	51100	25600	1000	10/15/19 18:53	10/18/19 12:15	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 18:53	10/18/19 12:15	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 18:53	10/18/19 12:15	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**2.2**	%	0.10	0.10	1		10/17/19 16:25		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-02 **Lab ID: 40197032021** Collected: 10/09/19 13:00 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<2560**	ug/kg	5130	2560	100	10/15/19 18:53	10/17/19 19:04	12674-11-2	
PCB-1221 (Aroclor 1221)	**<2560**	ug/kg	5130	2560	100	10/15/19 18:53	10/17/19 19:04	11104-28-2	
PCB-1232 (Aroclor 1232)	**<2560**	ug/kg	5130	2560	100	10/15/19 18:53	10/17/19 19:04	11141-16-5	
PCB-1242 (Aroclor 1242)	**<2560**	ug/kg	5130	2560	100	10/15/19 18:53	10/17/19 19:04	53469-21-9	
PCB-1248 (Aroclor 1248)	**21700**	ug/kg	5130	2560	100	10/15/19 18:53	10/17/19 19:04	12672-29-6	
PCB-1254 (Aroclor 1254)	**<2560**	ug/kg	5130	2560	100	10/15/19 18:53	10/17/19 19:04	11097-69-1	
PCB-1260 (Aroclor 1260)	**<2560**	ug/kg	5130	2560	100	10/15/19 18:53	10/17/19 19:04	11096-82-5	
PCB, Total	**21700**	ug/kg	5130	2560	100	10/15/19 18:53	10/17/19 19:04	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		100	10/15/19 18:53	10/17/19 19:04	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		100	10/15/19 18:53	10/17/19 19:04	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**2.4**	%	0.10	0.10	1		10/17/19 16:26		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-03 **Lab ID: 40197032022** Collected: 10/09/19 13:14 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<53100**	ug/kg	106000	53100	2000	10/15/19 18:53	10/18/19 07:20	12674-11-2	
PCB-1221 (Aroclor 1221)	**<53100**	ug/kg	106000	53100	2000	10/15/19 18:53	10/18/19 07:20	11104-28-2	
PCB-1232 (Aroclor 1232)	**<53100**	ug/kg	106000	53100	2000	10/15/19 18:53	10/18/19 07:20	11141-16-5	
PCB-1242 (Aroclor 1242)	**<53100**	ug/kg	106000	53100	2000	10/15/19 18:53	10/18/19 07:20	53469-21-9	
PCB-1248 (Aroclor 1248)	**277000**	ug/kg	106000	53100	2000	10/15/19 18:53	10/18/19 07:20	12672-29-6	
PCB-1254 (Aroclor 1254)	**<53100**	ug/kg	106000	53100	2000	10/15/19 18:53	10/18/19 07:20	11097-69-1	
PCB-1260 (Aroclor 1260)	**<53100**	ug/kg	106000	53100	2000	10/15/19 18:53	10/18/19 07:20	11096-82-5	
PCB, Total	**277000**	ug/kg	106000	53100	2000	10/15/19 18:53	10/18/19 07:20	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		2000	10/15/19 18:53	10/18/19 07:20	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		2000	10/15/19 18:53	10/18/19 07:20	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**5.9**	%	0.10	0.10	1		10/17/19 16:26		

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-04 **Lab ID: 40197032023** Collected: 10/09/19 13:31 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<27300**	ug/kg	54600	27300	1000	10/15/19 18:53	10/18/19 07:38	12674-11-2	
PCB-1221 (Aroclor 1221)	**<27300**	ug/kg	54600	27300	1000	10/15/19 18:53	10/18/19 07:38	11104-28-2	
PCB-1232 (Aroclor 1232)	**<27300**	ug/kg	54600	27300	1000	10/15/19 18:53	10/18/19 07:38	11141-16-5	
PCB-1242 (Aroclor 1242)	**<27300**	ug/kg	54600	27300	1000	10/15/19 18:53	10/18/19 07:38	53469-21-9	
PCB-1248 (Aroclor 1248)	**200000**	ug/kg	54600	27300	1000	10/15/19 18:53	10/18/19 07:38	12672-29-6	
PCB-1254 (Aroclor 1254)	**<27300**	ug/kg	54600	27300	1000	10/15/19 18:53	10/18/19 07:38	11097-69-1	
PCB-1260 (Aroclor 1260)	**<27300**	ug/kg	54600	27300	1000	10/15/19 18:53	10/18/19 07:38	11096-82-5	
PCB, Total	**200000**	ug/kg	54600	27300	1000	10/15/19 18:53	10/18/19 07:38	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 18:53	10/18/19 07:38	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 18:53	10/18/19 07:38	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**8.4**	%	0.10	0.10	1		10/17/19 16:26		

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-05 **Lab ID: 40197032024** Collected: 10/09/19 13:43 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<78300**	ug/kg	157000	78300	3000	10/15/19 18:53	10/18/19 07:56	12674-11-2	
PCB-1221 (Aroclor 1221)	**<78300**	ug/kg	157000	78300	3000	10/15/19 18:53	10/18/19 07:56	11104-28-2	
PCB-1232 (Aroclor 1232)	**<78300**	ug/kg	157000	78300	3000	10/15/19 18:53	10/18/19 07:56	11141-16-5	
PCB-1242 (Aroclor 1242)	**<78300**	ug/kg	157000	78300	3000	10/15/19 18:53	10/18/19 07:56	53469-21-9	
PCB-1248 (Aroclor 1248)	**337000**	ug/kg	157000	78300	3000	10/15/19 18:53	10/18/19 07:56	12672-29-6	
PCB-1254 (Aroclor 1254)	**<78300**	ug/kg	157000	78300	3000	10/15/19 18:53	10/18/19 07:56	11097-69-1	
PCB-1260 (Aroclor 1260)	**<78300**	ug/kg	157000	78300	3000	10/15/19 18:53	10/18/19 07:56	11096-82-5	
PCB, Total	**337000**	ug/kg	157000	78300	3000	10/15/19 18:53	10/18/19 07:56	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		3000	10/15/19 18:53	10/18/19 07:56	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		3000	10/15/19 18:53	10/18/19 07:56	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**4.2**	%	0.10	0.10	1		10/17/19 16:26		

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-06 **Lab ID: 40197032025** Collected: 10/09/19 13:57 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<918**	ug/kg	1840	918	30	10/15/19 18:53	10/18/19 08:14	12674-11-2	
PCB-1221 (Aroclor 1221)	**<918**	ug/kg	1840	918	30	10/15/19 18:53	10/18/19 08:14	11104-28-2	
PCB-1232 (Aroclor 1232)	**<918**	ug/kg	1840	918	30	10/15/19 18:53	10/18/19 08:14	11141-16-5	
PCB-1242 (Aroclor 1242)	**27200**	ug/kg	1840	918	30	10/15/19 18:53	10/18/19 08:14	53469-21-9	
PCB-1248 (Aroclor 1248)	**<918**	ug/kg	1840	918	30	10/15/19 18:53	10/18/19 08:14	12672-29-6	
PCB-1254 (Aroclor 1254)	**<918**	ug/kg	1840	918	30	10/15/19 18:53	10/18/19 08:14	11097-69-1	
PCB-1260 (Aroclor 1260)	**<918**	ug/kg	1840	918	30	10/15/19 18:53	10/18/19 08:14	11096-82-5	
PCB, Total	**27200**	ug/kg	1840	918	30	10/15/19 18:53	10/18/19 08:14	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		30	10/15/19 18:53	10/18/19 08:14	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		30	10/15/19 18:53	10/18/19 08:14	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.3**	%	0.10	0.10	1		10/17/19 16:26		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-07 **Lab ID: 40197032026** Collected: 10/09/19 14:04 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<29400**	ug/kg	58800	29400	1000	10/15/19 18:53	10/18/19 08:33	12674-11-2	
PCB-1221 (Aroclor 1221)	**<29400**	ug/kg	58800	29400	1000	10/15/19 18:53	10/18/19 08:33	11104-28-2	
PCB-1232 (Aroclor 1232)	**<29400**	ug/kg	58800	29400	1000	10/15/19 18:53	10/18/19 08:33	11141-16-5	
PCB-1242 (Aroclor 1242)	**154000**	ug/kg	58800	29400	1000	10/15/19 18:53	10/18/19 08:33	53469-21-9	
PCB-1248 (Aroclor 1248)	**<29400**	ug/kg	58800	29400	1000	10/15/19 18:53	10/18/19 08:33	12672-29-6	
PCB-1254 (Aroclor 1254)	**<29400**	ug/kg	58800	29400	1000	10/15/19 18:53	10/18/19 08:33	11097-69-1	
PCB-1260 (Aroclor 1260)	**<29400**	ug/kg	58800	29400	1000	10/15/19 18:53	10/18/19 08:33	11096-82-5	
PCB, Total	**154000**	ug/kg	58800	29400	1000	10/15/19 18:53	10/18/19 08:33	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 18:53	10/18/19 08:33	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 18:53	10/18/19 08:33	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**15.0**	%	0.10	0.10	1		10/17/19 16:26		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-08 **Lab ID: 40197032027** Collected: 10/09/19 14:11 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<5990**	ug/kg	12000	5990	200	10/15/19 18:53	10/18/19 08:55	12674-11-2	
PCB-1221 (Aroclor 1221)	**<5990**	ug/kg	12000	5990	200	10/15/19 18:53	10/18/19 08:55	11104-28-2	
PCB-1232 (Aroclor 1232)	**<5990**	ug/kg	12000	5990	200	10/15/19 18:53	10/18/19 08:55	11141-16-5	
PCB-1242 (Aroclor 1242)	**51300**	ug/kg	12000	5990	200	10/15/19 18:53	10/18/19 08:55	53469-21-9	
PCB-1248 (Aroclor 1248)	**<5990**	ug/kg	12000	5990	200	10/15/19 18:53	10/18/19 08:55	12672-29-6	
PCB-1254 (Aroclor 1254)	**<5990**	ug/kg	12000	5990	200	10/15/19 18:53	10/18/19 08:55	11097-69-1	
PCB-1260 (Aroclor 1260)	**<5990**	ug/kg	12000	5990	200	10/15/19 18:53	10/18/19 08:55	11096-82-5	
PCB, Total	**51300**	ug/kg	12000	5990	200	10/15/19 18:53	10/18/19 08:55	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		200	10/15/19 18:53	10/18/19 08:55	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		200	10/15/19 18:53	10/18/19 08:55	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**16.6**	%	0.10	0.10	1		10/17/19 16:26		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-09 **Lab ID: 40197032028** Collected: 10/09/19 14:17 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<9190**	ug/kg	18400	9190	300	10/15/19 18:53	10/18/19 09:17	12674-11-2	
PCB-1221 (Aroclor 1221)	**<9190**	ug/kg	18400	9190	300	10/15/19 18:53	10/18/19 09:17	11104-28-2	
PCB-1232 (Aroclor 1232)	**<9190**	ug/kg	18400	9190	300	10/15/19 18:53	10/18/19 09:17	11141-16-5	
PCB-1242 (Aroclor 1242)	**<9190**	ug/kg	18400	9190	300	10/15/19 18:53	10/18/19 09:17	53469-21-9	
PCB-1248 (Aroclor 1248)	**137000**	ug/kg	18400	9190	300	10/15/19 18:53	10/18/19 09:17	12672-29-6	
PCB-1254 (Aroclor 1254)	**<9190**	ug/kg	18400	9190	300	10/15/19 18:53	10/18/19 09:17	11097-69-1	
PCB-1260 (Aroclor 1260)	**<9190**	ug/kg	18400	9190	300	10/15/19 18:53	10/18/19 09:17	11096-82-5	
PCB, Total	**137000**	ug/kg	18400	9190	300	10/15/19 18:53	10/18/19 09:17	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		300	10/15/19 18:53	10/18/19 09:17	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		300	10/15/19 18:53	10/18/19 09:17	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.4**	%	0.10	0.10	1		10/17/19 16:26		

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-10 **Lab ID: 40197032029** Collected: 10/09/19 14:24 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<61500**	ug/kg	123000	61500	2000	10/15/19 18:53	10/18/19 09:39	12674-11-2	
PCB-1221 (Aroclor 1221)	**<61500**	ug/kg	123000	61500	2000	10/15/19 18:53	10/18/19 09:39	11104-28-2	
PCB-1232 (Aroclor 1232)	**<61500**	ug/kg	123000	61500	2000	10/15/19 18:53	10/18/19 09:39	11141-16-5	
PCB-1242 (Aroclor 1242)	**360000**	ug/kg	123000	61500	2000	10/15/19 18:53	10/18/19 09:39	53469-21-9	
PCB-1248 (Aroclor 1248)	**<61500**	ug/kg	123000	61500	2000	10/15/19 18:53	10/18/19 09:39	12672-29-6	
PCB-1254 (Aroclor 1254)	**<61500**	ug/kg	123000	61500	2000	10/15/19 18:53	10/18/19 09:39	11097-69-1	
PCB-1260 (Aroclor 1260)	**<61500**	ug/kg	123000	61500	2000	10/15/19 18:53	10/18/19 09:39	11096-82-5	
PCB, Total	**360000**	ug/kg	123000	61500	2000	10/15/19 18:53	10/18/19 09:39	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		2000	10/15/19 18:53	10/18/19 09:39	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		2000	10/15/19 18:53	10/18/19 09:39	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**18.7**	%	0.10	0.10	1		10/17/19 16:54		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-11 **Lab ID: 40197032030** Collected: 10/09/19 14:33 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<28900**	ug/kg	57800	28900	1000	10/15/19 18:53	10/18/19 10:02	12674-11-2	
PCB-1221 (Aroclor 1221)	**<28900**	ug/kg	57800	28900	1000	10/15/19 18:53	10/18/19 10:02	11104-28-2	
PCB-1232 (Aroclor 1232)	**<28900**	ug/kg	57800	28900	1000	10/15/19 18:53	10/18/19 10:02	11141-16-5	
PCB-1242 (Aroclor 1242)	**85100**	ug/kg	57800	28900	1000	10/15/19 18:53	10/18/19 10:02	53469-21-9	
PCB-1248 (Aroclor 1248)	**<28900**	ug/kg	57800	28900	1000	10/15/19 18:53	10/18/19 10:02	12672-29-6	
PCB-1254 (Aroclor 1254)	**<28900**	ug/kg	57800	28900	1000	10/15/19 18:53	10/18/19 10:02	11097-69-1	
PCB-1260 (Aroclor 1260)	**<28900**	ug/kg	57800	28900	1000	10/15/19 18:53	10/18/19 10:02	11096-82-5	
PCB, Total	**85100**	ug/kg	57800	28900	1000	10/15/19 18:53	10/18/19 10:02	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 18:53	10/18/19 10:02	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 18:53	10/18/19 10:02	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**13.6**	%	0.10	0.10	1		10/17/19 16:54		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-12 **Lab ID: 40197032031** Collected: 10/09/19 14:40 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<27300**	ug/kg	54700	27300	1000	10/15/19 18:53	10/18/19 10:24	12674-11-2	
PCB-1221 (Aroclor 1221)	**<27300**	ug/kg	54700	27300	1000	10/15/19 18:53	10/18/19 10:24	11104-28-2	
PCB-1232 (Aroclor 1232)	**<27300**	ug/kg	54700	27300	1000	10/15/19 18:53	10/18/19 10:24	11141-16-5	
PCB-1242 (Aroclor 1242)	**<27300**	ug/kg	54700	27300	1000	10/15/19 18:53	10/18/19 10:24	53469-21-9	
PCB-1248 (Aroclor 1248)	**295000**	ug/kg	54700	27300	1000	10/15/19 18:53	10/18/19 10:24	12672-29-6	
PCB-1254 (Aroclor 1254)	**<27300**	ug/kg	54700	27300	1000	10/15/19 18:53	10/18/19 10:24	11097-69-1	
PCB-1260 (Aroclor 1260)	**<27300**	ug/kg	54700	27300	1000	10/15/19 18:53	10/18/19 10:24	11096-82-5	
PCB, Total	**295000**	ug/kg	54700	27300	1000	10/15/19 18:53	10/18/19 10:24	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 18:53	10/18/19 10:24	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 18:53	10/18/19 10:24	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**8.6**	%	0.10	0.10	1		10/17/19 16:55		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-13 **Lab ID: 40197032032** Collected: 10/09/19 14:46 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<30100**	ug/kg	60300	30100	1000	10/15/19 18:53	10/18/19 10:46	12674-11-2	
PCB-1221 (Aroclor 1221)	**<30100**	ug/kg	60300	30100	1000	10/15/19 18:53	10/18/19 10:46	11104-28-2	
PCB-1232 (Aroclor 1232)	**<30100**	ug/kg	60300	30100	1000	10/15/19 18:53	10/18/19 10:46	11141-16-5	
PCB-1242 (Aroclor 1242)	**247000**	ug/kg	60300	30100	1000	10/15/19 18:53	10/18/19 10:46	53469-21-9	
PCB-1248 (Aroclor 1248)	**<30100**	ug/kg	60300	30100	1000	10/15/19 18:53	10/18/19 10:46	12672-29-6	
PCB-1254 (Aroclor 1254)	**<30100**	ug/kg	60300	30100	1000	10/15/19 18:53	10/18/19 10:46	11097-69-1	
PCB-1260 (Aroclor 1260)	**<30100**	ug/kg	60300	30100	1000	10/15/19 18:53	10/18/19 10:46	11096-82-5	
PCB, Total	**247000**	ug/kg	60300	30100	1000	10/15/19 18:53	10/18/19 10:46	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		1000	10/15/19 18:53	10/18/19 10:46	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		1000	10/15/19 18:53	10/18/19 10:46	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.0**	%	0.10	0.10	1		10/17/19 16:55		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: RB-14 **Lab ID: 40197032033** Collected: 10/09/19 14:53 Received: 10/11/19 08:10 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3541								
PCB-1016 (Aroclor 1016)	**<3010**	ug/kg	6010	3010	100	10/15/19 18:53	10/18/19 11:08	12674-11-2	
PCB-1221 (Aroclor 1221)	**<3010**	ug/kg	6010	3010	100	10/15/19 18:53	10/18/19 11:08	11104-28-2	
PCB-1232 (Aroclor 1232)	**<3010**	ug/kg	6010	3010	100	10/15/19 18:53	10/18/19 11:08	11141-16-5	
PCB-1242 (Aroclor 1242)	**40800**	ug/kg	6010	3010	100	10/15/19 18:53	10/18/19 11:08	53469-21-9	
PCB-1248 (Aroclor 1248)	**<3010**	ug/kg	6010	3010	100	10/15/19 18:53	10/18/19 11:08	12672-29-6	
PCB-1254 (Aroclor 1254)	**<3010**	ug/kg	6010	3010	100	10/15/19 18:53	10/18/19 11:08	11097-69-1	
PCB-1260 (Aroclor 1260)	**<3010**	ug/kg	6010	3010	100	10/15/19 18:53	10/18/19 11:08	11096-82-5	
PCB, Total	**40800**	ug/kg	6010	3010	100	10/15/19 18:53	10/18/19 11:08	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	0	%	57-115		100	10/15/19 18:53	10/18/19 11:08	877-09-8	S4
Decachlorobiphenyl (S)	0	%	47-97		100	10/15/19 18:53	10/18/19 11:08	2051-24-3	S4
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**16.9**	%	0.10	0.10	1		10/17/19 16:55		

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ANALYTICAL RESULTS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Sample: EB-01 **Lab ID: 40197032034** Collected: 10/09/19 11:38 Received: 10/11/19 08:10 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
8082 GCS PCB	Analytical Method: EPA 8082 Preparation Method: EPA 3510								
PCB-1016 (Aroclor 1016)	**<0.11**	ug/L	0.48	0.11	1	10/14/19 08:00	10/16/19 18:04	12674-11-2	
PCB-1221 (Aroclor 1221)	**<0.11**	ug/L	0.48	0.11	1	10/14/19 08:00	10/16/19 18:04	11104-28-2	
PCB-1232 (Aroclor 1232)	**<0.11**	ug/L	0.48	0.11	1	10/14/19 08:00	10/16/19 18:04	11141-16-5	
PCB-1242 (Aroclor 1242)	**<0.11**	ug/L	0.48	0.11	1	10/14/19 08:00	10/16/19 18:04	53469-21-9	
PCB-1248 (Aroclor 1248)	**<0.11**	ug/L	0.48	0.11	1	10/14/19 08:00	10/16/19 18:04	12672-29-6	
PCB-1254 (Aroclor 1254)	**<0.11**	ug/L	0.48	0.11	1	10/14/19 08:00	10/16/19 18:04	11097-69-1	
PCB-1260 (Aroclor 1260)	**<0.11**	ug/L	0.48	0.11	1	10/14/19 08:00	10/16/19 18:04	11096-82-5	
PCB, Total	**<0.11**	ug/L	0.48	0.11	1	10/14/19 08:00	10/16/19 18:04	1336-36-3	
Surrogates									
Tetrachloro-m-xylene (S)	86	%	43-112		1	10/14/19 08:00	10/16/19 18:04	877-09-8	
Decachlorobiphenyl (S)	58	%	10-103		1	10/14/19 08:00	10/16/19 18:04	2051-24-3	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

QC Batch: 337525 Analysis Method: EPA 8082
QC Batch Method: EPA 3541 Analysis Description: 8082 GCS PCB
Associated Lab Samples: 40197032001, 40197032002, 40197032003, 40197032004, 40197032005, 40197032006, 40197032007, 40197032008, 40197032009, 40197032010, 40197032011, 40197032012, 40197032013

METHOD BLANK: 1960620 Matrix: Solid
Associated Lab Samples: 40197032001, 40197032002, 40197032003, 40197032004, 40197032005, 40197032006, 40197032007, 40197032008, 40197032009, 40197032010, 40197032011, 40197032012, 40197032013

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	<25.0	50.0	10/17/19 06:56	
PCB-1221 (Aroclor 1221)	ug/kg	<25.0	50.0	10/17/19 06:56	
PCB-1232 (Aroclor 1232)	ug/kg	<25.0	50.0	10/17/19 06:56	
PCB-1242 (Aroclor 1242)	ug/kg	<25.0	50.0	10/17/19 06:56	
PCB-1248 (Aroclor 1248)	ug/kg	<25.0	50.0	10/17/19 06:56	
PCB-1254 (Aroclor 1254)	ug/kg	<25.0	50.0	10/17/19 06:56	
PCB-1260 (Aroclor 1260)	ug/kg	<25.0	50.0	10/17/19 06:56	
Decachlorobiphenyl (S)	%	92	47-97	10/17/19 06:56	
Tetrachloro-m-xylene (S)	%	92	57-115	10/17/19 06:56	

LABORATORY CONTROL SAMPLE: 1960621

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg		<25.0			
PCB-1221 (Aroclor 1221)	ug/kg		<25.0			
PCB-1232 (Aroclor 1232)	ug/kg		<25.0			
PCB-1242 (Aroclor 1242)	ug/kg		<25.0			
PCB-1248 (Aroclor 1248)	ug/kg		<25.0			
PCB-1254 (Aroclor 1254)	ug/kg		<25.0			
PCB-1260 (Aroclor 1260)	ug/kg	500	426	85	64-115	
Decachlorobiphenyl (S)	%			91	47-97	
Tetrachloro-m-xylene (S)	%			89	57-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1960622 1960623

Parameter	Units	40197032011 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	ug/kg	<26200			<26100	<26100					20	
PCB-1221 (Aroclor 1221)	ug/kg	<26200			<26100	<26100					20	
PCB-1232 (Aroclor 1232)	ug/kg	<26200			<26100	<26100					20	
PCB-1242 (Aroclor 1242)	ug/kg	481000			189000	412000				74	20	
PCB-1248 (Aroclor 1248)	ug/kg	<26200			<26100	<26100					20	
PCB-1254 (Aroclor 1254)	ug/kg	<26200			<26100	<26100					20	
PCB-1260 (Aroclor 1260)	ug/kg	<26200	523	523	<26100	<26100	0	0	49-115		20	M6
Decachlorobiphenyl (S)	%						0	0	47-97			S4
Tetrachloro-m-xylene (S)	%						0	0	57-115			S4

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

QC Batch: 337593 Analysis Method: EPA 8082
QC Batch Method: EPA 3541 Analysis Description: 8082 GCS PCB
Associated Lab Samples: 40197032014, 40197032015, 40197032016, 40197032017, 40197032018, 40197032019, 40197032020, 40197032021, 40197032022, 40197032023, 40197032024, 40197032025, 40197032026, 40197032027, 40197032028, 40197032029, 40197032030, 40197032031, 40197032032, 40197032033

METHOD BLANK: 1961068 Matrix: Solid
Associated Lab Samples: 40197032014, 40197032015, 40197032016, 40197032017, 40197032018, 40197032019, 40197032020, 40197032021, 40197032022, 40197032023, 40197032024, 40197032025, 40197032026, 40197032027, 40197032028, 40197032029, 40197032030, 40197032031, 40197032032, 40197032033

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg	<25.0	50.0	10/17/19 15:44	
PCB-1221 (Aroclor 1221)	ug/kg	<25.0	50.0	10/17/19 15:44	
PCB-1232 (Aroclor 1232)	ug/kg	<25.0	50.0	10/17/19 15:44	
PCB-1242 (Aroclor 1242)	ug/kg	<25.0	50.0	10/17/19 15:44	
PCB-1248 (Aroclor 1248)	ug/kg	<25.0	50.0	10/17/19 15:44	
PCB-1254 (Aroclor 1254)	ug/kg	<25.0	50.0	10/17/19 15:44	
PCB-1260 (Aroclor 1260)	ug/kg	<25.0	50.0	10/17/19 15:44	
Decachlorobiphenyl (S)	%	88	47-97	10/17/19 15:44	
Tetrachloro-m-xylene (S)	%	89	57-115	10/17/19 15:44	

LABORATORY CONTROL SAMPLE: 1961069

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
PCB-1016 (Aroclor 1016)	ug/kg		<25.0			
PCB-1221 (Aroclor 1221)	ug/kg		<25.0			
PCB-1232 (Aroclor 1232)	ug/kg		<25.0			
PCB-1242 (Aroclor 1242)	ug/kg		<25.0			
PCB-1248 (Aroclor 1248)	ug/kg		<25.0			
PCB-1254 (Aroclor 1254)	ug/kg		<25.0			
PCB-1260 (Aroclor 1260)	ug/kg	500	421	84	64-115	
Decachlorobiphenyl (S)	%			91	47-97	
Tetrachloro-m-xylene (S)	%			91	57-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1961070 1961071

Parameter	Units	40197032016 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
PCB-1016 (Aroclor 1016)	ug/kg	<952			<3170	<3170					20	
PCB-1221 (Aroclor 1221)	ug/kg	<952			<3170	<3170					20	
PCB-1232 (Aroclor 1232)	ug/kg	<952			<3170	<3170					20	
PCB-1242 (Aroclor 1242)	ug/kg	10800			19700	12700				43	20	
PCB-1248 (Aroclor 1248)	ug/kg	<952			<3170	<3170					20	
PCB-1254 (Aroclor 1254)	ug/kg	<952			<3170	<3170					20	
PCB-1260 (Aroclor 1260)	ug/kg	<952	634	634	<3170	<3170	0	0	49-115		20	M6
Decachlorobiphenyl (S)	%						0	0	47-97			S4

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QUALITY CONTROL DATA

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1961070 1961071

Parameter	Units	40197032016 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Tetrachloro-m-xylene (S)	%						0	0	57-115			S4

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

QC Batch: 337293 Analysis Method: EPA 8082
QC Batch Method: EPA 3510 Analysis Description: 8082 GCS PCB
Associated Lab Samples: 40197032034

METHOD BLANK: 1960002 Matrix: Water
Associated Lab Samples: 40197032034

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
PCB-1016 (Aroclor 1016)	ug/L	<0.056	0.25	10/16/19 15:31	
PCB-1221 (Aroclor 1221)	ug/L	<0.056	0.25	10/16/19 15:31	
PCB-1232 (Aroclor 1232)	ug/L	<0.056	0.25	10/16/19 15:31	
PCB-1242 (Aroclor 1242)	ug/L	<0.056	0.25	10/16/19 15:31	
PCB-1248 (Aroclor 1248)	ug/L	<0.056	0.25	10/16/19 15:31	
PCB-1254 (Aroclor 1254)	ug/L	<0.056	0.25	10/16/19 15:31	
PCB-1260 (Aroclor 1260)	ug/L	<0.056	0.25	10/16/19 15:31	
Decachlorobiphenyl (S)	%	82	10-103	10/16/19 15:31	
Tetrachloro-m-xylene (S)	%	84	43-112	10/16/19 15:31	

LABORATORY CONTROL SAMPLE & LCSD: 1960003 1960004

Parameter	Units	Spike Conc.	LCS Result	LCSD Result	LCS % Rec	LCSD % Rec	% Rec Limits	RPD	Max RPD	Qualifiers
PCB-1016 (Aroclor 1016)	ug/L		<0.056	<0.056					20	
PCB-1221 (Aroclor 1221)	ug/L		<0.056	<0.056					20	
PCB-1232 (Aroclor 1232)	ug/L		<0.056	<0.056					20	
PCB-1242 (Aroclor 1242)	ug/L		<0.056	<0.056					20	
PCB-1248 (Aroclor 1248)	ug/L		<0.056	<0.056					20	
PCB-1254 (Aroclor 1254)	ug/L		<0.056	<0.056					20	
PCB-1260 (Aroclor 1260)	ug/L	2.5	2.3	2.3	92	91	62-101	1	20	
Decachlorobiphenyl (S)	%				62	36	10-103			
Tetrachloro-m-xylene (S)	%				84	89	43-112			

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QUALITY CONTROL DATA

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

QC Batch: 337908 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 40197032009, 40197032010, 40197032011, 40197032012, 40197032013, 40197032014, 40197032015, 40197032016, 40197032017, 40197032018, 40197032019, 40197032020, 40197032021, 40197032022, 40197032023, 40197032024, 40197032025, 40197032026, 40197032027, 40197032028

SAMPLE DUPLICATE: 1962664

Parameter	Units	40197032025 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	18.3	17.0	8	10	

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REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

QUALITY CONTROL DATA

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

QC Batch: 337921 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 40197032029, 40197032030, 40197032031, 40197032032, 40197032033

SAMPLE DUPLICATE: 1962696

Parameter	Units	40197032029 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	18.7	17.6	6	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

QUALITY CONTROL DATA

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

QC Batch: 337957 Analysis Method: ASTM D2974-87
QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 40197032001, 40197032002, 40197032003, 40197032004, 40197032005, 40197032006, 40197032007, 40197032008

SAMPLE DUPLICATE: 1962804

Parameter	Units	40197330001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	4.3	4.3	0	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALIFIERS

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above LOD.

J - Estimated concentration at or above the LOD and below the LOQ.

LOD - Limit of Detection adjusted for dilution factor, percent moisture, initial weight and final volume.

LOQ - Limit of Quantitation adjusted for dilution factor, percent moisture, initial weight and final volume.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected at or above the adjusted LOD.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-G Pace Analytical Services - Green Bay

BATCH QUALIFIERS

Batch: 337420

[M5] A matrix spike/matrix spike duplicate was not performed for this batch due to insufficient sample volume.

ANALYTE QUALIFIERS

M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.

S4 Surrogate recovery not evaluated against control limits due to sample dilution.

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Green Bay, WI 54302
(920)469-2436

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40197032001	**C-01**	EPA 3541	337525	EPA 8082	337540
40197032002	**C-02**	EPA 3541	337525	EPA 8082	337540
40197032003	**C-03**	EPA 3541	337525	EPA 8082	337540
40197032004	**C-04**	EPA 3541	337525	EPA 8082	337540
40197032005	**C-05**	EPA 3541	337525	EPA 8082	337540
40197032006	**C-06**	EPA 3541	337525	EPA 8082	337540
40197032007	**C-07**	EPA 3541	337525	EPA 8082	337540
40197032008	**C-02-DUP**	EPA 3541	337525	EPA 8082	337540
40197032009	**DC-01**	EPA 3541	337525	EPA 8082	337540
40197032010	**DC-02**	EPA 3541	337525	EPA 8082	337540
40197032011	**DC-03**	EPA 3541	337525	EPA 8082	337540
40197032012	**DC-04**	EPA 3541	337525	EPA 8082	337540
40197032013	**DC-05**	EPA 3541	337525	EPA 8082	337540
40197032014	**DC-06**	EPA 3541	337593	EPA 8082	337594
40197032015	**DC-07**	EPA 3541	337593	EPA 8082	337594
40197032016	**DC-08**	EPA 3541	337593	EPA 8082	337594
40197032017	**DC-08-DUP**	EPA 3541	337593	EPA 8082	337594
40197032018	**DC-09**	EPA 3541	337593	EPA 8082	337594
40197032019	**DC-10**	EPA 3541	337593	EPA 8082	337594
40197032020	**RB-01**	EPA 3541	337593	EPA 8082	337594
40197032021	**RB-02**	EPA 3541	337593	EPA 8082	337594
40197032022	**RB-03**	EPA 3541	337593	EPA 8082	337594
40197032023	**RB-04**	EPA 3541	337593	EPA 8082	337594
40197032024	**RB-05**	EPA 3541	337593	EPA 8082	337594
40197032025	**RB-06**	EPA 3541	337593	EPA 8082	337594
40197032026	**RB-07**	EPA 3541	337593	EPA 8082	337594
40197032027	**RB-08**	EPA 3541	337593	EPA 8082	337594
40197032028	**RB-09**	EPA 3541	337593	EPA 8082	337594
40197032029	**RB-10**	EPA 3541	337593	EPA 8082	337594
40197032030	**RB-11**	EPA 3541	337593	EPA 8082	337594
40197032031	**RB-12**	EPA 3541	337593	EPA 8082	337594
40197032032	**RB-13**	EPA 3541	337593	EPA 8082	337594
40197032033	**RB-14**	EPA 3541	337593	EPA 8082	337594
40197032034	**EB-01**	EPA 3510	337293	EPA 8082	337420
40197032001	**C-01**	ASTM D2974-87	337957		
40197032002	**C-02**	ASTM D2974-87	337957		
40197032003	**C-03**	ASTM D2974-87	337957		
40197032004	**C-04**	ASTM D2974-87	337957		
40197032005	**C-05**	ASTM D2974-87	337957		
40197032006	**C-06**	ASTM D2974-87	337957		
40197032007	**C-07**	ASTM D2974-87	337957		
40197032008	**C-02-DUP**	ASTM D2974-87	337957		
40197032009	**DC-01**	ASTM D2974-87	337908		
40197032010	**DC-02**	ASTM D2974-87	337908		
40197032011	**DC-03**	ASTM D2974-87	337908		
40197032012	**DC-04**	ASTM D2974-87	337908		
40197032013	**DC-05**	ASTM D2974-87	337908		

REPORT OF LABORATORY ANALYSIS

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Green Bay, WI 54302
(920)469-2436

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 1690010224 PROJECT OMAHA
Pace Project No.: 40197032

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
40197032014	**DC-06**	ASTM D2974-87	337908		
40197032015	**DC-07**	ASTM D2974-87	337908		
40197032016	**DC-08**	ASTM D2974-87	337908		
40197032017	**DC-08-DUP**	ASTM D2974-87	337908		
40197032018	**DC-09**	ASTM D2974-87	337908		
40197032019	**DC-10**	ASTM D2974-87	337908		
40197032020	**RB-01**	ASTM D2974-87	337908		
40197032021	**RB-02**	ASTM D2974-87	337908		
40197032022	**RB-03**	ASTM D2974-87	337908		
40197032023	**RB-04**	ASTM D2974-87	337908		
40197032024	**RB-05**	ASTM D2974-87	337908		
40197032025	**RB-06**	ASTM D2974-87	337908		
40197032026	**RB-07**	ASTM D2974-87	337908		
40197032027	**RB-08**	ASTM D2974-87	337908		
40197032028	**RB-09**	ASTM D2974-87	337908		
40197032029	**RB-10**	ASTM D2974-87	337921		
40197032030	**RB-11**	ASTM D2974-87	337921		
40197032031	**RB-12**	ASTM D2974-87	337921		
40197032032	**RB-13**	ASTM D2974-87	337921		
40197032033	**RB-14**	ASTM D2974-87	337921		

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www.pacelabs.com

UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

40197032

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

(Please Print Clearly)	
Company Name:	Ramboll
Branch/Location:	Brookfield, WI
Project Contact:	Staci Goetz
Phone:	262-901-0131
Project Number:	1690010224
Project Name:	Project Omaha
Project State:	Wisconsin
Sampled By (Print):	David Markle
Sampled By (Sign):	
PO #:	Regulatory Program:

Quote #:	
Mail To Contact:	
Mail To Company:	
Mail To Address:	
Invoice To Contact:	Staci Goetz
Invoice To Company:	Ramboll
Invoice To Address:	175 N. Corporate Drive Suite 160, Brookfield, WI 53045
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air, W = Water
B = Biota, DW = Drinking Water
C = Charcoal, GW = Ground Water
O = Oil, SW = Surface Water
S = Soil, WW = Waste Water
SI = Sludge, WP = Wipe

FILTERED? (YES/NO) Y/N: N N
PRESERVATION (CODE)* Pick Letter: A A

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	Analyses Requested: PCBs	Analyses Requested: TCLP	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
001	C-01	10-09-19	0949	S	X				
002	C-02	10-09-19	1100	S	X				
003	C-03	10-09-19	1030	S	X				
004	C-04	10-09-19	0955	S	X				
005	C-05	10-09-19	1124	S	X				
006	C-06	10-09-19	1014	S	X				
007	C-07	10-09-19	1005	S	X				
008	C-02-DUP	10-09-19	1100	S	X				
009	DC-01	10-09-19	0942	S	X				
010	DC-02	10-09-19	0945	S	X				
011	DC-03	10-09-19	1037	S	X		Add'l volume for MS/MSD		
012	DC-04	10-09-19	1046	S	X				
013	DC-05	10-09-19	1026	S	X				

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: 10/16/19 (5 day TAT)

Transmit Prelim Rush Results by (complete what you want):
Email #1: Staci.goetz@ramboll.com
Email #2: dmarkle@ramboll.com
Telephone: 262-901-0131
Fax:

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
	10/10/19 11:20	Mary Fannin	10/10/19 11:20
Mary Fannin	10/10/19 1600		
CS Logistics	10/11/19 0810		10/11/19 0810

PACE Project No.: 40197032

Receipt Temp = 2.1 °C

Sample Receipt pH OK / Adjusted

Cooler Custody Seal: (Present) / Not Present; (Intact) / Not Intact

Version 6.0 08/14/06

C019a(27Jun2006)

ORIGINAL

10/16/19

UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

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40197032

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CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

(Please Print Clearly)	
Company Name:	Ramboll
Branch/Location:	Brookfield, WI
Project Contact:	Staci Goetz
Phone:	262-901-0131
Project Number:	1690010224
Project Name:	Project Omaha
Project State:	Wisconsin
Sampled By (Print):	David Markle
Sampled By (Sign):	D Mm
PO #:	Regulatory Program:

Quote #:	
Mail To Contact:	
Mail To Company:	
Mail To Address:	
Invoice To Contact:	Staci Goetz
Invoice To Company:	Ramboll
Invoice To Address:	175 N. Corporate Drive, Suite 160, Brookfield, WI 53045
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, SI = Sludge, W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	Analyses Requested: PCBS	TCLP	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)
001 014	DC-06	10-09-19	1020	S	X			
002 015	DC-07	10-09-19	0953	S	X			
003 016	DC-08	10-09-19	1114	S	X			
004 017	DC-08-DUP	10-09-19	1114	S	X			
005 018	DC-09	10-09-19	1009	S	X			
006 019	DC-10	10-09-19	1001	S	X			
007 020	RB-01	10-09-19	1242	concrete	X	X	HOLD TCLP	
008 021	RB-02	10-09-19	1300	concrete	X	X	HOLD TCLP	
009 022	RB-03	10-09-19	1314	concrete	X	X	HOLD TCLP	
010 023	RB-04	10-09-19	1331	concrete	X	X	HOLD TCLP	
011 024	RB-05	10-09-19	1343	concrete	X	X	HOLD TCLP	
012 025	RB-06	10-09-19	1357	S	X	X	HOLD TCLP	
013 026	RB-07	10-09-19	1404	S	X	X	HOLD TCLP	

10/11/19

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: 10-16-19 (5-day TAT)

Transmit Prelim Rush Results by (complete what you want):

Email #1:	Staci.goetz@ramboll.com
Email #2:	dmarkle@ramboll.com
Telephone:	262-901-0131
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
D Mm	10/10/19 11:20	Mary Fannin	10/10/19 11:20
Mary Fannin	10/10/19 1600		
CSLogistics	10/11/19 0810		

PACE Project No.: 40197032

Receipt Temp = RoI °C

Sample Receipt pH OK / Adjusted

Cooler Custody Seal: (Present) / Not Present; (Intact) / Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

ORIGINAL

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UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

Page 3 of 3

40197032

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

(Please Print Clearly)	
Company Name:	Ramboll
Branch/Location:	Brookfield, WI
Project Contact:	Staci Goetz
Phone:	262-901-0131
Project Number:	1690010224
Project Name:	Project Omaha
Project State:	Wisconsin
Sampled By (Print):	David March
Sampled By (Sign):	
PO #:	Regulatory Program:

Quote #:	
Mail To Contact:	
Mail To Company:	
Mail To Address:	
Invoice To Contact:	Staci Goetz
Invoice To Company:	Ramboll
Invoice To Address:	175 N. Corporate Drive, Suite 160, Brookfield, WI 53045
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air, W = Water
B = Biota, DW = Drinking Water
C = Charcoal, GW = Ground Water
O = Oil, SW = Surface Water
S = Soil, WW = Waste Water
SI = Sludge, WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	FILTERED? (YES/NO) Y/N	PRESERVATION (CODE)* Pick Letter	Analyses Requested: PCBS	Analyses Requested: TCLP	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
014 027	RB-08	10.09.19	1411	S	N	A	X	X	HOLD TCLP		
015 028	RB-09	10.09.19	1417	S	N	A	X	X	HOLD TCLP		
016 029	RB-10	10.09.19	1424	S	N	A	X	X	HOLD TCLP		
017 030	RB-11	10.09.19	1433	S	N	A	X	X	HOLD TCLP		
018 031	RB-12	10.09.19	1440	S	N	A	X	X	HOLD TCLP		
019 032	RB-13	10.09.19	1446	S	N	A	X	X	HOLD TCLP		
020 033	RB-14	10.09.19	1453	S	N	A	X	X	HOLD TCLP		
021 034	EB-01	10.09.19	1138	W	N	A	X				

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: 10.16.19 (5-Day TAT)

Transmit Prelim Rush Results by (complete what you want):

Email #1:	staci.goetz@ramboll.com
Email #2:	dmarkotz@ramboll.com
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
	10/10/19 11:20	Mary Jannin	10/10/19 11:20
Mary Jannin	10/10/19 1600		
CS Logistics	10/11/19 0810		
			10/11/19 0810

PACE Project No.: 40197032

Receipt Temp = 2.0I °C

Sample Receipt pH OK / Adjusted

Cooler Custody Seal: (Present) Not Present; (Intact) Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

ORIGINAL

Pace Analytical Services, LLC
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Sample Preservation Receipt Form

Client Name: Rambo 11 Project # L0197032

All containers needing preservation have been checked and noted below: □Yes □No ~~N~~/A Initial when completed: Date/ Time:

Lab Lot# of pH paper: Lab Std #ID of preservation (if pH adjusted):

Pace Lab #	Glass							Plastic							Vials						Jars			General			VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
	AG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BG3U	BP1U	BP2N	BP2Z	BP3U	BP3B	BP3N	BP3S	DG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	WGFU	WPFU	SP5T	ZPLC	GN							
001																					1												2.5 / 5 / 10
002																					1												2.5 / 5 / 10
003																					1												2.5 / 5 / 10
004																					1												2.5 / 5 / 10
005																					1												2.5 / 5 / 10
006																					1												2.5 / 5 / 10
007																					1												2.5 / 5 / 10
008																					1												2.5 / 5 / 10
009																					1												2.5 / 5 / 10
010																					3												2.5 / 5 / 10
011																					3												2.5 / 5 / 10
012																					1												2.5 / 5 / 10
013																					1												2.5 / 5 / 10
014																					1												2.5 / 5 / 10
015																					1												2.5 / 5 / 10
016																					1												2.5 / 5 / 10
017																					1												2.5 / 5 / 10
018																					1												2.5 / 5 / 10
019																					1												2.5 / 5 / 10
020																					2												2.5 / 5 / 10

10/11/19 AK

Exceptions to preservation check: VOA, Coliform, TOC, TOX, TOH, O&G, WI DRO, Phenolics, Other: _____ Headspace in VOA Vials (>6mm) : □Yes ✓No □N/A ***If yes look in headspace column**

AG1U	1 liter amber glass	BP1U	1 liter plastic unpres	DG9A	40 mL amber ascorbic	JGFU	4 oz amber jar unpres
AG1H	1 liter amber glass HCL	BP2N	500 mL plastic HNO3	DG9T	40 mL amber Na Thio	WGFU	4 oz clear jar unpres
AG4S	125 mL amber glass H2SO4	BP2Z	500 mL plastic NaOH, Znact	VG9U	40 mL clear vial unpres	WPFU	4 oz plastic jar unpres
AG4U	120 mL amber glass unpres	BP3U	250 mL plastic unpres	VG9H	40 mL clear vial HCL		
AG5U	100 mL amber glass unpres	BP3B	250 mL plastic NaOH	VG9M	40 mL clear vial MeOH	SP5T	120 mL plastic Na Thiosulfate
AG2S	500 mL amber glass H2SO4	BP3N	250 mL plastic HNO3	VG9D	40 mL clear vial DI	ZPLC	ziploc bag
BG3U	250 mL clear glass unpres	BP3S	250 mL plastic H2SO4			GN:	

Pace Analytical Services, LLC
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Sample Preservation Receipt Form

Client Name: CAmball Project #: 40197032

Pace Lab #	Glass							Plastic							Vials						Jars			General			VOA Vials (>6mm) *	H2SO4 pH ≤2	NaOH+Zn Act pH ≥9	NaOH pH ≥12	HNO3 pH ≤2	pH after adjusted	Volume (mL)
	AG1U	AG1H	AG4S	AG4U	AG5U	AG2S	BG3U	BP1U	BP2N	BP2Z	BP3U	BP3B	BP3N	BP3S	DG9A	DG9T	VG9U	VG9H	VG9M	VG9D	JGFU	WGFU	WPFU	SP5T	ZPLC	GN							
021																					2												2.5 / 5 / 10
022																					2												2.5 / 5 / 10
023																					2												2.5 / 5 / 10
024																					2												2.5 / 5 / 10
025																					2												2.5 / 5 / 10
026																					2												2.5 / 5 / 10
027																					2												2.5 / 5 / 10
028																					2	1											2.5 / 5 / 10
029																					2	2											2.5 / 5 / 10
030																					2	2											2.5 / 5 / 10
031																					2	2											2.5 / 5 / 10
032																					2	2											2.5 / 5 / 10
033																					2	2											2.5 / 5 / 10
034				2																													2.5 / 5 / 10
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																																	2.5 / 5 / 20

10/14/15 JMJ

10/14/15

Pace Analytical™ 1241 Bellevue Street, Green Bay, WI 54302	Document Name: Sample Condition Upon Receipt (SCUR)	Document Revised: 25Apr2018
	Document No.: F-GB-C-031-Rev.07	Issuing Authority: Pace Green Bay Quality Office

Sample Condition Upon Receipt Form (SCUR)

Project #: WO#: 40197032

Client Name: Campbell

Courier: ☑ CS Logistics ☐ Fed Ex ☐ Speedee ☐ UPS ☐ Waltco ☐ Client ☐ Pace Other: _____

Tracking #: —

Custody Seal on Cooler/Box Present: ☑ yes ☐ no Seals intact: ☑ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☒ no Seals intact: ☐ yes ☐ no

Packing Material: ☒ Bubble Wrap ☒ Bubble Bags ☐ None ☐ Other _____

Thermometer Used SR - WA **Type of Ice:** ☒ Wet Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature Uncorr: ROI /Corr: —

Temp Blank Present: ☐ yes ☒ no **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp should be above freezing to 6°C.
Biota Samples may be received at ≤ 0°C.

Person examining contents:
Date: 10/11/19
Initials: JW

Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☐Yes ☒No ☐N/A	2. QUOTE mailto not docusigned 10/11/19 JW
Chain of Custody Relinquished:	☒Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☒Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☒Yes ☐No	5.
- VOA Samples frozen upon receipt	☐Yes ☐No	Date/Time:
Short Hold Time Analysis (<72hr):	☐Yes ☒No	6.
Rush Turn Around Time Requested:	☐Yes ☒No	7.
Sufficient Volume: For Analysis: ☑Yes ☐No MS/MSD: ☐Yes ☒No ☐N/A		8.
Correct Containers Used:	☒Yes ☐No	9.
-Pace Containers Used:	☒Yes ☐No ☐N/A	
-Pace IR Containers Used:	☐Yes ☐No ☒N/A	
Containers Intact:	☑Yes ☐No	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: S W		
Trip Blank Present:	☐Yes ☐No ☒N/A	13.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: If checked, see attached form for additional comments ☐

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ **Date:** 10/11/19

APPENDIX B

HEALTH AND SAFETY PLAN

Prepared for:
Gardner Denver-Thomas Products Division
Sheboygan, Wisconsin

Prepared By:
Ramboll Environment & Health
Brookfield, Wisconsin

Date:
October 2019

Project Number:
1690010224

HEALTH AND SAFETY PLAN

GARDNER DENVER-THOMAS PRODUCTS DIVISION
1419 ILLINOIS AVENUE
SHEBOYGAN, WISCONSIN

RAMBOLL

ENVIRONMENT
& HEALTH

Table 1A: Emergency Response Telephone Roster

	Office	Cell
PROJECT TEAM		
Ramboll Corporation		
Project Director: Erin Veder	312-288-3810	312-953-4905
Project Manager: Donna Volk	262-901-3504	414-429-5151
Designated Site Supervisor: Duncan Glasford	262-901-0130	262-573-6315
Health, Safety & Security Coordinator: David Markelz	262-901-0131	262-422-9422
Corporate HS&S Director: Kristen Heitman	312-288-3824	773-879-2235
Contractors		
Company: Pace Labs Contact: Steve Mleczko	920-321-9440	920-469-2436
Company: SRS Locating Contact Tony Savino		815-405-5185
Client/Security		
Site Contact: Ray Kultgen	920-457-4891	
EMERGENCY RESPONSE AGENCIES		
Hospital: St. Nickolas Hospital	920-459-8300	
Emergency Fire	911	
Emergency Police	911	
Health Department	920-459-4382	
OTHER EMERGENCY ASSISTANCE		
National Response Center (oil and chemical spills)	800-424-8802	
Poison Control Center	800-222-1222	
Federal Emergency Management Agency	202-646-2500	
NON-EMERGENCY PHONE NUMBERS		
Police	920-459-3333	
Ambulance Service: Orange Cross	920-694-0347	
Occupational Clinic: WorkCare	888-449-7787	
Fire Department	920-459-3327	

Table 1B: Emergency Services Instructions

For Emergency Medical Incidents, Emergency Fire Response, or Hazardous Materials Incidents

Emergency Telephone Numbers:

- Hospital: 911
- Police: 911
- Fire Department: 911
- Site Security/Client: 920-457-4891

1. Remember to speak SLOWLY and CLEARLY. Do NOT hang up first: let the dispatcher conclude the call.
2. Provide the following information:
   a. Location: Thomas Products – (1419 Illinois Avenue, Sheboygan, WI)
   b. Your name and phone number
3. Describe nature of Incident:
   a. Emergency Medical Incident
      - How many victims
      - Type of incident-physical injury, etc.
      - Assessment of victims' condition if known (whether victim is conscious/unconscious, breathing/not breathing, pulse/no pulse, nature of injuries, first aid measures used, etc.)
      - Where incident occurred
   b. Fire:
      - Location of Fire
   c. Hazardous Materials Incident:
      - This is a hazardous materials incident requiring dispatch of HAZMAT unit
      - Type of incident (fire, explosion, spill, etc.)
      - Type of material (specific chemicals or general description)
      - Whether there is also a Medical Emergency
4. Give your location at the Site.

Note: Security, Site Supervisor or designee must meet the emergency personnel at the staging area to brief them on the situation.

ROUTE DESCRIPTION AND MAP TO HOSPITAL

Hospital Information:

Hospital Name: *St. Nickolas Hospital*

Hospital Address: *3100 Superior Avenue*

Hospital Phone Number: *920-459-8300*

Directions to Area Hospital:

- Head northeast on Broadway toward Jefferson St/West St
- Continue onto Old Bus Line Rd
- Turn right at E Willow Ave
- Turn left at Vandalia Rd
- Continue onto S Main St
- Turn right at School St
- Turn right at Leva St
- End: 1200 E. Tremont Street, Hillsboro, IL (Destination will be on the right)

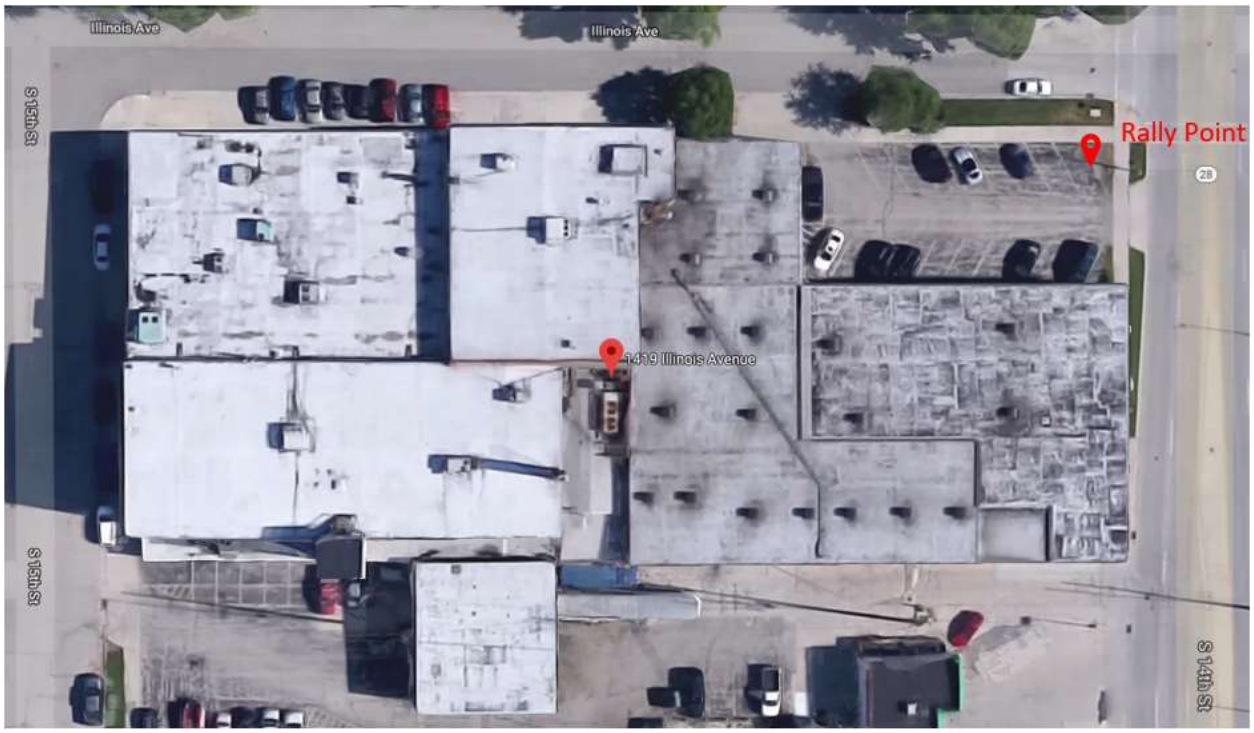
SITE EMERGENCY EVACUATION ROUTE AND MAP

Rally Point(s):

Location: Parking lot in the northeast corner of the site.

Directions to Rally Point:

- Head to the parking lot in northeast corner of the site.



CONTENTS

TABLES

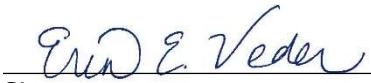
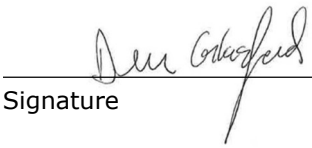
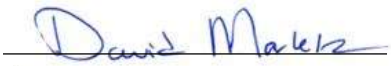
APPENDICES

ACRONYMS AND ABBREVIATIONS

AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute
BBP	Bloodborne Pathogen
C	Ceiling Limit
CPR	cardiopulmonary resuscitation
dBA	Decibels on the "A" weighted scale
EMR	Experience Modification Rate
ERP	Emergency Response Plan
GFCI	Ground fault circuit interrupter
H	High
HA	Hazard Assessment
HASP	Health and Safety Plan
HSIR	Health and Safety Incident Report
HSSC	Health, Safety & Security Coordinator
IDLH	Immediately Dangerous to Life and Health
LOTO	Lockout/Tagout
L	Low
M	Moderate
SDS	Safety Data Sheet
Mg/m^3	milligrams per cubic meter
NA	Not Anticipated
NE	Not Established
NIOSH	National Institute for Occupational Safety and Health
PC	Program Coordinator
PELs	Permissible Exposure Limits
PD	Project Director
PM	Project Manager
PPE	Employee Protective Equipment
PPM	Parts Per Million
SC	Site Coordinator
SPI	Standard Practice Instruction
SSC	Subsurface Clearance
STEL	Short Term Exposure Limits
T & C	Terms and Conditions
TWA	Time Weighted Average

HEALTH & SAFETY PLAN REVIEW AND APPROVAL

By signing below, it is acknowledged that this health and safety plan (HASP) identifies the activities that are anticipated to be performed in the field. In addition, this HASP identifies the personal protective and monitoring equipment that may be necessary for the project. Signatories assure that the required equipment will be available for use. It is also understood that the provisions of this HASP will be updated if there is a change of a task and/or the addition of tasks, and future revisions will be approved by the individuals listed below or their designee.

Erin Veder		10/8/2019
Project Director	Signature	Date
Donna Volk		10/8/2019
Project Manager	Signature	Date
Duncan Glasford		10/8/2019
Designated Site Supervisor	Signature	Date
Duncan Glasford		10/8/2019
Designated HASP Preparer	Signature	Date
David Markelz		10/8/2019
Designated HASP Reviewer	Signature	Date

This form MUST be signed prior to starting the on-site work. In addition, a copy of this form should be returned to the office Health and Safety Coordinator prior to leaving for the field. After completion of the project, the original signed HASP must be retained in the project file.

Author's Initials: DG Typist's Initials: DG File Name: 1690010224

1. INTRODUCTION

This purpose of this health and safety plan (HASP) is to inform all Ramboll US Corporation (Ramboll) employees of known or reasonably anticipated potential hazards and safety concerns at this site. All employees participating in field activities must be trained in the general and specific hazards unique to the job they are performing and, if applicable, meet recommended medical examination and/or training requirements. All Ramboll employees shall follow the guidelines, rules, and procedures contained in this site-specific HASP. Ramboll employees shall contact the Project Manager (PM) if unexpected conditions are encountered at the site, including but not limited to new processes; changes in operation, products, services; additional or changes in the chemicals of concern; and/or unsafe conditions are encountered which were not previously addressed in this HASP.

For purposes of this HASP, subcontractors refer to those retained directly or indirectly by Ramboll, and contractors refer to all other entities working on site. Each contractor, subcontractor, and visitor shall be expected to review and understand the hazards, risks, and control methods (including emergency procedures) as outlined in this HASP and sign off on the HASP. This can be accomplished either during the project planning stage or during the first safety briefing on site. However, contractors and subcontractors will be required to prepare their own HASP to address site safety and work hazards associated with their proposed site activities prior to mobilization to the site. In addition, each subcontractor will be required to provide Ramboll with their site-specific HASP and communicate the types of hazards and control methods associated with their activities to Ramboll during the first safety briefing on site and as conditions change. Relevant Contractor information regarding the identification of hazards and appropriate control strategies for the hazards of their job tasks should also be presented, and a site-specific HASP should be available for review by all parties. Each contractor or subcontractor must assume direct responsibility for its own employees' health and safety.

Copies of the HASPs will be kept on site for review and reference during all site activities. Upon completion of the project, the finalized and signed copy of the HASP will be placed in the project file.

When retaining and working with subcontractors, the following minimum requirements shall be met:

- A properly executed Contractor/Subcontractor Terms and Conditions (T&C) agreement with Ramboll in place prior to commencing work on-site;
- Insurance policies and limits are acceptable to Ramboll and all applicable Insurance Certificates are properly executed (i.e., Ramboll being named as additionally insured under such policies, including Professional and Pollution Liability, if applicable. This will also include adding Ramboll's CLIENT as being named as an insured party under the same policies);
- The roles and responsibilities of the subcontractor have been established, including the naming of the Health and Safety point of contact (these should be clearly indicated in the applicable subcontractor HASP);
- Submission of illness and injury logs indicating a favorable total incident rate (i.e., for the previous calendar year: the total incident rate is calculated by the total number of cases X 200,000 divided by the total hours worked by all employees of the subcontractor). This should be equal to or less than the industry average (i.e., for remediation services listed under the North American Industry Classification System (NAICS) 562 the total incident rate must be equal or below 3.8); and
- A favorable Experience Modification Rate (EMR) (i.e., a rate equal to or less than 1.0) or an explanation of why the company does not qualify for an EMR from their insurance company.

1.1 Site Description

The site is located at 1419 Illinois Avenue in Sheboygan, Sheboygan County, Wisconsin. The approximately 1.5-acre site is developed with an approximately 47,000-square foot manufacturing

building. The site is a manufacturer of gas and liquid pumps used in the laboratory, medical and food and beverage industry.

1.2 Site History

The site is in the process of installing a new 1200-ton press machine. To facilitate the press installation, the existing concrete flooring and subgrade soils were removed. During removal, it was noted by the contractor that the soil and concrete appeared to be impacted. A local environmental consultant was retained to sample roll off containers of soil (9) and concrete (5). The stained concrete reportedly contained 798 parts per million (ppm) of polychlorinated biphenyls (PCBs) and the soil contained 140 ppm PCBs.

1.3 Scope and Applicability

Ramboll has been retained to conduct and/or manage activities at the site. This HASP addresses activities currently being conducted at the site. Addendums will be added to this HASP to address activities at the site as they develop in the future.

Ramboll views the implementation of a site-specific HASP as a critical management tool necessary to the safety, health, and well-being of site employees and the community. Site operations will be performed in such a manner as to minimize the possibility of serious injury or accidents to site employees, fire, explosion, or any unplanned or sudden release of contaminants into the environment that could adversely affect local receptors. This HASP is intended to be in compliance with all applicable regional, state, federal and local regulations and is consistent with Ramboll's commitment to the health and safety of its employees, contractors on the site, and the surrounding community.

The HASP identifies potential hazards associated with the activities being conducted during field activities at the site, establishes the minimum procedural and equipment requirements to protect on-site employees from potential hazards, and requires that on-site activities are conducted in a manner consistent with both accepted professional practice and applicable regulations. It also describes measures to minimize accidents and injuries that may occur during normal daily activities or during adverse conditions.

The HASP is based upon the currently available information regarding the site. Operating conditions could potentially change as the work progresses, requiring some modification of the HASP. Any permanent modifications to the HASP, including changes necessary to correct any potential health and safety issues at the site will be made only with permission by those individuals listed in Section 1 of this HASP. Approved changes will be added to the HASP either as a HASP Revision (i.e., a new updated HASP is generated) or as a HASP Addendum (i.e., a document detailing changes or additions to safety protocols and referencing the HASP). When a HASP Addendum is in use, both the HASP and the Addendum must be reviewed and understood by all employees involved, and both must be present at the site during our work.

Applicability of this HASP extends to all employees and visitors to the site. However, Ramboll's subcontractors are ultimately responsible for the health and safety of their employees and representatives and are required to furnish their own HASP. All employees and visitors entering on-site active fieldwork areas are responsible for reading and complying with the HASP and must sign an agreement to comply with the requirements of the HASP.

1.4 Specific Work Activities

The principal features of the field activities currently underway or planned for the immediate future include the following work activities or tasks:

- Task 1–Transportation to and from Site
- Task 2–Utility Clearance

- Task 3–Discrete and Composite Soil Sample Collection

Each of these Tasks are further described as follows.

Task 1–Transportation to and from the site

This Task includes obtaining a rental car and driving to and from the site daily. The commute it approximately 60 minutes each way and will include travel on highways and paved side roads. A vehicle inspection should be performed by walking around and making visual observations for apparent damage prior to driving.

Task 2–Utility Clearance

Prior to sampling activities, Ramboll will conduct a site reconnaissance visit to evaluate access to sample locations, discuss logistics with Knowledgeable Site Representatives, and review available facility drawings. Ramboll contact Diggers Hotline for public utility location and will also retain a private utility subcontractor to locate underground utilities and/or anomalies where Ramboll intends to conduct subsurface investigations. Ramboll will provide oversight during the subsurface utility clearance activities.

Sampling locations shall be cleared to at least a 5-foot radius (to accommodate the mandated critical zone per Standard Practice Instruction [SPI] Subsurface and Overhead Clearance) by the private locator (See Appendix F for SPI 27). Once cleared by the private locator, these sample locations are **fixed** and cannot be offset. Backup sample locations shall be pre-cleared by the private locator in the event the alternate locations are required to complete the scope of work.

Task 3–Discrete and Composite Soil Sampling

This task includes the collection of soil samples using a hand auger and collection both discreet and composite soil samples that will be analysed for PCBs. Hand auger soil samples will be collected at approximately one-foot depths from the excavated machine pit and sidewalls using a three-meter grid sample interval. The machine pit area is approximately 30 feet long by 12 feet wide; as such (per EPA protocol), 7 composite soil samples and 10 discreet soil samples will be collected from the machine pit area. In addition, one composite soil sample will be collected from each of the rolloff containers that contain soil from the machine pit excavation and the roll-off containers that contain concrete to the extent practicable. Depending on the results, the roll-off containers may also be analysed for Total Leachable PCBs.

Soil samples will be collected in accordance with the approved scope of work. Samples will be collected using standard methods and protocols and will be shipped to a qualified laboratory under chain-of-custody in a thermally insulated cooler with ice. Prior to collection of each sample and between successive sampling attempts, sampling equipment will be decontaminated to minimize the potential for cross-contamination.

1.5 Applicable Standards

The methods and procedures prescribed in this HASP are intended to conform to established professional practices and applicable federal, state, and local occupational safety and health protection standards based on information that is currently available. Regulations serving as the technical compliance basis for this document may include but are not limited to the following:

- US Department of Labor, *Occupational Safety and Health Standards for Construction* (29 CFR 1926).
  - *Hazardous Waste Operations and Emergency Response* (29 CFR 1926.65)
  - *Hearing Protection* (29 CFR 1926.101 and 29 CFR 1926.52)

  - *Eye and Face Protection* (29 CFR 1926.102)
  - *Respiratory Protection* (29 CFR 1926.103)
  -
  - *Material Handling Equipment* (29 CFR 1926.602)
- US Department of Labor, *OSHA Standards for General Industry* (29 CFR 1910).
  - *Hazardous Waste Operations and Emergency Response* (29 CFR 1910.120)
  - *PPE General Requirements* (29 CFR 1910.132)
  - *Eye and Face Protection* (29 CFR 1910.133)
  - *Respiratory Protection* (29 CFR 1910.134)
  - *Head Protection* (29 CFR 1910.135)
  - *Foot Protection* (29 CFR 1910.136)
  - *Hand Protection* (29 CFR 1910.138)
  - *Medical Services and First Aid* (29 CFR 1910.151)
  - *Portable Fire Extinguishers* (29 CFR 1910.157)
  - *Hazard Communication Standard* (29 CFR 1910.1200)
- US Department of Labor, Recording and Reporting Occupational Injuries and Illnesses, (29 CFR 1904).

The following technical documents may have been utilized as references in the preparation of this HASP. However, the citation of these technical documents does not imply compliance with all aspects of these documents. The purpose of these citations is to aid in the interpretation of conflicting issues that may arise during the performance of site activities. The following technical documents may include but are not limited to:

- National Institute for Occupational Safety & Health (NIOSH)/OSHA/United States Coast Guard (USCG)/ United States Environmental Protection Agency (USEPA), Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, (October, 1985).
- US Department of Health and Human Services (DHHS), NIOSH Sampling and Analytical Methods, DHHS (NIOSH) Publication 84-100.
- American National Standards Institute (ANSI), Emergency Eyewash and Shower Equipment, Z358.1 (1981).
- ANSI, Protective Footwear, Z41.1 (1983).
- ANSI, Practice for Occupational and Educational Eye and Face Protection, Z87.1 (1979).
- ANSI, Protective Headgear for Industrial Workers-Requirements, Z89.1 (1986).

2. IDENTIFICATION OF KEY EMPLOYEES

An efficient on-site operation requires that all key employees be identified and that their roles and responsibilities be clearly defined. Below is a discussion of the management structure for this project.

2.1 Project Organization

Ramboll serves as the Project Coordinator for the site. Ramboll is responsible for overseeing activities conducted by Ramboll employees and Ramboll's subcontractors at the site. Ramboll also is responsible for oversight of compliance with this HASP in the field by Ramboll employees. Ramboll subcontractors may plan, manage, and carry out activities at the site, including environmental investigation and remediation tasks, and will provide their own health and safety officers and HASP. As part of Ramboll's role as Site Coordinator, Ramboll will ensure that all subcontractors and site workers are aware of the Ramboll HASP and its requirements.

2.2 Ramboll Employees

Assigned functions of key Ramboll project team members and subcontractors are described in Tables 2 and 3, respectively, located at the end of this section. The applicable responsibilities for these individuals are as follows.

2.2.1 Project Director/Project Manager

Responsibilities include overall coordination and oversight of on-site activities and other field-based activities. The Project Director (PD) and the Project Manager (PM) have overall accountability and responsibility for the safety of operations and the health and safety of all employees and for monitoring the work effort, schedule, costs, communication, and will ensure that the activities of all site employees comply with the approved work plans and will recommend or provide disciplinary action, as appropriate, if non-compliances occur. The PD and PM are also responsible for implementation of any directives from the Corporate Health Safety and Security (HSS) Director.

These individuals will also provide the focal point for communications between the regulatory authorities; state and local community, on-site contractors, and project staff. This liaison activity will provide a clear line of communication between all parties to minimize the chance for misconceptions concerning any aspect of the project.

Any and all recommended revisions or changes in the HASP will be reviewed by the PD, PM and Project Health, Safety & Security Coordinator (HSSC). Any potential changes to the HASP template language, our standard field protocols, responsibilities, or training requirements are subject to final approval by the Corporate HSS Director.

2.2.2 Corporate Health, Safety & Security Director

The Ramboll Corporate HSS Director will oversee all issues related to health and safety and will have final approval authority for any potential changes to the HASP template language, our standard field protocols, responsibilities, or training requirements.

2.2.3 Project Health, Safety & Security Coordinator

The Project HSSC, along with the Corporate HSS Director are resources for the development of the site-specific hazard assessments and control mechanisms. The HSSC is also responsible for implementation of any directives from the Corporate HSS Director/HSS Department. For any potential changes to the HASP template language, our standard field protocols, responsibilities, or training requirements, the Project HSSC should be consulted and the Corporate HSS Director will have final approval authority. The Corporate HSS Director or their designee will make all final decisions regarding questions on hazard assessments, selected control mechanisms, policy variances, or other aspects of the HASP.

2.2.4 Designated Site Supervisor

The Ramboll Designated Site Supervisor is responsible for overseeing day-to-day site activities performed by Ramboll and its subcontractors. The principal responsibility of the designated Ramboll Site Supervisor will be to coordinate and document all on-site work necessary to fulfill approved work plans. The Ramboll Site Supervisor typically also functions as the Site Health and Safety Officer (SHSO). The Ramboll Site Supervisor and Project HSSC may be the same individual.

The Ramboll Site Supervisor reports to the PM, HSSC, and PD and is also responsible for implementation of any directives from the Corporate HSS Director/HSS Department. The Site Supervisor is responsible for ensuring compliance with all aspects of the HASP which include, but are not limited to, safe work practices, site access controls, work safety zones, proper personal protective equipment (PPE), review planned site activities, implement safety procedures necessary to complete work safely, perform daily safety briefings, assist in on-site emergencies, and act as technical liaison to regulatory agency personnel. The Site Supervisor will report all site-related injuries to the PD, PM, Project HSSC and/or Corporate HSS Director, and to any other necessary authorities. The Site Supervisor will ensure that all site employees understand their respective emergency response duties. In the instance of any emergency or non-emergency incidents concerning site employees, the Site Supervisor will be contacted and will be responsible for communicating any information regarding site safety conditions to rescue or emergency personnel. The Site Supervisor will ensure that all activities at the site comply with the approved HASP.

Any person working on-site has the authority to **stop work** if any operation threatens the health and safety of on-site workers or the surrounding community. In the event that such a situation occurs, the Site Supervisor shall be notified immediately. Ramboll's Site Supervisor will update the Ramboll PD, PM, HSSC, and Corporate HSS Department on all project-related health and safety issues as they arise.

The Site Supervisor will be certified in first aid and cardiopulmonary resuscitation (CPR) by the American Red Cross, or equivalent. The Site Supervisor will also be HAZWOPER trained for site work in accordance with applicable regulations and participate in a medical surveillance program.

In the event of an emergency, the Ramboll Site Supervisor will also function as the Site Emergency Response Coordinator and will implement, and coordinate emergency response procedures described in this HASP.

2.2.5 Other Employees

All other Ramboll employees will be certified in first aid and CPR by the American Red Cross, or equivalent and will also be HAZWOPER trained for site work in accordance with applicable regulations and participate in a medical surveillance program – or the equivalent training and certifications required specific to the region or country where the work is being performed.

Ramboll's subcontractors, if needed, shall prepare their own company HASP which shall specifically govern the work performed by its employees. The contractor's HASP shall be in conformance with Ramboll's HASP. Subcontractors performing on-site operations subject to HAZWOPER requirements should be asked to provide a Health and Safety Contact who will assist Ramboll's PM and/or Site Supervisor. The subcontractor HS Contact may be their project manager or another individual with knowledge of the subcontractor's HS program. The HS Contact should confirm that their employees have received appropriate health and safety training and are participating in a medical surveillance program.

Any person working on-site, including subcontractors, has the authority and the responsibility to **stop work** if any operation threatens the health and safety of on-site workers or the surrounding

community. In the event that such a situation occurs, the Site Supervisor shall be notified immediately.

Table 2: Ramboll Employees Contact Information

Employees Telephone Roster			
Company/Title	**Employee**	**Office**	**Cell**
Ramboll Project Director	Erin Veder	312-288-3810	312-953-4905
Ramboll Project Manager	Donna Volk	262-901-3504	414-429-5151
Ramboll Corporate Health, Safety & Security Director	Kristen Heitman	312-288-3824	773-879-2235
Ramboll Project Health, Safety & Security Coordinator	David Markelz	262-901-0131	262-422-9422
Ramboll Designated Site Supervisor	Duncan Glasford	262-901-0130	262-573-6315
Client Contact	Ray Kultgen	920-457-4891	[redacted]

Table 3: Contractor/Subcontractor Contact Information

Contractor/Subcontractor Telephone Roster			
Company/Title	**Employee**	**Office**	**Cell**
Pace Labs	Steve Mleczko	920-321-9440	920-469-2436
SRS	Tony Savino	[redacted]	815-405-5185

3. HAZARD EVALUATION

The Project Hazard Analysis below identifies the hazards anticipated to be encountered by the project team based on the tasks presented in Section 2.5.

Table 4: Project Hazard Analysis

Chemical Hazards Present: ☐ None	☐ Flammable/combustible ☐ Compressed gas ☐ Explosive ☐ Organic peroxide ☐ Oxidizer ☐ Water reactive ☐ Unstable reactive ☐ Dust/Fumes/Particulates	☐ Corrosive ☐ Toxic ☐ Highly Toxic ☐ Irritant ☐ Sensitizer ☐ Carcinogen ☐ Mutagen ☒ Other: PCBs
Site Hazards Present: ☐ None	☐ Heat ☐ Cold ☐ Severe weather ☒ Walking/working surfaces ☒ Noise ☐ Unexploded ordinances ☐ Close/abandoned mines ☒ Operational facility (traffic/docks/loading) ☐ Other: manufacturing production area	☐ Ionizing radiation ☐ Non-ionizing radiation ☐ Confined spaces ☐ Live electrical equipment ☐ Poor lighting ☐ Overhead hazards ☐ Work near railroads ☐ Traffic mgmt. (vehicle, pedestrian interference)
Task Hazards Present: ☒ None	☐ Heavy machinery/drill rigs ☒ Trenching/excavation ☐ Vehicle use ☐ Work near/on water ☒ Elevated heights (<6 feet) ☐ Elevated heights (>6 feet) ☐ Overhead/underground utilities ☐ Power hand tools ☐ Electrically powered equipment	☐ Cutting devices/tools ☐ Lifting operations (cranes, rigging) ☐ LO/TO (electrical, pressure) ☐ Drums, cylinders, containers ☒ Material handling, ergonomics ☐ SIMOPs (Simultaneous operations) ☒ Other:hand auger use and soil sample preparation – repetitive motion
Biological Hazards Present: ☒ None	☐ Animal/human fluid, blood, tissue ☐ Poisonous/irritating plants ☐ Ticks, mosquitos	☐ Contaminated needles ☐ Live bacterial cultures ☐ Insects/rodents/snakes ☐ Other:
Safety/Security: ☒ None	☐ Security issue ☐ Isolated area ☐ Employees working alone ☐ Seasonal hunting	☐ Employees working early/late ☐ Potentially dangerous wildlife ☐ Guard/stray dogs ☐ No/limited cell phone service ☐ Other:

3.1 Chemical Hazards

3.1.1 Specific Chemicals of Concern

The chemicals listed in the table below includes the identification of chemical contaminants known and/or suspected of being present on-site, the affected media, known concentrations (if applicable), the Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV), and the Action Level (i.e., 50% of the PEL/TLV). This information will be inserted into Table 5 below. In addition, Appendix A contains specific hazardous property information for commonly encountered chemicals although a Safety Data Sheet (SDS) (or equivalent) will also be included in Appendix A.

Table 5: Chemicals of Concern

☐ **NA - No** Known or Anticipated Chemicals of Concern

Chemical	Environmental Media [1]	Highest Measured Concentration	PEL/TLV [2]
PCBs	SO	104 mg/kg	1 mg/m^3
PCBs	Concrete	798 mg/kg	1 mg/m^3

Notes:

[1] Codes for environmental media: **SL**=Sludge; **GW**=Ground Water; **SW**=Surface Water; **LW**=Liquid Waste; **SO**=Soil; **A**=Air; **OTH**= Other (Specify)

[2] PEL: Permissible Exposure Limit / TLV: Threshold Limit Value

mg/m^3: milligrams per cubic meter

mg/kg: milligrams per kilograms

ppm: Parts per million

%: Minimum percent allowed for personal entry into a space

3.1.2 Chemical Products Used on Site

Table 5B lists the anticipated chemicals that will be brought, used, and/or stored on site by Ramboll.

Field employees will take caution when handling chemicals (e.g., sample bottles with preservatives, calibration gasses and solutions). Prior to handling preserved sample jars/bottles, the field team will review the corresponding SDS (see Appendix A) and don the appropriate PPE as listed in the SDS and noted in Tables 9 and 10 below. Field employees will take care when handling the preserved sample jars/bottles so as not to spill the preservatives on themselves or the ground. If sample bottles are broken upon arrival at the site, the field team may don appropriate PPE and disposed of the broken bottles only if there is a safe means to do so. If feasible, field employees should avoid handling broken glass containing chemical preservatives. Return coolers that contain broken bottles to the laboratory for disposal.

Table 5B: List of Commonly Used Chemical Preservatives

Sample Preservative	Approx. Volume	Sample Preservative	Approx. Volume
☐ Ascorbic acid	mL	☐ Sodium bisulfate	mL
☐ Ethylenediamine (EDA)	mL	☐ Sodium hydroxide (NaOH)	mL
☐ Hydrochloric acid (HCl)	mL	☐ Sodium thiosulfate ($Na_2S_2O_3$)	mL
☐ Methanol	mL	☐ Sulfuric acid (H_2SO_4)	mL
☐ Nitric acid	mL	☐ Zinc acetate	mL
☐ Other:	mL	☐ Other:	mL

Calibration Gas	Approx. Volume	Calibration Gas	Approx. Volume
☐ Isobutylene (100 ppmV)	L	☐ Isobutylene (500 ppmV)	L
☐ Other:	L	☐ Other:	L
Calibration Solution	**Approx. Volume**	**Calibration Solution**	**Approx. Volume**
☐ pH 4	mL	☐ Zobell	mL
☐ pH 7	mL		mL
☐ pH 10	mL		mL

4. HAZARD CONTROLS

To conduct a Task in the safest possible manner, the hazard(s) associated with a Task need to be identified so that appropriate hazard control(s) can be implemented and used by employees conducting these Task(s). This process is called a "Job Hazard Analysis (JHA) or "Job Safety Analysis" (JSA). To aid in the JHA/JSA process, the associated Task(s) (as outlined in Section 1.3) are correlated against the anticipated hazards. A "Relative Hazard/Risk Rating" is also provided to identify which hazards pose the greatest risk to employees but more importantly, what hazard controls should be implemented.

Table 6: Summary of Hazards

Task Number(s)	Hazards	Relative Hazard /Risk Rating*	Hazard Controls Appendix and/or HASP Section
3	Chemical Hazards	NA ☐ Low ☒ Medium ☐ High ☐	B1 Chemical
3	Dust/Fumes/Particulates	NA ☐ Low ☒ Medium ☐ High ☐	B2 Dust/Particulates/Fumes
1,2	Job Zone Control	NA ☐ Low ☒ Medium ☐ High ☐	B3 Job Zone Control
1,2,3	Heat	NA ☒ Low ☐ Medium ☐ High ☐	B4 Heat
1,2,3	Cold	NA ☐ Low ☒ Medium ☐ High ☐	B5 Cold
2,3	Severe Weather	NA ☐ Low ☒ Medium ☐ High ☐	B6 Severe Weather
2,3	Walking/Working Surfaces	NA ☐ Low ☒ Medium ☐ High ☐	B7 Safe Walking Surfaces and Work Areas
2,3	Noise	NA ☐ Low ☐ Medium ☒ High ☐	B8 Noise
NA	Unexploded Ordinances	NA ☒ Low ☐ Medium ☐ High ☐	B9 Unexploded Ordinances
NA	Closed/Abandoned Mines	NA ☒ Low ☐ Medium ☐ High ☐	B10 Closed/Abandoned Mines
2,3	Operational Facility (Traffic/Docks/Loading)	NA ☐ Low ☐ Medium ☒ High ☐	B11 Operational Facility
NA	Ionizing Radiation	NA ☒ Low ☐ Medium ☐ High ☐	B12 Radiation
NA	Non-ionizing Radiation	NA ☒ Low ☐ Medium ☐ High ☐	B12 Radiation
NA	Confined Spaces	NA ☒ Low ☐ Medium ☐ High ☐	B13 Confined Spaces
NA	Live Electrical Equipment	NA ☒ Low ☐ Medium ☐ High ☐	B14 Live Electrical Equipment
NA	Poor Lighting	NA ☒ Low ☐ Medium ☐ High ☐	B7 Safe Walking Surfaces and Work Areas
NA	Overhead Hazards	NA ☒ Low ☐ Medium ☐ High ☐	B15 Overhead Hazards
NA	Work Near Railroads	NA ☒ Low ☐ Medium ☐ High ☐	B16 Work Near Railroads
2,3	Traffic Management (Vehicle, pedestrian interference)	NA ☐ Low ☐ Medium ☒ High ☐	B17 Traffic Management
NA	Heavy machinery/drill rigs	NA ☒ Low ☐ Medium ☐ High ☐	B18 Heavy Machinery/Drill Rigs
2,3	Trenching/Excavation	NA ☐ Low ☒ Medium ☐ High ☐	B19 Trenching/Excavation

Table 6: Summary of Hazards

Task Number(s)	Hazards	Relative Hazard /Risk Rating*	Hazard Controls Appendix and/or HASP Section
1	Vehicle use	NA ☐ Low ☒ Medium ☐ High ☐	B20 Vehicle Use
NA	Work near/on water	NA ☒ Low ☐ Medium ☐ High ☐	B21 Work Near/On Water
NA	Elevated heights (<4ft)	NA ☒ Low ☐ Medium ☐ High ☐	B22 Working from Heights (<4 feet)
NA	Elevated heights (>4ft)	NA ☒ Low ☐ Medium ☐ High ☐	B23 Working from Heights (>4 feet)
2,3	Overhead/underground utilities	NA ☐ Low ☒ Medium ☐ High ☐	B24 Overhead/Underground Utilities
NA	Powered hand tools	NA ☒ Low ☐ Medium ☐ High ☐	B25 Electrically Powered Equipment and Tools
NA	Electrically powered equipment	NA ☒ Low ☐ Medium ☐ High ☐	B25 Electrically Powered Equipment and Tools
NA	Cutting devices/tools	NA ☒ Low ☐ Medium ☐ High ☐	B26 Cutting Devices/Tools
NA	Lifting operations (cranes, rigging)	NA ☒ Low ☐ Medium ☐ High ☐	B27 Lifting operations (cranes, rigging)
NA	LO/TO (electrical, pressure)	NA ☒ Low ☐ Medium ☐ High ☐	B28 Lock Out/Tag Out (LO/TO) (electrical/pressure)
NA	Drums, cylinders, containers	NA ☒ Low ☐ Medium ☐ High ☐	B1 Chemical
NA	Material handling, ergonomics	NA ☒ Low ☐ Medium ☐ High ☐	B29 Material Handling/Ergonomics
NA	SIMOPS (Simultaneous Operations)	NA ☒ Low ☐ Medium ☐ High ☐	B30 SIMOPS
NA	Animal/human fluid/blood/tissue	NA ☒ Low ☐ Medium ☐ High ☐	B31 Bloodborne Pathogens
NA	Poisonous/irritating plants	NA ☒ Low ☐ Medium ☐ High ☐	B32 Plants and Animals
NA	Contaminated needles	NA ☒ Low ☐ Medium ☐ High ☐	B31 Bloodborne Pathogens
NA	Live bacterial cultures	NA ☒ Low ☐ Medium ☐ High ☐	B31 Bloodborne Pathogens
NA	Insects/rodents/snakes	NA ☒ Low ☐ Medium ☐ High ☐	B32 Plants and Animals
NA	Ticks, mosquitos	NA ☒ Low ☐ Medium ☐ High ☐	B32 Poisonous Plants, Animals, and Insects
NA	Security issues	NA ☒ Low ☐ Medium ☐ High ☐	B33 Job Safety
NA	Isolated area	NA ☒ Low ☐ Medium ☐ High ☐	B34 Personal Safety
NA	Employees working alone	NA ☒ Low ☐ Medium ☐ High ☐	B35 Working Alone
NA	Seasonal hunting	NA ☐ Low ☐ Medium ☐ High ☐	B36 Seasonal Hunting and Dangerous Wildlife

Table 6: Summary of Hazards

Task Number(s)	Hazards	Relative Hazard /Risk Rating*	Hazard Controls Appendix and/or HASP Section
NA	Employees working early/late	NA ☐ Low ☐ Medium ☐ High ☐	B34 Personal Safety
NA	Potentially dangerous wildlife	NA ☐ Low ☐ Medium ☐ High ☐	B36 Seasonal Hunting and Dangerous Wildlife
NA	Guard/stray dogs	NA ☐ Low ☐ Medium ☐ High ☐	B33 Job Safety
NA	No/limited cell phone service	NA ☐ Low ☐ Medium ☐ High ☐	B34 Personal Safety B35 Working Alone

Note:

A single hazard may be listed under several Tasks. In this case, use the highest Severity ranking of the tasks evaluated as the overall ranking.

***Relative Hazard/Risk Rating**

When evaluating a Task against a specific hazard, the evaluator should:

1. **Determine how frequently you will be conducting the Task and generally be exposed to the Hazard while on-site;**
2. **Determine the duration (i.e., the amount of time) you will spend conducting the Task; and**
3. **Determine the Severity that the Task/Hazard may cause using Table 7. When assessing the severity, assume the hypothetical injury was a result of the task being conducted improperly and that PPE was not being worn:**
   - **Minimal Severity** would require first aid, and/or the property/equipment damage is limited to minor wear and tear, scratches, dents (still functional);
   - **Moderate Severity** requires professional medical attention, and/or the property/equipment damage necessitates repair but not replacement; and
   - **High Severity** requires immediate medical attention/life threatening and/or the property/equipment damage is significant and requires replacement.

Table 7: *Relative Risk Rating Decision Table

The Hazard…	Has No Severity	Has Minimal Severity	Has Moderate Severity	Has High Severity
Is Not Present (i.e., 0% of your on-site time does not expose you to this Hazard)	NA	NA	NA	NA
Is Rarely Present (i.e., <25% of your on-site time exposes you to this Hazard)	NA	LOW	LOW	MED
Is Sometimes Present (i.e., 25%-<50% of your time exposes you to this Hazard)	NA	LOW	MED	HIGH
Is Frequently to Constantly Present (i.e., 50% to 100% of your time exposes you to this Hazard)	NA	MED	HIGH	HIGH

4.1 General Site Safety

All activities will be conducted in a manner that minimizes hazards and employee exposures to such hazards. The following are some general safety rules that must be followed while on site:

- All employees who perform on site operations with the potential for exposure to hazardous substances are required to meet employee training requirements and medical surveillance criteria, which are described in this site health and safety plan.
- All hazardous substances and contaminated soils, liquids, and other residues shall be handled, transported, labeled, and disposed of in accordance with accepted material handling procedures.
- Employees will wear personal protective equipment as required.
- All work on site, will be planned and supervised by the appropriate employees to prevent injuries.
- All injuries, accidents, unsafe acts/conditions, and near misses will be reported. Property damage and loss including, but not limited to vehicles and equipment, will also be reported.
- Supervisors will ensure that their employees observe and obey all safety rules and regulations required for the safe conduct of work.
- Alcoholic beverages and illegal drugs will not be allowed on-site. Possession of either will be grounds for disciplinary actions.
- No employee will be assigned to a task without first having been instructed on proper methods of carrying out the task.
- All posted safety signs will be obeyed.
- Space around on-site emergency and fire-fighting equipment will be kept clear.
- All trash and discarded materials will be staged in an orderly fashion and regularly removed from the site.
- Approval to perform work operations alone must be preapproved by the site PD/PM and a communication plan must be established.
- Smoking, eating, drinking, and chewing gum or tobacco will not be permitted within the work zones and will follow applicable decontamination procedures prior to eating, drinking, and/or smoking.

- Employees should keep track of weather conditions and wind direction to the extent they could affect potential exposure.
- Employees should be alert to any abnormal behavior on the part of other workers that might indicate distress, disorientation, or other ill effects.
- Employees should never ignore symptoms that could indicate potential exposure to chemical contaminants. These should be immediately reported to their supervisor or the Site Health and Safety Officer.
- Visible indicators of potentially immediate danger to life and health (IDLH) conditions include:
    1. Large containers and tanks that must be entered.
    2. Enclosed spaces such as buildings or trenches that must be entered.
    3. Potentially explosive or flammable situations (indicated by bulging drums, effervescence, gas generation, or instrument readings).
    4. Extremely hazardous materials (such as cyanide, phosgene, or radiation sources).
    5. Visible vapor clouds.
    6. Areas where biological indicators such as dead animals or vegetation are located.

4.2 Specific SSC Requirements

The hazards posed by the presence of underground and overhead services are significant. Where there is a requirement for ground penetrating activity, the work shall be thoroughly vetted prior to commencing subsurface work. No intrusive work is to be conducted until the hazards associated with the possible presence of underground and overhead services have been properly identified, and safe locations for intrusion marked and agreed upon. This applies to any intrusive site work (i.e., any work that will involve the disturbance or penetration of the ground or manmade surface by mechanical or manual means, INCLUDING: trial pit excavations, borehole excavations (shell and auger, rotary, hydraulic, percussive), gas spiking, manual excavations, hand digging, intrusion into vertical, indoor, or below ground surfaces, and/or any other on-site activity where disturbance of the ground surface is required). If conducting intrusive activities, the following tasks must be completed **and documented** prior to initiating ground disturbance activities (each is summarized below).

4.2.1 Historical Site Information Review

Obtain the most recent as-built drawings and/or site plans (including underground storage tank [UST] product and vent lines), as available. Consider requesting any other site plot plans, surveys, photographs, and information that might be instructive from the client or other sources. Site information reviewed shall be specified in Table 8 SSC Actions (below).

4.2.2 Plot Plan

Develop a plot plan that accurately reflects all available information and site conditions as accurately as possible, including the number of facilities/pipelines or utilities, locations and alignments. The plot plan shall be updated as SSC activities commence to properly capture site-conditions or visual indicators. Intrusive activities shall not proceed without an updated plot plan or drawing.

4.2.3 Pre-Marking Ground Disturbance Locations

Whenever feasible, ground disturbance locations and/or areas shall be pre-marked using white stakes, white paint or white flags (or black in cases where snow is on the ground) prior to the public and/or private utility mark-outs. Pre-marking provides the line locators with visual boundaries as guidance in clearing locations and placing marks.

4.2.4 Line Location Services

In areas where public and private resources are available, **Ramboll will contact both public and private utility locate services for any project that involves intrusive activities.** To give line operators enough time to respond to a request to locate, a minimum of 72 business hours is required prior to the planned start of work. If the driller/excavator retains these services, Ramboll will conduct a follow-up to confirm utility locate information.

Meet directly with the private locator and provide them with location plans, if possible. If an on-site meeting with the private locator is not possible, you MUST contact the private locator so that they understand the scope of the proposed subsurface work and the extent of their activities.

4.2.5 Site Walkover-Visual Indicators

The Designated Person MUST conduct site walk-over and complete the SSC Field Checklist (Appendix C) for all projects that involve ground disturbance. The site walk-over and visual inspection is most effective when completed during locating activities, but, at a minimum, must be completed PRIOR to ground disturbance. The main intent of the SSC Field Checklist is to identify above ground indicators of potential underground utilities. It will also be used to confirm that common utilities have been accounted for, located and verified. Any potential underground utilities should be marked on a site plot plan and the site walkover should be documented utilizing Ramboll's Subsurface Clearance Field Checklist.

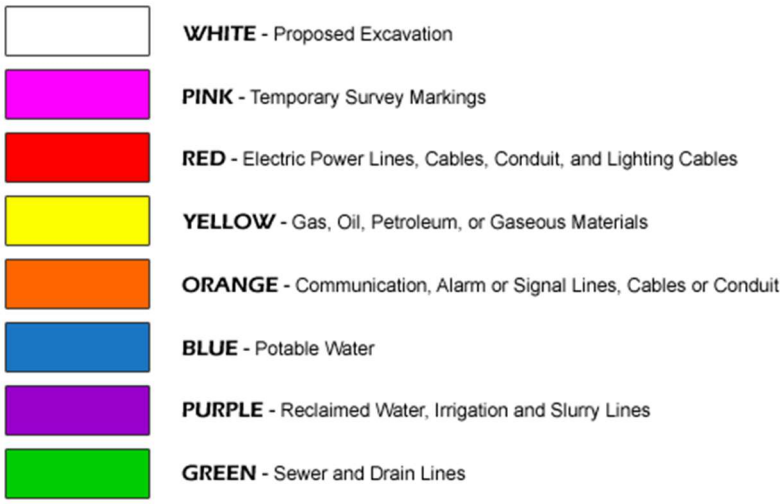
4.2.6 Utility Mark-Out

All known pipelines and utilities, as noted on the plot plan, pipeline map or drawing, that pass within the search zone must be located, identified and marked to indicate location and alignment.

A qualified and competent line locator shall conduct line-locating practices utilizing available pipeline maps or plot plans for all areas within the search zone. Direct connection (clamping on) to all possible nearby underground services should be undertaken whenever possible to increase the success rate/reliability in locating. **The specific ground penetration location must be cleared to the edge of the critical zone** (5 feet or 1.5m area surrounding intrusive locations/areas in every direction) using a search and sweep method to verify maximum detection capabilities.

If anticipated services are not identified or located, drilling or ground disturbance will not occur until the service is visually identified.

Commonly used utility mark out colors and identifiers are listed below:



Upon completion of their work (whether you are on-site or not), the private locator MUST contact you to present their results. In addition to providing you with an overall summary of their work, they must also inform you of any unique circumstance(s) which limited their ability in locating the potential presence of underground utilities (e.g., the existence of overhead electrical lines); if they encountered any abnormalities (e.g., concrete surfaces with reinforced rebar); and/or any other condition which may have diminished the validity of their results and efforts.

Where doubt exists over the location of a service, request a site visit from the appropriate utility provider or abandon locations in the immediate area and contact the PM and/or PD.

4.2.7 Clearance of Ground Disturbance Locations & Critical Zones

After anticipated utilities have been located and marked, use the available information along with regulatory requirements and project objectives to select final ground disturbance locations.

Each specific ground penetration location must be cleared to the edge of the critical zone (5 feet or 1.5m area surrounding intrusive locations/areas in every direction) using a search and sweep method to verify maximum detection capabilities. Ensure that all detected services and those featured on location plans are outside of the critical zone of EACH location where intrusive work will occur, using a sweep and search method.

The critical zone considers minimum tolerance distances from facility lines (which vary by location) and uncertainties introduced by on-site conditions, human factors, and equipment. **No intrusive activities shall take place if utilities or visual indicators are present within the critical zone**. When known utilities or visual indicators intersect critical zones, the boring and/or excavation location criteria should be reevaluated by the Designated Person and PM, and if possible, moved to an alternate location. Alternate locations, whether used due to nearby utilities or borehole refusal, must also be cleared to the same standards as the original locations.

If work is required to be conducted in a critical zone containing a marked utility or visual indicator, approval MUST be obtained from the PD, PM and HSS Director, or their designee, prior to ground penetrating activities.

4.2.8 Overhead Lines

Ensure that any ground penetrating activities are located a minimum of 28 feet (9m) horizontally from any overhead electric cable supported wooden poles, or 50 feet (15m) horizontally in the case of those supported on metal poles/towers. Where this cannot be achieved, contact relevant electricity provider for guidance as well as the PD/PM and Director HSS, or their designee.

4.3 SSC Summary

If the tasks presented in this HASP involve ground penetrating work, Table 8 and the specific procedures outlined in section 4 are applicable and must be followed. Table 8 summarizes the steps required to be completed, including justification of any exceptions. This table must be completed in its entirety prior to conducting subsurface work. If certain requirements are not applicable, describe reason for exemption.

The SSC Project Checklist (Table 8) is to be completed by the HASP preparer and used as a guideline for the activities that must be planned for SSC project work. Planned and proposed dates and activities should be included by the HASP preparer, and information updated as it become available. If field practices differentiate from plans proposed and documented on the SSC Project Planning Checklist (like walkover dates or historical documents reviewed), it is the Designated Person's responsibility to update the project-specific HASP and SSC Project Planning Checklist to reflect these changes. Any deviations from these requirements must be documented and approved prior to the commencement of ground disturbance activities.

Table 8: Pre-Project Planning Checklist

Subsurface Clearance (SSC) Pre-Project Planning Worksheet
Document the steps that must be followed and justify any exceptions.
This checklist MUST be completed in its entirety.

SSC Requirements	Yes	No	N/A	Comments
Clearance Site Supervisor: SSC Area Expert:	☒	☐	☐	Name: Dave Markelz Contact: 262-422-9422 Name: Kristen Heitman Contact: 773-879-2235
Identify a **Knowledgeable Site Representative**, as available Name: Ray Kultgen (Denver Gardner) Contact: 920-457-4891	☒	☐	☐	The facility had GPRS scan the excavation area and no live or energized utilities were identified. Conduit is located in the excavation but no utilities have been installed within the conduit.
Gather applicable **Site Utility Information** Note: If no Site Utility information and/or no Knowledgeable Site Representative is provided consider additional controls such as soft digging.	☒	☐	☐	Shallow hand auger samples only samples collected no deeper than one foot below the bottom of the excavation e.
Create a Site-specific **Plot Plan**	☒	☐	☐	*Must depict all known utilities identified prior to intrusive work from review of aerial photos, site documents/maps/plans gathered and discussions with knowledgeable site person(s).*
Mark **Intrusive Locations**/**Areas** and **Alternate Locations** on the Plot Plan	☒	☐	☐	*All proposed Intrusive Locations must be marked on the Plot Plan prior to work beginning. ONLY Alternate locations/areas cleared using the SSC Program are permitted for continued drilling if refusal is meet on site.*
Private Locator responsible for Private Locate.	☒	☐	☐	Name of subcontractor: SRS Locating Contact information: Tony Savino
Discuss SSC Site Investigation with **Private Locate**	☒	☐	☐	*Discuss with subcontractor, as applicable, and document the specific technology(s) that will be used to confirm Public Utilities, actively clear the site, and clear specific intrusive locations. Discuss specifics site details such as ground surface, soil conditions, known utilities and underground structures, and any site-specific features that may create interference.*
Assess **Public Utilities** Note: Either via One Call, 811, directly with utility owners or via a webservice - confirm the presence and absence of commonly expected services in the area. In some cases, the utility company may need to be contacted directly to request a utility locate. All commonly expected utilities must be marked or positively confirmed to be absent from our work area prior to intrusive work.	☐	☐	☒	Diggers Hotline # 20194101310 (10-7-2019) Utilities Notified: Alliant Energy ATT Distribution Charter Communications City of Sheboygan Wisconsin Public Service
Proposed date for SSC site locate and participants (Clearance Site Supervisor must participate for the duration of the site locate)	☒	☐	☐	Date: October 9, 2019 Participants: *(Clearance Site Supervisor, Site Representative, private utility locator, etc.)*

5. EMPLOYEE TRAINING REQUIREMENTS

All employees performing on-site operations with the potential for exposure to hazardous substances or health hazards will meet the employee training requirements in accordance with applicable regulations. The training policies and procedures will ensure that employees can recognize hazards, understand emergency response procedures, and have the knowledge necessary to enable them to perform their assigned jobs in a manner that ensures employee and public safety. Completion of appropriate health and safety training, as described below, and participation of medical surveillance will be required to gain access to on-site areas other than the Support Zone. Documentation of training includes initial 40-hour health and safety training, 8 hours of annual refresher training, 8 hours of supervisor training, supervised field experience, first aid training, and CPR certification.

5.1 Initial Training

A. Basic Health and Safety Training

A minimum of 24 hours of initial health and safety training off-site is required to obtain on-site access to areas other than the Support Zone. All employees engaged in or supervising activities in the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ) will have a minimum of 40 hours of initial health and safety training off-site, meeting the in accordance with applicable regulations.

B. Supervised Field Experience

All employees with 24 hours of initial health and safety training are also required to have a minimum of 1 day of field experience under the direct supervision of an experienced supervisor. Employees with 40 hours of initial health and safety training are required to have a minimum of 3 days of field experience under the direct supervision of an experienced supervisor.

C. Supervisor Training

All on-site managers and supervisors directly responsible for, or who supervise employees engaged in invasive site activities will have received the initial 40-hour health and safety training and at least 8 additional hours of specialized off-site training consistent with applicable regulations. This specialized training will include topics such as, but not limited to, regulatory compliance, management of on-site health and safety hazards and recognition of special employee training needs.

D. Health and Safety Officer Training

Health and safety officers will be trained to a level required by their job function and responsibility. This will include training in implementation of HASPs and compliance with applicable health and safety requirements.

E. First Aid and CPR Training

Ramboll employees will maintain first aid and CPR training as certified by the American Heart Association (or equivalent) to render first aid and CPR.

5.2 Refresher Training

All employees who have received 40 hours of initial health and safety training will receive 8 hours of refresher training annually, as specified in accordance with applicable regulations. Topics to be covered in this training program will include those specified in the initial 40-hour health and safety training and/or those specified in the supervisory training course, as well as a critique of incidents that could serve as training examples.

Project-specific refresher training will be provided when the project scope is changed and/or when the hazards change.

A. Site Safety Briefings

Site safety briefings will be conducted prior to the start of each work day or work shift to discuss health and safety issues, changes in work procedures, exposure incidents and other relevant information. Prior to each change in operations, the meetings will address PPE use and maintenance, physical safety hazards from machinery, protection from chemical hazards, decontamination procedures, protection from heat/cold stress and specific safety requirements associated with the new operations. During safety meetings, on-site employees qualified to perform first aid and CPR will be identified. All changes in the HASP will be reviewed during the morning safety briefing. A record of the meeting will be written daily and signed by all participants and included in section 13.0 of this HASP.

B. Visitor's Briefing

Visitors will not be permitted to enter areas other than the Support Zone unless documentation of training, as described above, is presented to the Ramboll site supervisor. All visitors will be provided with applicable site-specific information including but not limited to hazard recognition, employee hygiene and site safety rules, use of PPE, and emergency response procedures. Visitors requesting on-site access to areas other than the Support Zone will be required to review and sign off on the HASP to ensure understanding and compliance with the provisions in the HASP. All employees, contractors, and site visitors will receive information contained in this HASP and any site-specific hazard awareness prior to entry into the site, as applicable. The training will ensure that employees can recognize hazards, understand emergency response procedures, and have the knowledge necessary to enable them to perform their assigned jobs in a manner that ensures employee and public safety. All employees will be required to sign an attendance sheet (see section 13.0 in this HASP) verifying that they received and participated in a training briefing. Individuals refusing to sign the sheet will not be allowed to work on the site.

Compliance with Hazard Communication Standard is required for work at this site. Safety Data Sheets (SDSs) are part of Appendix A. Employees shall receive training for the identification of hazards associated with the materials in use and the safe use of these materials, as applicable. Any hazardous chemical products brought to the site (other than standard fuels) for use during field activities must be reviewed by the Site Supervisor. Contractors are responsible for having their own hazard communication program. Contractors will supply SDS documentation to the Site Supervisor for all products to be used on-site.

In addition, any employee who is or is expected to be directly involved with intrusive sampling of contaminated environmental media or other sampling activities that could reasonably lead to chemical exposure is subject to appropriate training and standards, including but not limited to 40-hour HAZWOPER (or equivalent) (and 8-hour refresher training), respiratory protection, first aid, and CPR training. This would include any employee that visits exclusion zones of hazardous waste sites or remediation sites.

5.3 Hazard Communication

The following procedures related to hazard communication are applicable to this site. All employees will be briefed on this program.

5.3.1 Container Labeling

All containers received on site will be inspected to ensure the following: (1) All containers will be clearly labeled as to the contents; (2) the appropriate hazard warnings will be noted; and (3) the name and address of the manufacturer will be listed.

All drums or bins to be shipped off the site will have a label affixed with the following information: (1) the identity of the waste generator, (2) the boring, well, or excavation identification and sample depth, (3) the waste matrix (e.g. soil, water, product), and (4) the date of waste generation.

5.3.2 Employee Training & Information

Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following:

1. An overview of the requirements contained in the Hazard Communication Standard;
2. Hazardous chemicals present in their workplace operations;
3. Location and availability of a written hazard communication program;
4. How to read labels and review SDSs to obtain appropriate hazard information;
5. Locations of SDS files and the hazardous chemical inventory;
6. Physical and health effects of the hazardous chemicals;
7. Methods and observation techniques used to determine the presence or release of hazardous chemicals;
8. How to lessen or prevent exposure to these hazardous chemicals through usage of control/work practices and personal protective equipment; and
9. Emergency procedures to follow if they are exposed to these chemicals.

Ramboll employee(s) will inform subcontractor(s) of any hazardous chemicals brought on-site by Ramboll; and likewise, subcontractors shall inform Ramboll employees the same.

5.4 Disciplinary Actions

If employees do not follow the HSS safety rules and/or are conducting operations that are hazardous to themselves or their fellow workers, work should be stopped, and disciplinary actions will be implemented in accordance with Ramboll's policies. No person who disregards safety rules or who creates unsafe situations will be allowed to continue working in this manner, and such situations may result in dismissal of the individual(s) from the site pending further investigation.

5.5 HSS Event/Incident Reporting

Each contractor is responsible for maintaining injury and illness records in accordance with applicable regulations and supplying Ramboll with applicable records in a timely fashion upon request. With respect to health, safety and security events or incidents, the following types of events/incidents are to be reported:

- All employee injuries and illnesses that include first aid, doctor/hospital visits which may or may not involve restricted work and/or lost time;
- Environmental incidents and exposures, such as spills or other unplanned releases to the environment or nonconformance to operating procedures;
- All evacuations (false or real);
- Any Property damage including but not limited to Ramboll-owned, rented, or client-owned property; potential property damage also includes any observation, uncovering, or intersection or subsurface or overhead utilities;
- Any Property loss;

- Near misses, which could have resulted in an injury, accident, environmental impact or property damage;
- Public/third party liability incidents which may involve injury, illness or property damage due to the actions of any non-Ramboll employee arising out of, or in connection with the Firm's contracted scope of work, operations, products, or premises.

All the incident types outlined above MUST be communicated by the Ramboll Site Supervisor to the PD/PM, Project HSSC, and/or a Corporate HSS representative immediately following the incident, either in person or via phone, e-mail, or text messaging. The contacted person will then ensure that the other core project members are informed either in person or via phone, e-mail, or text messaging, regardless of time of day. As soon as possible after the event and no later than 72 hours after the event, the first page of the Incident/Event Investigation Report form will be completed by the Site Supervisor or his/her designee and sent the core project members (i.e., the PD/PM, Project HSSC, and Corporate HSS representative), for preliminary root cause analysis. The root cause analysis will not be deemed complete until input from all individuals involved in the event, applicable witnesses, and input from the core team has been obtained. Similarly, the implementation of any corrective/preventive actions will NOT be considered complete until input from the HSS Director (and others as necessary) has been obtained.

6. MEDICAL SURVEILLANCE AND RECORDKEEPING

The goals of the medical surveillance program are to monitor the health of potentially exposed employees using medical examinations and diagnostic laboratory testing, to provide medical care for occupational injury or illness, to keep accurate records for future reference and to ensure the selection of employees physically able to safely perform the work assigned. The medical surveillance program supports and monitors the effectiveness of the primary health and safety goal of controlling worker exposure to hazardous substances. Medical examinations will be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine.

In general, all employees who may be exposed to hazardous substances above the permissible limits; who wear a respirator; or who are injured, become ill, or develop signs or symptoms due to possible overexposure to hazardous substances from hazardous waste operations must be medically monitored. Ramboll's requirement is for all employees to be subject to Medical Surveillance Program as well as any employee who may wear a respirator, regardless of the during of use.

Each employee enrolled in the Medical Surveillance Program will be subject to periodic medical exams, the frequency of which will vary depending on the extent and duration of exposure, the type of chemicals involved, and the individual employee's medical profile. These employees will receive a medical examination at least once per calendar year.

Documentation of current participation in a medical surveillance program and fitness for duty, including ability to wear respiratory protective equipment, will be necessary for all employees who work on-site in areas other than the Support Zone. However, all specific medical information and examination results obtained during administration of the medical surveillance program will be maintained by the examining physician as confidential.

6.1 Baseline Medical Examinations

The baseline medical examination serves two major purposes: (1) it determines the individual's fitness for duty, including the ability to work while wearing a respirator; and (2) it provides baseline data for comparison with future medical data. The baseline medical examination will include, at a minimum, the following:

1. Complete occupational and medical history;
2. Physical examination;
3. Blood count and chemistry profile;
4. Urinalysis with microscopic review;
5. Chest x-ray;
6. Pulmonary function tests;
7. Resting electrocardiogram (EKG); and
8. Cardiac stress test (at physician's discretion).

Certification of fitness for duty and ability to wear personal protective equipment must be provided to gain access to on-site areas other than the Support Zone. However, all specific medical information obtained during administration of the medical surveillance program will be maintained as confidential.

6.2 Periodic Medical Examinations

Each individual enrolled in the medical surveillance program will be subject to periodic medical surveillance examinations. In general, employees involved in field activities with a frequency of

greater than 30 days per year will receive medical examinations at least annually. Periodic medical examinations should include the parameters included in the baseline examination, except for the chest x-ray and EKG, which are repeated after the baseline examination at the physician's discretion and with agreement of the individual.

6.3 Special Medical Examinations

Special medical examinations or consultations will be arranged for employees exposed in an emergency to hazardous substances at concentrations above the PELs without adequate protection. This will be done as soon as possible after the overexposure has been determined by the Site Supervisor, in consultation with the Corporate Health and Safety Director.

Special medical examinations shall also be arranged upon notification by the individual that he/she has developed signs or symptoms indicating a possible overexposure to hazardous substances, or if the examining physician determines that a more frequent medical examination is necessary.

6.4 Special Circumstances

Any individual who is on a medication that may interfere with the ability to perform his/her job function, or who may require special medical attention, must notify the Site Supervisor of these circumstances prior to commencing work at the site.

6.5 Health and Safety Records

Health and safety records for on-site Ramboll employees including but not limited to training, medical clearances, fit testing, and any monitoring will be kept on file by the Corporate Health and Safety Director and on-site by the Site Supervisor, as applicable. Sub-contractor and contractor health and safety records shall be maintained by the applicable sub-contractor and/or contractor and provided to the Site Supervisor, if requested. Ramboll Employee Training and Medical Records are maintained at Ramboll, 333 West Wacker Drive, Chicago, Illinois. **RECORDS WILL BE MAINTAINED ON-SITE AS NECESSARY** in accordance with applicable laws, client or agency requests.

7. PERSONAL PROTECTIVE EQUIPMENT

This section of the Site Health and Safety Plan is a reference of selection for different levels of PPE. The protective equipment will be selected based on the contaminant type(s), concentration(s) in air (if any), standing liquid (if any), or other applicable matrix, and the known route(s) of entry into the human body. In situations where the type of materials, their concentrations, or exposure potentials are unknown, a decision based on professional judgment regarding the assignment of personal protective equipment will be made by the HSSC.

7.1 Selection of PPE

The selected PPE should be able to resist degradation, penetration, and permeation by the contaminants present at the site. In selecting the appropriate protective material, the following should be considered: chemical resistance; tear and puncture resistance; flexibility; thermal stress; cleanability; and durability.

PPE will be selected, used and maintained in accordance with applicable regulations.

Levels of PPE

The four levels of PPE are Levels A, B, C, and D, with Level A providing the highest available level of respiratory, skin, and eye protection. A summary of the basic PPE ensemble for Levels A, B, C, and D is provided below. PPE selection for operations at the site will be tailored to address specific task conditions. If your project involves hazards requiring Level A or B PPE, additional planning and a HASP addendum will be required. Please contact the HSS Department for assistance.

Level A (High)

Level A PPE provides the maximum degree of respiratory, skin, and eye protection. Contact the HSS Department for additional requirements. A Level A PPE ensemble should include:

- Full-face piece self-contained breathing apparatus (SCBA) or full-face piece supplied air respirator with escape SCBA;
- Fully encapsulating, chemical-resistant suit, safety boots and inner gloves; and
- Hard hat (if overhead or bump hazards exist).

Level B (High)

Level B PPE provides the maximum level of respiratory protection. Since chemical-resistant clothing is not considered gas, vapor, or particulate tight, Level B PPE does not provide the maximum skin protection. However, a good quality, hooded, chemical-resistant one-piece garment with taped wrists and ankles provides a reasonable degree of protection against splashes of liquids and lower concentrations of chemicals in ambient air. It is the minimum level recommended for confined space entries and initial site entries until the hazards have been further identified. Contact the HSS Department for additional requirements. Level B PPE should be used when **any** one of the following criteria is met:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection but less skin protection--this includes atmospheres with IDLH concentrations of specific substances that do not represent a severe skin hazard or atmospheres that do not meet the criteria for use of air-purifying respirators;
- Atmosphere contains less than 19.5% oxygen; or

- Presence of incompletely identified vapors or gases is indicated by air monitoring instruments but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

Level C (High)

Level C PPE provides the same level of skin protection as Level B PPE, but a lower level of respiratory protection. Air-purifying respirators can be used only if the substance has adequate warning properties; the individual passes a qualitative fit-test for the mask; an appropriate cartridge/canister is used, and its service limit concentration is not exceeded; and site operations are not likely to generate unknown compounds or excessive concentrations of already identified substances. Level C PPE can be used when **all** the following conditions are met:

- Oxygen concentrations are not less than 19.5%;
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin;
- Types of air contaminants have been identified, concentrations measured, and a cartridge or canister is available that can remove the contaminant;
- Atmospheric contaminant concentrations do not exceed IDLH levels; and
- Job functions do not require self-contained breathing apparatus (SCBAs).

Modified Level D (Medium)

Modified Level D PPE provides minimal skin protection (i.e., hand/glove protection along with standard work clothes with optional coveralls) and no respiratory protection. Modified Level D PPE can be used when the following conditions are met:

- Atmosphere contains no known hazard;
- Oxygen concentrations are not less than 19.5%;
- Work functions include minimal contact with contaminated soil, water, groundwater and precludes splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Level D (Low)

Level D PPE provides no skin protection other than standard work clothes and no respiratory protection. Work functions are limited non-hazardous environments and preclude contact with media that may be potentially contaminated at hazardous levels for any type of chemical.

7.2 Respirator Fit Test

A respirator fit test will be conducted on all site employees who will perform work operations in areas other than the Support Zone. Prior to the initiation of any fit testing, employees must be certified as medically able to wear a respirator. The respirator fit test is conducted to ensure proper face piece-to-face seal. A secure fit is important with positive-pressure equipment and is essential to the safe functioning of negative-pressure equipment, such as most air-purifying respirators. Employees will receive instruction on proper wear and maintenance of the respirator.

Qualitative fit tests will be conducted annually in accordance with the ANSI Practices for Respiratory Protection, Z88.2-1989. In addition, a negative and positive fit check will be performed each time an employee dons the air-purifying respirator (APR). Documentation of annual respirator fit tests will be kept in the Support Zone.

7.2.1 Negative and Positive Fit Check

The negative and positive pressure fit check will be performed each time an employee dons the APR. The negative pressure fit check involves closing off the inlet openings to the APR cartridges by covering with the palms of the hands. If an inward leakage of air is detected, the APR should be checked for material defects and refitted or replaced with another APR.

The positive pressure fit check is performed by placing the palm of hand over the exhalation valve and gently exhaling for 10 seconds to create positive pressure inside the facepiece. If an outward air leak is detected, the APR should be readjusted. If after readjustment leakage still occurs, another APR should be used.

7.3 PPE Inspection Checklist and Maintenance

PPE inspections will be conducted upon receipt of PPE from the factory or distributor; when it is issued to workers; after use or training; and prior to maintenance. Periodic inspections of stored equipment will be conducted routinely, whenever a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise. At a minimum, PPE inspection should include the following:

A. Clothing

Before use:

1. Determine that the clothing material is correct for the specified task.
2. Visually inspect for:
   - Imperfect seams
   - On-uniform coatings
   - Tears
   - Malfunctioning Closures
3. Hold up to light and check for pinholes
4. Flex product:
   - Observe for cracks
   - Observe for other signs of shelf deterioration
5. If the product has been used previously, inspect inside and out for signs of chemical breakthrough or deterioration, such as:
   - Discoloration
   - Swelling
   - Stiffness
6. During the work task, periodically inspect for:
   - Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind that chemical permeation can occur without any visible effects.
   - Closure failure
   - Tears
   - Punctures

- Seam discontinuities

B. Gloves

Before use, pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet towards fingers or inflate glove and hold under water. In either case, no air should escape.

C. Respirators

SCBA/supplied air/air-purifying:

1. Inspect SCBA/supplied air/air-purifying respirators before and after each use, at least monthly when in storage and during cleaning. Air-purifying respirators should be inspected before each use to be sure they have been adequately cleaned.
2. Check all connections for tightness, inspect air lines prior to each use for cracks, kinks, cuts, frays, and weak areas.
3. Check for proper setting and operation of regulators and valves (according to manufacturer's recommendations) and check operation of alarms.
4. Check material conditions for:
   - Signs of pliability
   - Signs of deterioration
   - Signs of distortion
5. Check face shields and lenses for:
   - Cracks
   - Crazing
   - Fogginess
6. Examine cartridges or canisters to ensure that:
   - They are the proper type for the intended use,
   - The expiration date has not passed, and
   - They have not been opened or used previously.

7.4 Task Specific PPE

This section of the Project Health and Safety Plan is used for the selection of the appropriate PPE. The protective equipment will be selected based on the contaminant type(s), concentration(s) in air (if any), standing liquid (if any), or other applicable matrix (e.g., soil, sludge, sediment, etc.) and the known route(s) of entry into the human body. Table 9 presents the general level of protection to be used for each task that is anticipated to be conducted on this Project.

Table 10 identifies the specific PPE items that are required or recommended to be used on this project. This includes identifying the specific type of hand and body protection (as applicable) for the chemicals that may be encounter while conducting the tasks outlined in this HASP.

Table 9: Task Specific Personal Protective Equipment

Task Description as depicted in Section 2.5	Level of Protection					
	A (High) Contact HSS Dept.	B (High) Contact HSS Dept.	C (High)	Mod D (Medium)	D (Low)	NA
Utility Clearance	☐	☐	☐	☐	☒	☐
Soil Sample collection and composite sampling	☐	☐	☐	☐	☒	☐

Key:

Level D (Low): Long sleeve shirt*; long pants*; hard hat; eye protection; hearing protection; and safety shoes.

Level D Modified (Medium): Level D protection plus protective coveralls, as required; and appropriate hand protection.

Level C (High): Level D (Modified) protection plus negative pressure respiratory protection with appropriate cartridges; chemical protective coveralls in lieu of general coveralls; use of inner and outer sets of hand protection.

Level B (High): Level C protection plus Pressure-demand supplied air respirator with escape bottle in lieu of negative pressure respirator; chemical resistant coveralls with hood; chemical resistant boots. Contact HSS for additional requirements.

Level A (High): Level B protection plus fully encapsulating (gas tight) chemically resistant suit. Contact HSS for additional requirements.

*Clothing made of natural fibers shall be worn when a shock or arc flash hazard exists.

Table 10: Personal Protective Equipment and Supplies

Equipment	Req	Rec	NA	Equipment	Req	Rec	NA
Steel-toe Boots	☒	☐	☐	SCBA	☐	☐	☒
Outer Disposable Boots	☐	☒	☐	Full-face Airline Resp.	☐	☐	☒
Long Sleeve Shirt and Pants	☒	☐	☐	Full Face Negative Pressure Resp.	☐	☐	☒
Flame Retardant Coveralls	☐	☐	☒	Half Face Negative Pressure Resp	☐	☐	☒
Tyvek Suit	☐	☐	☒	Powered Air Purifying Resp	☐	☐	☒
Poly-coated Tyvek / Saranex Suit	☐	☐	☒	First Aid Kit	☒	☐	☐
Fully Encapsulated Chemical Suit	☐	☐	☒	Fire Extinguisher	☐	☒	☐
Hearing Protection	☒	☐	☐	Mobile Phones	☒	☐	☐
Leather Gloves	☐	☒	☐	Walkie Talkies	☐	☐	☒
Outer Chemical Gloves (Type): Nitrile	☒	☒	☐	Water or Other Fluid Replenishment	☒	☐	☐
Inner Chemical Gloves (Type): Nitrile	☒	☐	☐	Eye Wash	☐	☐	☒

Table 10: Personal Protective Equipment and Supplies

Equipment	Req	Rec	NA	Equipment	Req	Rec	NA
Hard Hat	☐	☒	☐	Sunscreen	☐	☐	☒
Safety Glasses with Side Shields	☒	☐	☐	Insect Repellent	☐	☐	☒
Vented (Splash proof) Goggles	☐	☐	☒	Other: Click or tap here to enter text.	☐	☐	☐

Key:

Req = Required;

Rec = Recommended;

NA = Not Applicable

8. AIR MONITORING/SAMPLING PROCEDURES

Air samples may be collected during the project to identify and quantify airborne contaminants to delineate areas where PPE may be needed; determine the level of PPE necessary; document on-site employees' exposures; assess the potential health effects of exposure; determine the need to implement engineering controls or evacuate the work zone or site; and determine the need for specific medical monitoring. Some commonly used devices include the following:

Combustible Gas Indicator (CGI)–Examples include O2 / LEL meter. A CGI measures the concentration of a combustible gas or vapor. Its accuracy is, in part, dependent upon on the difference between the calibration and sampling temperatures; oxygen-deficient atmospheres also affect accuracy; filament can be damaged by silicones, halides, and tetraethyl lead; and the sensitivity is a function of the difference in the chemical and physical properties between the calibration gas and the unknown.

Flame Ionization Detector (FID)–Examples include Organic Vapor Analyzers (OVA). Depending on mode, it may detect many organic gases and vapors. An FID will not detect inorganic gases and vapors; has reduced reliability in high humidity conditions; and should not be used when temperatures are below 40F (4.4C).

Ultraviolet (UV) Photo Ionization Detector (PID)–Examples include HNU; MiniRAE, and similar types. Detects several organic and some inorganic gases and vapors. A PID does not detect methane; does not detect a compound if the probe used has a lower energy than the compound's ionization potential; does not readily ionize fully chlorinated materials; high humidity affects readings; low humidity affects operation; response is sensitive to dust or moisture on the lamp; and responses will fluctuate when gases are mixed. Some PIDs are available that when properly equipped, can specifically measure benzene concentrations.

Infrared Spectrophotometer (IR)–Examples include Miran. Measures concentrations of many gases and vapors in the air but designed to quantify one- or two- component mixtures. Not approved for use in hazardous conditions; must make repeated passes to achieve reliable results; and somewhat bulky/heavy.

Direct-Read Colorimetric Tubes–Examples include Drager. The compound reacts with the indicator chemical in the tube, producing a stain whose length is proportional to the compounds' concentration. Results are affected by temperature, pressure, and humidity; many similar compounds interfere with results.

Personal Air Monitoring–Quantitative air sampling for nuisance dust, metals, organic and inorganic compounds. Samples are collected using personal air sampling pumps and the appropriate sampling media. All employee samples will be collected in the employees breathing zone over the duration of the work shift. The specific methods to be utilized for the collection of personal air samples will require the involvement of a Certified Industrial Hygienist (CIH) if this type of sampling will be conducted.

8.1 Using Monitoring Devices

Conducting an applicable task may necessitate using one or more monitoring devices as listed in Table 11, particularly if gases, vapors, explosion hazards and/or oxygen deficient atmosphere can occur or are expected. If a monitoring device will be utilized, the corresponding device letter should be placed in the column labeled "Monitoring Instrument Required" in Table 12. In addition, you MUST record the following information in the field log book if you are going to use a monitoring device:

1. Instrument name and serial number.
2. Date of calibration.

3. Frequency/duration of monitoring.
4. The monitoring results.
5. And the actions taken based on the results, even if "no actions are required to be taken"

Table 11: Monitoring Devices Available			
A	PID (10.6 eV)	**H**	Summa Canister
B	PID (11.7 eV)	**I**	Heat Stress Monitor
C	FID	**J**	Air Sampling:
D	OVA	**K**	Air Sampling:
E	CGI/LEL	**L**	Radiation Detector
F	Colorimetric Indicator Tubes	**M**	Gas Multimeter
G	Dust Monitoring	**N**	Other Device:

With respect to Table 11, also insert the task and the applicable Action Level in the appropriate box using 50% of the most restrictive (lowest) PEL or TLV as the Trigger. For example, if the most restrictive PEL for a particular VOC is 50 ppm, use 25 ppm as the "Trigger" value.

Table 12: Required Monitoring				
Required Monitoring **If monitoring is necessary to identify that a risk is at or above tolerable limits and/or is used in controlling a risk on site, document the task and the maximum allowable exposure or trigger, and the monitoring instrument required to be used.**	**Constituent**	**Task(s)**	**Trigger (action level)**	**Monitoring instrument required**
	Oxygen		19.5% to 23.5%	
	Carbon Monoxide		25 ppm	
	H_2S		5 ppm	
	C_2S			
	CH_4		0.5% or 5000 ppm	
	VOCs: Total		0.5 ppm	
	Semi-VOCs:			
	Metals			
	Dusts			
	Others:			
	Others:			

8.2 Action Level Guidance

In general, this HASP must address site-specific chemicals as noted in Tables 11 and 12. However, there are chemicals commonly encountered in the workplace that may not be a chemical targeted for sampling but nonetheless will have adverse health effects. These chemicals are listed in Table 13 below.

Table 13: Action Levels for Commonly Encountered Compounds	
Compound	**Action Level**
VOC (Total)	0.5 ppm MAXIMUM
VOC (no compounds with PEL <10 ppm)	5 ppm MAXIMUM
CH_4	0.5% MAXIMUM or 5000 ppm
CO_2	0.25% OR 2500 ppm MAXIMUM
CO	25 ppm MAXIMUM
H_2S	5 ppm MAXIMUM
O_2	19% MINIMUM–23.5% MAXIMUM

8.2.1 Volatile Organic Compound

An action level for each chemical or group of chemicals should be based on 50% of the most restrictive (lowest) PEL or TLV. Absent analytical data that adequately represent the types and concentrations of VOCs at the site, the default VOC (Total) action level is 0.5 ppm. The action level may be revised based on prior analytical data if appropriate, and this decision should be made with input from the HSSC and HSS department.

If a sustained (i.e., 1-minute sampling period) total volatile organic compound (VOC) reading within the breathing zone as determined by a photo ionization detector (PID) is above the action level, site employees shall attempt to mitigate the situation through the use of engineering controls (i.e., move upwind, increase air circulation) as indicated in Table 14. If the action level still cannot be met, employees shall leave the area and contact the PM and HSSC for further instructions.

Table 14: Volatile Organic Compound				
Instrument	**Calibration Gas Standard**	**Frequency/ Duration of Air Monitoring**	**Action Level [1] Above Background (Breathing Zone)**	**Action**
Photo ionization detector (PID) calibrated daily	100 ppm isobutylene	Every 5-10 minutes take a 1-minute reading.	> 5 ppm above background level (no compounds with PEL <10 ppm)	Introduce engineering controls (i.e., blower fans) (Level D) Evaluate controls (see below)
After Introduction of Engineering Controls				
PID calibrated daily	100 ppm isobutylene	Every 5-10 minutes take a 1-minute reading.	< 5 ppm (no compounds with PEL <10 ppm)	Continue work (Level D)
			5-50 ppm above background level	Don respirator (Level C); Contact HSSC to evaluate
			> 50 ppm above background level	Discontinue work (Level C)

Note:
[1] Action Levels for "Known contaminants" should be based on 50% of the most restrictive Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV).

8.2.2 Combustible Gas Indicator (CGI)/Oxygen Meter

Table 15: Combustible Gas Indicator (CGI)/Oxygen Meter

Meter Response	Action/Respiratory Protection
CGI response <10% LEL	Continue normal operations with regular, periodic monitoring
CGI response > 10% LEL	Discontinue operations; evacuate employees and prohibit entry; allow to vent until readings are <10%.
Oxygen level <19.5% or >23.5%	Retreat from work area; consult with PM and HSSC about upgrading to Level B respiratory protection, adding mechanical ventilation, or possible changes in work practices.

8.2.3 Odors

If strong odors are encountered or if employees develop headaches, dizziness or other potential exposure symptoms, the employees shall leave the work area to a well-ventilated area and contact the PM and HSSC for further instructions.

8.2.4 Dusts

The permissible exposure levels for total and respirable dusts are 15 and 5 mg/m^3, respectively. In general, at these concentrations you will not be able to read the face of a wristwatch (with your arm extended) when the total dust concentration reaches 15 mg/m^3. Particles of dust in the respirable size range cannot be seen without the aid of a microscope but in aggregate, may be perceived as a haze. More importantly and with few exceptions, when dust is noticeable in the air, more respirable particles will exist than larger particles.

Typically, controlling dusty investigative activities using a water sprayer will control potential exposures. However, if dusty conditions exist that are not related to investigative/remedial activities (dry, uncovered soils with high winds), employees shall leave the area and contact the PM and HSSC for further instructions.

For sites and tasks with where dusts may contain harmful chemicals and there is a risk of exposure to dust-borne contamination, additional evaluation of potential exposure is necessary to evaluate action levels and PPE requirements. The HSS Department and/or HSSC can assist with this evaluation. To determine the likelihood of exposure from dusts, a theoretical "Total Dust" concentration in mg/m^3 can be calculated to estimate the total dust concentration in which the concentration of the contaminant in the soil could equal and/or exceed its' established exposure limit (EL). This equation is as follows:

Total Dust (mg/m^3) = (10^6 mg/kg) (**EL** mg/m^3) / (Conc. of contaminant in soil mg /kg) (**SF**)

Where:

EL = Exposure Limit of the contaminant of concern (e.g., its PEL or TLV in mg/m^3); and

SF = Safety Factor, a number between one and ten. Used to account for the degree of confidence in the characterization data (a ten would represent a poor degree of confidence, for example only one soil sample was collected / analyzed to characterize the site).

The **SF** is based upon the following assumptions: 1) the concentration of the contaminant in the airborne dust is the same as its concentration in the sample matrix; 2) the soil data depicts a representative "worst-case" scenario; 3) the monitoring instrument used, accurately measures the

ambient concentration of particulate matter in the air; and 4) a single contaminant of concern is present.

As an example, assume that Lead (with an EL of 0.05 mg/m^3) is the contaminant of concern and a soil concentration of 25,000 mg/kg has been identified. Depending on the SF used, the theoretical total dust concentration will range between 2 to 0.2 mg/m^3. This means that when the in-situ particulate monitoring device is registering a concentration within 2 to 0.2 mg/m^3 range, there is a high probability that this dust contains enough lead to equal and/or exceed the EL. Hence, the level of PPE used would be increased until engineering controls are determined to be effective as documented by personal monitoring.

9. CONFINED SPACE ENTRY

Ramboll's health and safety policy prohibits unauthorized entry into confined spaces. If entry into a confined space is required, prior to entering a confined space, Ramboll employees (or its subcontractor's employees) will need additional training. Without Confined Space training, entry into confined spaces is prohibited. In addition, entry authorization will only be given after Ramboll management has reviewed the nature of the confined space, the hazards present, and the measures needed to ensure safety. Under these circumstances, Ramboll will work with the host facility/client to determine training requirements, sampling requirements, written program requirements, and equipment needed to safely enter the confined space.

It is not anticipated that confined space entry will be required for this project and/or the tasks listed in this HASP. If confined space entry is required, this HASP will be revised accordingly and the Corporate HSS Department should be involved to ensure all applicable regulations will be met.

10. SPILL RESPONSE

If warranted, before any spill clean-up work is initiated at the site, applicable local, state, and/or Federal Emergency Response Authorities will be identified and contacted by either the Client Contact and/or a designated Ramboll employee.

10.1 Reporting and Initial Employee Safety

Upon discovery of a hazardous substance spill, employees are to:

- Immediately summon help by notifying the Project Manager and the Client Contact;
- Act to ensure the safety of nearby employees;
- Proceed to a safe location;
- If anyone is seriously injured, immediately contact emergency medical services; and
- Keep unauthorized employees out of the area.

10.2 Initial Spill Reaction

Factors that limit the employee's response at the site of a spill are:

- Level of training,
- Personal safety,
- Available personal protective equipment (PPE), and
- Knowledge of the substance.

Employees should limit their actions to shutting off equipment or pumps and closing valves if possible, feasible and safe to do so.

10.3 Spill Response Evaluation

The identity and hazards of the spilled material should be determined before decisions regarding spill containment and control are made. The Client contact and Project Manager should evaluate the hazards regarding the spill and decide whether project employees or external response organizations should conduct the cleanup.

The Project Manager must contact the Project Director and Corporate HSS Director to discuss the spill incident for further input on deciding how the cleanup can be conducted, including:

- Levels of PPE and safety procedures,
- Safety and work zones,
- All steps of the response activities,
- Most effective procedures or methods for cleanup,
- Means of containment,
- Leak of spill control, and
- Decontamination procedures (including Emergency decontamination).

11. DECONTAMINATION

11.1 Sampling and Construction Equipment Decontamination

Decontamination involves the orderly controlled removal of contaminants. All undedicated sampling equipment and sampling meters (if applicable) will be cleaned prior to and between each use. All on-site equipment will be decontaminated and allowed to air dry before leaving the site. Decontamination maybe accomplished using an approved cleaner, water, and steam. Subcontractors will be responsible for decontamination of their own equipment used during field operations, as well as disposal of the decontamination fluids. Decontamination fluids and soil cuttings will be temporarily stored in sealed and labeled 55-gallon drums, staged at a safe location which is mutually acceptable to Ramboll and the host facility, pending offsite disposal. The decontamination methods will be as follows:

Pipe X Metal X cleaning solution (https://chemicalsolutionsintl.com/product/pipe-x-metal-x/), a biodegradable decontamination solution for removing PCBs from metal surfaces. (A copy of the SDS for Pipe X Metal X is appended to the HASP). The solution will be used in a spray bottle, used to wet down paper towel and the saturated towels used to decontaminate the hand auger, tools and composite mixing bowls used for sample collection. The used towels will be placed in a garbage bag and placed in one of the roll off boxes that contains stained concrete for offsite disposal.

11.2 Employee Decontamination

All site employees should minimize contact with contaminants. At a minimum, the gross removal of contaminants from PPE shall occur in a designated area. All disposable PPE will be disposed of in approved 55-gallon drums (including respirator cartridges). Non-disposal PPE must be decontaminated, particularly safety boots. Any PPE that cannot be decontaminated should be disposed of along with the waste generated from field operations. The drums will be sealed and labeled appropriately, stored at a single secure location on the site, and be disposed of appropriately off-site. Employees should wash their hands and face prior to departing from the site and prior to eating, drinking, smoking and/or applying cosmetics. The decontamination methods will be as follows:

Modified Level D (Medium) Employee Decontamination

Where activities are performed in modified Level D (Medium) PPE employees will perform decontamination using the following guidelines:

- Place tools, instruments, samples and trash at an appropriate location. The equipment drop area should be clean and dry and at a minimum, plastic bags should be available for trash. Waste PPE will not be placed in the same containers as general trash.
- Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off equipment, samples, and tools prior to removal from the decontamination areas.
- Employees will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
- Remove outer work gloves and place in an appropriate container specified for waste PPE.
- Remove outer Tyvek coveralls if used and place them in an appropriate container specified for waste PPE.
- Remove inner protective gloves and place them in an appropriate container specified for waste PPE.

- Remove inner protective gloves and place them in an appropriate container specified for waste PPE.
- Wash hands using soap and water (separate from other decontamination cleaners/solutions).

Level C (High) Employee Decontamination

Employees involved in activities that require the use of Level C PPE will observe the following decontamination guidelines:

- Place tools, instruments, samples and trash at an appropriate location. There areas should be clean and dry, and at a minimum contain plastic bags for trash. Waste PPE will not be placed in the same containers as general trash.
- Inspection equipment, samples and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off equipment, samples and tools prior removal from the decontamination areas. Employees will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
- Un-tape wrists and ankles.
- Remove outer work gloves and place them in an appropriate container specified for waste PPE.
- Remove outer Tyvek coveralls and place them in an appropriate container specified for waste PPE.
- Wipe off and remove respirator mask (also goggles if worn).
- Remove inner protective gloves and place them in an appropriate container specified for waste PPE.
- Wash hands using soap and water (separate from other decontamination cleaners/solutions).

During emergencies, the need to quickly respond to an accident or injury must be weighed against the risk to the injured party from chemical exposure. It may be that the time lost decontaminating an individual may cause greater harm to the individual than from the potential for chemical exposure, particularly if the injury is life-threatening. In these instances, a non-injured person needs to inform responding emergency personnel of the potential for chemical contamination on the victim, specifically mentioning the type and expected concentrations.

11.3 Investigation-Derived Material Disposal

Investigation-derived materials will also be handled appropriately and will be placed in garbage bags and placed inside one of the roll off boxes that contains stained concrete for disposal.

12. EMERGENCY RESPONSE PLAN

The Emergency Response Plan (ERP) describes contingencies and emergency response procedures. The ERP defines the responsibilities of key employees in planning, prevention, and response to emergency situations, and identifies agency contacts and medical care procedures. The ERP addresses measures to prevent and respond to emergency situations, such as fire or explosion; spill or release of hazardous material; employee injury or illness; or other adverse events. General Emergency guidelines are as follows:

12.1 Stop Work Authority

All Ramboll employees have the authority and obligation to stop any task or operation where concerns and/or questions regarding the control of HSE risk exist, are not clearly established, or are not understood. Management is responsible for creating a culture where Stop Work Authority is exercised freely and without fear of retribution or intimidation.

When an unsafe condition is identified, a Stop Work intervention will be initiated and treated as a "near miss". As such, an incident report will be completed in accordance with Standard Practice Instruction 19 entitled "Incident Reporting" so that the unsafe condition can be documented, reviewed, and corrective actions and preventative measures be implemented as applicable.

These actions will be coordinated by the Site Supervisor, with support from the PM/PD/MP and the HSSC, and all affected employees will be notified of the Stop Work issue. No work will resume until all Stop Work issues and concerns have been adequately addressed. Most issues can be resolved in a timely manner at the job site, but occasionally additional investigation and corrective actions may be required. Work may resume when it is safe to do so.

12.2 Employee Involved in Emergency Response

Key employees involved in site emergency response include the PM, Site Supervisor, the Ramboll PD and contractor PMs. Clear lines of authority have been established for implementing emergency response procedures and for ensuring safety compliance. All emergencies and personal injuries will be immediately reported to Site Supervisor. The Site Supervisor will immediately report the incident to the PD/PM and Corporate Health and Safety Director.

12.3 Emergency Response Telephone Roster

The Emergency Response Telephone Roster consists of persons and organizations both on- and off-site who would be involved in the ERP. This roster, provided as Table 1A, will be kept in Ramboll site vehicle, a list of on-site employees who are trained in first aid and CPR will also be kept in the file. All site employees will be familiar with the Emergency Response Telephone Roster and will understand the proper chain of command. A listing of on- and off-site emergency contacts and key employees and their alternates will be posted in the site office.

12.4 Emergency Communications

The external communication system between on-site and off-site emergency response employees is necessary to report and coordinate emergency response. Where feasible, cell phone will be the primary means of external communication and will be used to notify off-site emergency response agencies and to request assistance. If cell phones may not be sufficient to provide a reliable means of emergency communication (for example, in areas without cellular reception, or if cell phones are not permitted on-site), other reliable methods of communication should be considered, and a Communication Plan should be developed.

12.5 Emergency Medical Care and Treatment

Every injury and exposure will be reported according to the procedures outlined in section 6.7 of this HASP, regardless of whether the incident appears to be serious or not, or whether any adverse health effects or symptoms are apparent after the exposure. Universal precautions to BBP shall be observed while administering first aid.

12.6 Life-Threatening Emergency Response

Incidents are possible that would result in emergencies beyond the on-site emergency response capabilities. In these situations, all work must be stopped, employees must be evacuated as necessary, and the appropriate emergency services contacted. Such incidents might include:

- Life-threatening injuries or injuries/exposures requiring medical treatment; and
- Fires progressing beyond incipient stage.

12.7 Evacuation Routes and Procedures

During site operations and in the event of an evacuation, a safe location (rally point) will be identified. As part of the site orientation, all on-site employees will be informed of the evacuation plan and rally points. For purposes of a safe and efficient means of vehicular egress, all vehicles will be backed into their designated parking location.

If evacuation is necessary, employees will determine wind direction. Whenever possible, evacuation should be in the direction perpendicular to the wind direction without passing through the plume or smoke cloud and/or spilled material, if applicable. Employees will report to their designated rally point. If a workers' evacuation to their primary rally point is hindered by emergency conditions, workers shall evacuate to the secondary rally Point. The Site Supervisor and/or designated back-up person will account for all site employees and notify first responders if any employees are unaccounted for, and report this information to the PM, PD, and HSSC. The Corporate HSS Department will also be notified if evacuations are necessary.

12.8 Training

All site employees will review the information in this HASP on the emergency response procedures, and the location and use of on-site emergency equipment, and will have received emergency response training. During the site orientation and/or site safety briefings, site employees will be trained in emergency response procedures, on-site communication systems and evacuation routes, as stated in this HASP. Visitors will be briefed on hazard recognition, safe work practices and basic emergency procedures by the Site Supervisor.

12.9 First Aid Procedures

If an employee is injured, general first aid will be administered. If safety concerns or hazardous conditions are still present (e.g., incipient fire, falling debris), the individual shall be moved to avoid further injury or risk. If an employee is injured in a contaminated area, general first aid will be administered and then the employee will be moved to the support zone for decontamination (if applicable), additional first aid, and preparation for transportation, giving due consideration to which risk will be greater; the spread of contamination or the health/safety of the individual.

First aid kits will be maintained on site at each project location. The type of first aid kit to be maintained will be for minor emergencies, such as cuts and skin abrasions. Where applicable, first aid supplies will be stored in a water proof container. The Site Supervisor or designated person will ensure that adequate first aid supplies (listed below) are maintained.

Minimum List of First Aid Supplies	
(1) First Aid Guide*	(6) Burn treatment applications
(1) Absorbent Compress >4”x8”	(4) 3”x3” Sterile gauze pads
(16) 1”x3” Adhesive bandages	(2) Pair medical exam gloves
(1) Adhesive tape 2.5yard roll	(1) Triangular bandage >40”x40”x56”
(10) Antiseptic treatment applications	(6) Antibiotic ointment applications
* Please see Appendix D First Aid Guidance, print, and store with ANSI approved First Aid kit on-site.	

Recommended List of First Aid Supplies	
Analgesic (oral, non-drowsy)	Eye covering >1/4” thick
Bandage compress >2”x2”	Eye/face wash
Breathing barrier, single use	Roller bandage >2”x4yards
Cold pack >4”x5”	Hand sanitizer

The contents of the first aid kits shall be checked before being sent out to each job and at least weekly on each job to ensure that expended items are replaced. Where the eyes or body of any employee may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be available for use.

12.10 Uncovering an Underground Service (Intact)

In the event of any damage or dislocation of any underground facility/pipeline or utility in connection with ground disturbance activity, work activities shall cease in the damaged facility. The Designated Person shall immediately call the applicable emergency phone number. Then, the affected utility and One Call service shall be notified, if applicable. The One Call service may be able to assist with contact numbers for notifying member companies in the event of any damage. NO ONE should attempt to repair, clamp or constrict the damaged utility.

ALWAYS ASSUME THAT ANY UNDERGROUND PIPE OR SUBSURFACE LINE IS LIVE!

- Stop Work; remove tools if safe to do so.
- Clear all persons from the scene.
- Call the emergency number.
- Contact the One Call/utility member for guidance, if applicable.
- Contact the PM and/or PD so they can contact the Client, MP, Director of HSS and HSSC.

12.11 Striking an Underground Electrical/Telecom Cable

- Stop work.
- Evacuate Ramboll employees from the immediate area to a safe distance as site conditions warrant, considering employees which may not be able to immediately evacuate (e.g., operator seats in excavators are normally electrically isolated, whereas other parts of the excavator may be energized).
- Call the emergency number.

- In the event of injuries provide first aid and summon medical assistance.
- Contact the One Call/utility member for guidance, if applicable.
- Contact the PM and/or PD so they can contact the Client, MP, Corporate HSS Director and HSSC.
- Do not allow anyone to enter the area until the electricity/utility provider has made the cable safe.

12.12 Striking a Pressurized Gas Pipeline

- Stop work, leave tools in-place but shut off any running equipment, including engines.
- Evacuate the immediate area to a safe distance as site conditions warrant.
- Ensure there are no sources of ignition in the area.
- Call the emergency number.
- Contact the pipeline owner and/or One Call, if applicable.
- Contact the PM and/or PD so they can contact the Client, MP, Corporate Director of HSS and HSSC.
- Do not re-enter the immediate area until safe to do so.

12.13 Striking a Pressurized Water Main

- Stop work, remove tools and confine jetting water if safe, necessary and appropriate to do so.
- Evacuate immediate area.
- Ensure that water flowing away is not creating potential hazards (e.g., electrical shorting, flooding, contaminant migration etc.) and where possible warn those likely to be affected.
- Call the emergency number.
- Contact the water utility and/or One Call, if applicable.
- Contact the PM and/or PD so they can contact the Client, MP, Corporate Director of HSS and HSSC.
- Do not re-enter the immediate area until safe to do so.

12.14 Follow-up Procedures

If a site employee is injured on site and immediate medical treatment beyond first aid is needed, the designated site supervisor is instructed to call 911 and/or the designated emergency phone number and then report the incident.

Any SSC work that results in an injury, illness, incident, near miss or unsafe act or condition MUST be verbally communicated by the affected employee or a Ramboll employee witnessing the incident to either the local HSSC, PM, or PD immediately following the incident. Notification to the regional HR representative, Director of HR, and the Corporate HSS Director MUST also be made for incidents involving any employee injury and/or illness that happened while on company time including first aid, and doctor/hospital visits which may or may not involve restricted work and/or lost time.

As soon as possible after the incident but no later than 72 hours after the event, Page One of the Incident/Event Reporting Form (see SPI 19, Incident/Event Reporting) is to be completed by the employee and a witness that was involved in the incident and/or observed the incident.

Post-incident investigations and root cause analysis will be conducted by the Corporate HSS Department to discover the exact circumstances and cause of the incident. Amendments to the HASP

will be approved and implemented by the Project HSSC and the Corporate HSS Director, as needed. All site employees will be informed of any revisions to the site-specific HASP and the resolution of any outstanding safety concerns prior to returning to their site functions. The necessary steps to ensure that operations can safely resume include:

- Ensure that all emergency equipment (fire extinguisher, communication system, first aid kits and first aid station) is available and in functional order;
- Clear all incident-caused debris from the site, if safe to do so; and
- Inspect area and equipment for additional hazards that may necessitate a HASP revision.
- Prepare a HASP revision if necessary to incorporate new information, procedures, and/or corrective actions related to the incident/event.

NOTE: Specific emergency contact information is contained in the first and last pages of this HASP. Applicable directions to the nearest medical facility are contained in the last page to this HASP. If an emergency occurs*, SECURE the safety of yourself and those working under your direction and then contact appropriate site and Ramboll representatives that are referenced in Table 1A of this HASP.*

13. HEALTH & SAFETY PLAN FIELD TEAM SIGNATURES

Sign off sheet attesting that the HASP has been made available and reviewed by the individual prior to entry into the site.

Project Employee List & Safety Plan Distribution Record

Ramboll Employees

All project staff must sign indicating they have read and understand the Site Health and Safety Plan. A copy of this Site Health and Safety Plan must be made available for their review and readily available at the job site.

Employee Name/ Job Title	Date Distributed	Signature

Contractors, Subcontractors

A copy of this safety plan shall be provided to contractors and subcontractors who may be affected by activities covered under the scope of this Site Health and Safety Plan for their information only, although the contractors and subcontractors remain responsible for the safety of their own employees. All contractors and subcontractors must comply with applicable country, state and local government rules and regulations.

Firm Name	Contact Person	Date Distributed

Health and Safety Meeting

All employees participating in the project must receive initial Health and Safety Orientation. Thereafter, a brief tailgate safety meeting is required as deemed necessary by the Site Health and Safety Officer (or at least once every 10 working days).

Date	Topics	Name of Attendee	Employee Firm Name	Initials

Visitor

It is Ramboll's policy that visitors must furnish their own personal protective equipment. All visitors are required to sign the visitor log and comply with Health and Safety Plan requirements. If the visitor represents a regulatory agency concerned with site health and safety issues, the Site Health and Safety Officer shall also immediately notify HSSC.

Name of Visitor	Firm Name	Date of Visit	Signature

14. SAFETY MEETING CHECKLIST

The Site Supervisor should consider discussing the following topics with all field employees conducting work as part of this HASP, as applicable.

Date and Time of Meeting: _____

Conducted By: _____

CHECK TOPIC(S) DISCUSSED:

HASP Content	HASP Content
☐ Chemicals of Concern	☐ Employees On-Site (Introductions)
☐ Tasks to be Performed	☐ Responsibilities
☐ Location of Tasks	☐ Monitoring equipment
☐ Hazards/Risks of Tasks	☐ Other _____
☐ Site Limitations (e.g., cell phone use)	☐ Other _____
First Aid	**Industrial Sanitation and Hygiene**
☐ Facilities	☐ Drinking water
☐ Reporting and Records	☐ Restrooms/Porta toilets
☐ Treatment of _____	☐ Personal Cleanliness
Personal Protective Equipment	**Housekeeping**
☐ Glasses, Goggles, and Shields	☐ Waste Containers
☐ Hard Hats	☐ Waste Materials
☐ Respirators	☐ Other _____
☐ Gloves	
☐ Other _____	
Emergency Procedures	**Fire Prevention**
☐ Communications	☐ Extinguisher Locations
☐ Primary Rally Point:	☐ Designated Smoking Areas
☐ Secondary Rally Point:	☐ Hot Work
☐ Headcount	☐ Flammable Liquids Present
☐ Hospital Location/Route	☐ Explosives Present
☐ PPE/Decon	☐ Other _____
☐ Other _____	
Special Tools / Equipment	**Vehicles/Heavy Equipment**
☐ Chain saws / Chop saws	☐ Transportation of Employees
☐ Other _____	☐ Operation and Inspection
☐ Other _____	☐ Preventative Maintenance
	☐ Other _____

Discussion

_____

_____

APPENDIX A
CHEMICAL INFORMATION AND SAFETY DATA SHEETS

Hazardous Property Information

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point [c] (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Range of Odor Values (ppm)	eV
Volatile Organic Compounds (VOCs)										
☐	Acetic acid (64-19-7)	Miscible	1.05	103	11 mm	4.0% 19.9%	10 ppm	50 ppm	0.0004-204	
☐	Acetone (67-64-1)	Miscible	0.79	0	180 mm	2.5% 12.8%	500 ppm	2,500 ppm	0.40-11,745	
☐	Acrolein (107-02-8)	40%	0.84	-15	210 mm	2.8% 31%	C 0.1 ppm Skin	2 ppm	0.0036-1.8	
☐	Acrylonitrile (107-13-1)	7%	0.81	30	83 mm	3% 17%	2 ppm Skin	85 ppm Ca	1.6 -22	
☐	Benzene (71-43-2)	0.07%	0.88	12	75 mm	1.2% 7.8%	1 ppm Skin	500 ppm Ca	0.47-313	
☐	Bromodichloro-methane (75-27-4)	4500 mg/l	1.98	--	50 mm	Non-flam	None established	None determined	--	
☐	Bromoform (75-25-2)	0.10%	2.89	--	5 mm	Non-flam	0.5 ppm Skin	850 ppm	0.19-15	
☐	Bromomethane (74-83-9)	2%	1.73	--	1.9 atm	10% 16.0%	1 ppm	250 ppm Ca	--	
☐	Carbon Tetrachloride (56-23-5)	0.05%	1.59	--	91 mm	Non-flam	2 ppm Skin	200 ppm Ca	1.68-720	
☐	Chlorobenzene (108-90-7)	0.05%	1.11	82	9 mm	1.3% 9.6%	10 ppm	1000 ppm	0.087-13	
☐	2-Chloroethyl-vinyl Ether (110-75-8)	0.02%	1.05	61	27 mm	--	None established	None determined	--	
☐	Chloroethane (75-00-3)	0.60%	0.92	-58	1000 mm	3.8% 15.4%	100 ppm Skin	3800 ppm	3.8-379[j]	
☐	Chloroform (67-66-3)	0.50%	1.48	--	160 mm	Non-flam	2 ppm	500 ppm Ca	0.102-1,413	
☐	Chloromethane (74-87-3)	0.50%	0.92	--	5.0 atm	8.1% 17.4%	50 ppm	2000 ppm Ca	>10	
☐	Dibromo-chloromethane (124-48-1)	2700 mg/l	2.5	--	76 mm	--	None established	None Determined	--	
☐	Dibutyl phthalate (84-74-2)	0.001% (77°F)	1.05	315	0.00007 mm	0.5% --	5 mg/m^3	4,000 mg/m^3	0.023	
☐	1,2-Dichlorobenzene (95-50-1)	0.01%	1.3	151	1 mm	2.2% 9.2%	25 ppm Skin	200 ppm	0.02-50	
☐	1,1-Dichloroethane (75-34-3)	0.60%	1.18	2	182 mm	5.4% 11.40%	100 ppm	3,000 ppm	49-1,359	
☐	1,1-Dichloroethylene (DCE) (75-35-4)	0.04%	1.21	-2	500 mm	6.5% 15.5%	1 ppm	None determined	50-1,387	

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point [c] (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Range of Odor Values (ppm)	eV
☐	1,2-Dichloroethane (107-06-2)	0.90%	1.24	56	64 mm	6.2% 16%	1 ppm	50 ppm Ca	4.3-988	
☐	1,2-Dichloroethylene (540-59-0)	0.40%	1.27	36-39	180-265 mm	5.6% 12.8%	200 ppm	1,000 ppm	277	
☐	1,2-Dichloropropane (78-87-5)	0.30%	1.16	60	40 mm	3.4% 14.5%	75 ppm	400 ppm Ca	0.26-8.66	
☐	1,3-Dichloropropene (542-75-6)	0.20%	1.21	77	28 mm	5.3% 14.5%	1 ppm Skin	None Determined Ca	<0.99	
☐	Bis-(2-Ethylhexyl)-phthalate (DEHP) (117-81-7)	0.00003%	0.99	420	<0.01 mm	0.3% --	5 mg/m^3	5,000 mg/m^3 Ca	--	
☐	Diethyl phthalate (84-66-2)	0.10%	1.12	322	0.002 mm	0.7% --	5 mg/m^3	None Determined	0.036-0.363	
☐	Dinitrotoluene (DNT) (25321-14-6)	Insoluble	1.32	404	1 mm	-- --	0.15 mg/m^3 Skin	50 mg/m^3 Ca	--	
☐	Endrin (72-20-8)	Insoluble	1.7	--	0.00001 mm	--	0.1 mg/m^3 Skin	2 mg/m^3	--	
☐	Ethyl benzene (100-41-4)	0.01%	0.87	55	7 mm	0.8% 6.7%	5 ppm	800 ppm	<0.002-18	
☐	Hydrazine (302-01-2)	Miscible	1.01	99	10 mm	2.9% 98%	0.01 ppm Skin	50 ppm Ca	3.0-4.0	
☐	Methyl ethyl ketone (MEK) (78-93-3)	28%	0.81	16	78 mm	1.4% 11.4%	200 ppm	3000 ppm	0.07-339	
☐	Methyl tert-butyl ether (MTBE) (1634-04-4)	5.1 g/100ml	0.7	-18	245 mm	1.6% 8.4%	40 ppm	None determined	0.03-0.17	
☐	Methylene chloride (75-09-2)	2%	1.33	--	350 mm	13% 23%	25 ppm	2,300 ppm Ca	1.2-440	
☐	Phenol (108-95-2)	9% (77°F)	1.06	175	0.4 mm	1.8% 8.6%	5 ppm Skin	250 ppm	0.0045-1.95	
☐	1,1,2,2-Tetrachloroethane (79-34-5)	0.30%	1.59	--	5 mm	Non-flam	1 ppm Skin	100ppm Ca	0.233-7.3	
☐	Tetrachloroethylene (PCE) (127-18-4)	0.02%	1.62	--	14 mm	Non-flam	25 ppm	150 ppm Ca	0.767-71	
☐	Toluene (108-88-3)	0.07% (74°F)	0.87	40	21 mm	1.1% 7.1%	10 ppm Skin	500 ppm	0.021-157	
☐	1,1,1-Trichloroethane (71-55-6)	0.40%	1.34	--	100 mm	7.5% 12.5%	350 ppm	700 ppm	0.97-715	
☐	1,1,2-Trichloro-ethane (79-00-5)	0.40%	1.44	--	19 mm	6% 15.5%	10 ppm Skin	100 ppm Ca	--	

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point [c] (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Range of Odor Values (ppm)	eV
☐	1,2,4-Trichlorobenzene (120-82-1)	0.003%	1.45	222	1 mm	2.5% 6.6% (302 °F)	C 5 ppm	None Determined	2.96	
☐	Trichloroethylene (TCE) (79-01-6)	0.1% (77°F)	1.46	--	58 mm	8% 10.5%	25 ppm	1,000 ppm Ca	0.5-167	
☐	Trichlorofluoromethane (75-69-4)	0.1% (75°F)	1.47	--	690 mm	Non-flam	C 1,000 ppm	2000 ppm	5-200,057	
☐	1,1,2-Trichloro-1,2,2-trifluoroethane (76-13-1)	0.02%	1.56	--	285 mm	-- --	1,000 ppm	2,000 ppm	--	
☐	1,2,4-Trimethylbenzene (95-63-6)	0.006%	0.88	112	1 mm	0.9% 6.4%	25 ppm	None determined	0.006-2.4	
☐	Vinyl Chloride (75-01-4)	0.1% (77°F)	0.09	--	3.3 atm	3.6% 33%	1 ppm Skin	None Determined Ca	203-356	
☐	Xylene (o, p, m, mix) (1330-20-7)	Slightly soluble	0.86-0.88	81-90	7-9 mm	0.9% 7%	100 ppm	900 ppm	0.012-316	
Metals										
☐	Aluminum metal and oxide (as Al)	[b]	2.7	--	0 mm	[e]	10 mg/m^3 (respirable)	None determined	--	
☐	Antimony ()	[b]	6.69	--	0 mm	[e]	0.5 mg/m^3	50 mg/m^3	--	
☐	Arsenic (inorganic compounds, as As)	[b]	5.73	--	0 mm	[e]	0.01 mg/m^3	5 mg/m^3 Ca	--	
☐	Arsenic (organic compounds, as As)	Properties vary depending upon the specific organic arsenic compound.					0.2 mg/m^3	None determined	--	
☐	Barium chloride(as Ba) (10361-37-2)	38%	3.86	--	low	Non-flam	0.5 mg/m^3	50 mg/m^3	--	
☐	Barium nitrate (as Ba) (10022-31-8)	9%	3.24	--	Low	[e]	0.5 mg/m^3	50 mg/m^3	--	
☐	Beryllium and compounds (as Be)	[b]	1.85	--	0 mm	[e]	0.2 □g/m^3	4 mg/m^3 Ca	--	
☐	Cadmium dust (as Cd)	[b]	8.64	--	--	[e]	0.005 mg/m^3	9 mg/m^3 Ca	--	
☐	Chromium (III) compounds (as Cr)	[b]	Properties vary depending upon the specific compound.				0.5 mg/m^3	25 mg/m^3	--	
☐	Cobalt metal dust and fume (as Co) (7440-48-4)	Insoluble	8.92	--	0 mm	[e]	0.02 mg/m^3	20 mg/m^3	--	
☐	Copper dust and mist (as Cu)	[b]	8.94	--	0 mm	[e]	1 mg/m^3	100 mg/m^3	--	
☐	Lead	Insoluble	11.34	--	0 mm	[e]	0.05 mg/m^3	100 mg/m^3	--	

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point [c] (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Range of Odor Values (ppm)	eV
☐	Manganese, Fume and compounds (as Mn) (7439-96-5)	Insoluble	7.2	--	0 mm	Comb-ustible	0.2 mg/m^3	500 mg/m^3	--	
☐	Mercury compounds (as Hg) Except alkyl compound	[b]	13.6	--	0.0012 mm	[e]	0.025 mg/m^3 Skin	10 mg/m^3	--	
☐	Molybdenum (7439-98-7)	[b]	10.28	--	0 mm	Comb-ustible	10 mg/m^3 3 mg/m^3 (resp.)	5,000 mg/m^3	--	
☐	Nickel and other compounds (as Ni)	[b]	8.9	--	0 mm	[e]	0.5 mg/m^3	10 mg/m^3 Ca	--	
☐	Selenium (7782-49-2)	Insoluble	4.28	--	0 mm	Comb-ustible	0.2 mg/m^3	1 mg/m^3	--	
☐	Silver, metal dust, and soluble compounds (as Ag)	[b]	10.49	--	0 mm	[e]	0.01 mg/m^3	10 mg/m^3	--	
☐	Thallium (soluble compounds, as Ti)	[b]	Properties vary depending upon the specific compound.				0.1 mg/m^3 Skin	15 mg/m^3	--	
☐	Vanadium pentoxide dust and Fume (1314-62-1)	0.8%	3.36	--	0 mm	[e]	0.05 mg/m^3 (Respirable)	35 mg/m^3	--	
☐	Zinc oxide (1314-13-2)	0.0004% (64°F)	5.61	--	0 mm	[e]	5 mg/m^3	500 mg/m^3	--	
Miscellaneous										
☐	Ammonia (7664-41-7)	34%	--	--	8.5 atm	15% 28%	25 ppm	300 ppm	0.043-60.3	
☐	Asbestos (1332-21-4)	Insoluble	--	--	0 mm	Non-flam	0.1 fibers/cc	None determined	--	
☐	Chromic Acid and chromates (1333-82-0)	63%	2.7	--	Very low	Non-flam	0.005 mg/m^3	15 mg/m^3 Ca	--	
☐	Cyanide (as CN)	--	--	--	--	Non-flam	5 mg/m^3 Skin	--	--	
☐	DDT (50-29-3)	Insoluble	0.99	162-171	0.0000002 mm	--	1 mg/m^3 Skin	500 mg/m^3 Ca	--	
☐	Diesel Fuel #2 (68476-34-6)	Insoluble	0.81-0.90	130	--	0.6-1.3 6-7.5	None established	None determined	--	
☐	Fluorides, as F	--	--	--	--	--	2.5 mg/m^3	None determined	--	
☐	Gasoline (8006-61-9)	Insoluble	0.72-0.76	-45	38-300 mm	1.4% 7.6%	300 ppm	Ca None determined	--	
☐	Kerosene (8008-20-6)	Insoluble	0.81	100-162	5mm (100°F)	0.7% 5.0%	200 mg/m^3[g] Skin	None determined	--	

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point [c] (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Range of Odor Values (ppm)	eV
☐	Naphthalene (91-20-3)	0.003%	1.15	174	0.08 mm	0.9% 5.9%	0.1 ppm	250 ppm	0.0019-1.02	
☒	PCB (42% chlorine) (53469-21-9)	Insoluble	1.39	--	0.001 mm	Non-flam	1 mg/m^3 Skin	5 mg/m^3 Ca	--	
☒	PCB (54% chlorine) (11097-69-1)	Insoluble	1.38	--	0.00006	Non-flam	0.5 mg/m^3 Skin	5 mg/m^3 Ca	--	
☐	Phosphorus (yellow) (7723-14-0)	0.00%	1.82	--	0.03 mm	-- --	0.1 mg/m^3	5 mg/m^3	--	
☐	Polycyclic Aromatic Hydrocarbons (PAH)	Properties vary depending upon the specific compound. Listed in NIOSH as Coal Tar Pitch Volatiles					0.2 mg/m^3	80 mg/m^3 Ca	--	

SITE-SPECIFIC SUBSTANCES

(Add hazardous property information on any substances that are of concern at the site but are not listed above.)

EXPLANATIONS AND FOOTNOTES:

[a] Water solubility is expressed in different terms in different references. Many references use the term "insoluble" for materials that will not readily mix with water, such as gasoline. However, most of these materials are water soluble at the part per million or part per billion level. Gasoline, for example, is insoluble in the gross sense, and will be found as a discrete layer on top of the ground water. But certain gasoline constituents, such as benzene, toluene, and xylene, will also be found in solution in the ground water at the part per million or part per billion levels.

[b] Solubility of metals depends on the compound in which they are present.

[c] Several chlorinated hydrocarbons exhibit no flash point in a conventional sense, but will burn in the presence of high energy ignition source or will form explosive mixtures at temperatures above 200 □F.

[d] Expressed as mm Hg under standard conditions.

[e] Explosive concentrations of airborne dust can occur in confined areas.

[f] Cal/OSHA Time-weighted Average (TWA) Permissible Exposure Limits (PELs) except where noted in g. The substances designated by "Skin" in the PEL column may be absorbed into the bloodstream through the skin, the mucous membranes and/or the eye, and contribute to the overall exposure. “C” notation indicates the number given is a ceiling value.

[g] TLV-TWA adopted by the American Conference of Governmental Industrial Hygienists (ACGIH). Currently, there is no Cal/OSHA PEL.

[h] The substances with a “Ca” notation in the IDLH column are considered potential occupational carcinogens by NIOSH.

[i] Odor thresholds values extracted from “*ODOR THRESHOLDS for Chemicals with established Occupational Health Standards*”, American Industrial Hygiene Association, 1997.

(d) Odor detection threshold: Lowest concentration at which a stimulus is being detected.

(r) Odor recognition threshold: Lowest concentration at which a definite odor character is detected.

[j] Values extracted from the US Environmental Protection Agency Technology Transfer Network, Air Toxics website. URL: www.epa.gov/ttn/atw/, 2006

[k] Value extracted from “*HESIS Guide to Solvent Safety*” California Department of Health Services, 2004. URL: http://www.dhs.ca.gov/ohb/HESIS/solv_cht.htm

[l] Value extracted from “*Chemical Summary for Methyl-Tert-Butyl Ether”,* US Environmental Protection Agency, Office of Pollution Prevention and Toxics, August 1994. URL: http://www.epa.gov/chemfact/s_mtbe.txt

SAFETY DATA SHEET

1 CHEMICAL PRODUCT & COMPANY IDENTIFICATION

Trade Name	**PIPE X - METAL X™**
Code Number	RP 102
Manufacturer	Chemical Solutions Int'l Corp. P.O. Box 891185 Houston, Texas 77289-1185
Telephone Numbers	(832)736-9345
Home Page:	www.chemicalsolutionsintl.com
Email:	erika@chemicalsolutionsintl.com
Product Class	Compound cleaning liquid

Date Prepared: May 02, 2014

2 COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Components	CAS Number	OSHA PEL	ACGIH TLV
Nitrilotriacetic Acid	139-13-9		
Sodium Metasilicate	6834-92-0	2 mg/m^3	2 mg/m^3
Monoethanolamine	141-43-5	3 mg/m^3	
Ethylene Glycol	111-76-2	25 mg/m^3	
Nonylphenol Ethoxylate	684-39-463		
Sodium Xylene Sulfonate	1300-72-7	10 mg/m^3	
Water			

3 HAZARDS IDENTIFICATION

Emergency Overview:
Caution
May cause irritation to the eyes, skin and respiratory system.

Health Effects: Eyes: May cause discomfort.

Health Effects: Skin: Concentrate will dry out and chap sensitive skin as would detergent. Dryness, redness, and chapping may occur.

Health Effects: Inhalation: Inhalation of high concentration of vapors may upset stomach and cause slight irritation of the respiratory tract.

Health effects: Ingestion: Ingestion may produce gastrointestinal disturbances including irritation, nausea and diarrhea. Ingestion of large amounts may result in serious damage to gastrointestinal tract. DO NOT INDUCE VOMITING.

4 FIRST AID MEASURES

Eyes:
Immediately flush eyes with water for at least 15 minutes while holding eyelids open. If irritation persists get medical attention.

Skin:
For skin contact flush with large amounts of water while removing contaminated clothing and shoes. If irritation develops get medical attention.

Inhalation:
If symptoms are experienced remove to fresh air. If symptoms persist get medical attention. If the affected person is not breathing apply artificial respiration. If breathing is difficult, give oxygen. Seek medical attention.

Ingestion:
If swallowed, do not induce vomiting, and get immediate medical attention.

5 FIRE FIGHTING MEASURES

Flash Point:	None
Extinguishing Media:	N/A
Decomposition Products:	Oxides of carbon
UEL:	N/A
LEL:	N/A

Unusual fire and explosion hazards:
Containers may explode from internal pressure if confined to fire. Cool with water.

Fire fighting equipment:
Fire fighters and others exposed to products of combustion should wear self-contained breathing apparatus and full protective clothing.

6 ACCIDENTAL RELEASE MEASURES

Spill and Leak Procedures:
If material is spilled, stop leak and/or remove leaking package to safe area. Flush with water. Use any approved method for dilute cleaner. Surfactants are highly biodegradable. Dispose of in accordance with applicable regulations.

7 HANDLING AND STORAGE

Handling Procedures:
Handle in accordance with good industrial hygiene and safety practices. These practices include avoiding unnecessary exposure and prompt removal of material from eyes, skin and clothing.

Storage Procedures:
Store away from acids, alkalis, and oxidizers.

Precautionary Measures:
Use with adequate ventilation. Avoid breathing high concentrations of vapors. Do not get in eyes, on skin or clothing. Wash thoroughly after handling.

8 EXPOSURE CONTROLS

General Considerations:
Consider the potential hazards of this material, applicable exposure limits, job activities and work place conditions when designing engineering controls and selecting personal protective equipment.

Personal Protective Equipment: Eyes/Face
Wear safety glasses or chemical goggles (if splashing is possible).

Personal Protective Equipment: Skin

Wear suitable protective clothing. Use impervious gloves made of rubber, PVC, or neoprene to avoid contact with skin.

Personal Protective Equipment: Respiratory
None required under normal conditions of use. If high concentrations of vapors or mists are encountered use a NIOSH approved vapor respirator. Consult the manufacturer to determine appropriate type of equipment for a given application.

Personal Protective Equipment: General
Eye wash fountain and emergency showers are recommended.

Ventilation:

Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see section 2). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment. Consult NFPA Standard 91 for design of exhaust system.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance/Odor	Yellow liquid with medium viscosity and citrus odor
Flash Point	None
Specific Gravity	1.06
Vapor Pressure	Same as water
Vapor Density (Air = 1)	>1
Evaporation Rate (water = 1)	<1
Boiling Point	212°F
Solubility in water	Complete
pH	10.5

10 STABILITY AND REACTIVITY

Chemical Stability:	Stable
Hazardous Polymerization:	Will not occur
Incompatibility:	Strong acids or alkalis, oxidizers or oxidizing materials
Conditions to avoid:	None known

11 TOXICOLOGICAL INFORMATION

Carcinogenicity: Nitrillotriacetic Acid – IARC – 2B
NTP - 2

No other components have been identified as carcinogen by NTP, IARC or OSHA.

12 ECOLOGICAL INFORMATION

No data available for this product

13 DISPOSAL CONSIDERATIONS:

Follow all Federal, State, and Local regulations.

14 TRANSPORTATION INFORMATION:

The data provided in this section is for information only. The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate regulations to properly classify your shipment for transportation.

Proper Shipping Name: Non-hazardous cleaning compound, liquid, non-regulated by 49CFR.

Reportable Quantity:	None
Hazard Class and Label:	None
UN Number:	None
NA Number:	None
ERG:	None

15 REGULATORY INFORMATION

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA):
The following components of this product are specifically listed as hazardous substances in 40 CFR 302.4 and are present at levels which could require reporting:

Component	CAS #
Nitrilotriacetic Acid	139-13-9
Sodium Metasilicate	6834-92-0
Monoethanolamine	141-43-5
Ethylene Glycol	111-76-2
Sodium Xylene Sulfonate	1300-72-7

Superfund Amendments and Reauthorization Act of 1986 (SARA):
Title III Sections 302 and 304 – Extremely Hazardous Substances:

Component	CAS #
None	

Title III – Section 313 Reportable Chemical

Component	CAS #
Nitrilotriacetic Acid	139-13-9

Title III – Section 311 and 312

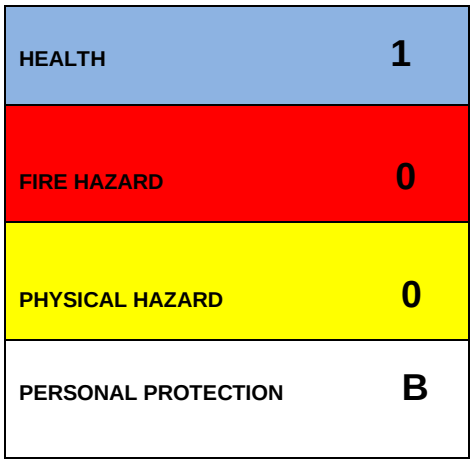
	Nitrilotracetic Acid	Sodium Metasilicate
Delayed hazard:	No	No
Fire hazard:	No	No
Immediate health hazard	Yes	Yes
Reactive hazard	No	No
Sudden release of pressure hazard	No	No

TSCA Status: d-Limonene is the only component in this product listed on the TSCA inventory.

16 ADDITIONAL INFORMATION

Hazard Ratings:

HMIS		NFPA	
Health	1	Health	1
Flammability	0	Flammability	0
Reactivity	0	Reactivity	0
PPE	B	Other	B



Disclaimer:
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MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**AMMONIUM HYDROXIDE**
Version #	08
Revision date	03-06-2012
CAS #	Mixture
Product Codes	**J.T.Baker: 0889, 4807, 5358, 5604, 5817, 5820, 5980, 5993, 7874, 9717, 9718, 9719, 9721, 9729, 9731, 9733, 9741, 9743** **Macron: 0127, 3246, 3256, 3258, 3261, 37826, 6665, H893, IM0889, IM5980, V006, V188, V222, V649, V893, XL002, XM187, XM189**
Synonym(s)	Ammonia aqueous * Ammonia solutions
Manufacturer	Avantor Performance Materials, Inc.
Address	3477 Corporate Parkway Suite #200 Center Valley, PA 18034 US
Customer Service	855-282-6867
24 Hour Emergency	908-859-2151
Chemtrec	800-424-9300

2. Hazards Identification

Emergency overview	DANGER Corrosive. Causes severe skin and eye burns. Causes digestive tract burns. Harmful if swallowed. Mist or vapor extremely irritating to eyes and respiratory tract.
OSHA regulatory status	This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects	
Routes of exposure	Ingestion. Inhalation. Skin contact. Eye contact.
Eyes	Corrosive. Causes severe eye burns. Vapor or spray may cause eye damage, impaired sight or blindness.
Skin	Corrosive. Causes severe skin burns.
Inhalation	Corrosive. May cause damage to mucous membranes in nose, throat, lungs and bronchial system.
Ingestion	Harmful if swallowed. Corrosive. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.
Target organs	Eyes. Skin. Respiratory system.
Chronic effects	Corrosive. Prolonged contact causes serious tissue damage.
Potential environmental effects	Expected to be very toxic to aquatic organisms.

3. Composition / Information on Ingredients

Hazardous components	CAS #	Percent
AMMONIUM HYDROXIDE	1336-21-6	18 - 72

Non-hazardous components	CAS #	Percent
WATER	7732-18-5	28 - 82

Composition comments Contains 10 - 35% NH3.

4. First Aid Measures

First aid procedures

Eye contact	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.
Skin contact	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes.
Inhalation	Move to fresh air. If breathing stops, provide artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion	Call a physician or poison control center immediately. Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs.
Notes to physician	Keep victim under observation. Treat symptomatically.
General advice	In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Show this safety data sheet to the doctor in attendance. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire Fighting Measures

Flammable properties	The product is not flammable. No unusual fire or explosion hazards noted.

Extinguishing media

Suitable extinguishing media	Water spray. Carbon dioxide (CO2). Dry chemical powder. Foam.
Unsuitable extinguishing media	None known.

Protection of firefighters

Specific hazards arising from the chemical	Fire may produce irritating, corrosive and/or toxic gases.
Protective equipment and precautions for firefighters	Use water spray to cool unopened containers. Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Cool containers exposed to flames with water until well after the fire is out.
Special protective equipment for fire-fighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Wear self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode when fighting fires.
Specific methods	In the event of fire and/or explosion do not breathe fumes.

6. Accidental Release Measures

Personal precautions	Wear appropriate protective equipment and clothing during clean-up. Keep unnecessary personnel away. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Local authorities should be advised if significant spillages cannot be contained.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.
Methods for containment	Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible.

Methods for cleaning up

Large Spills: Neutralize spill area and washings with dilute acetic acid. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Dike far ahead of spill for later disposal.

Small Spills: Neutralize spill area and washings with dilute acetic acid. Wipe up with absorbent material (e.g. cloth, fleece). Collect in a non-combustible container for prompt disposal.

Never return spills in original containers for re-use. Clean surface thoroughly to remove residual contamination. Clean up in accordance with all applicable regulations.

J. T. Baker NEUTRACIT®-2 or BuCAIM® caustic neutralizers are recommended for spills of solutions of this product.

7. Handling and Storage

Handling

Wear appropriate personal protective equipment. Do not breathe mist or vapor. Do not get in eyes, on skin, on clothing. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling. Do not eat, drink or smoke when using the product. Considerable heat is generated when water or acid is added, therefore when making solutions always add the caustic to the water or acid with constant stirring. See Section 8 of the MSDS for Personal Protective Equipment.

Storage

Do not store in metal containers. Keep tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

ACGIH

Components	Type	Value
AMMONIUM HYDROXIDE (1336-21-6)	STEL	35.0000 ppm
	TWA	25.0000 ppm

Occupational exposure limits

U.S. - OSHA

Components	Type	Value
AMMONIUM HYDROXIDE (1336-21-6)	PEL	50.0000 ppm
		35.0000 mg/m3

Engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Explosion proof exhaust ventilation should be used.

Personal protective equipment

Eye / face protection

Chemical goggles and face shield are recommended.

Skin protection

Wear appropriate chemical resistant clothing. Wear appropriate chemical resistant gloves.

Respiratory protection

If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Respirator type: Chemical respirator with specific cartridge and full facepiece providing protection against the compound of concern.

General hygeine considerations

Provide eyewash station and safety shower. 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.

9. Physical & Chemical Properties

Appearance

Clear.

Color

Colorless.

Odor

Ammoniacal.

Odor threshold

Not available.

Physical state	Liquid.
Form	Liquid.
pH	13.8 (29% NH3)
Melting point	-101.6 °F (-74.4 °C) (28.5% NH3)
Freezing point	-101.6 °F (-74.4 °C) (28.5% NH3)
Boiling point	81 °F (27.2 °C) (29.4% NH3)
Flash point	Not available.
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	28 % (NH3)
Flammability limits in air, lower, % by volume	15 % (NH3)
Vapor pressure	287.971 kPa
Specific gravity	0.9 (28% NH3)
Relative density	Not available.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available
Decomposition temperature	Not available.
Molecular weight	35.05
Molecular formula	H5-N-O

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal temperature conditions.
Conditions to avoid	Excessive heat.
Incompatible materials	Strong oxidizing agents. Water. Acids. Metals. Halogens. Nitromethane.
Hazardous decomposition products	Ammonia. Nitrogen oxides (NOx).
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Components	Test Results
AMMONIUM HYDROXIDE (1336-21-6)	Acute Oral LD50 Rat: 350 mg/kg

Sensitization	Not a skin sensitizer.
Acute effects	Harmful if swallowed.
Local effects	Causes severe burns. Mist or vapor extremely irritating to eyes and respiratory tract.
Chronic effects	Corrosive. Prolonged contact causes serious tissue damage.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Skin corrosion/irritation	Corrosive to skin and eyes.
Epidemiology	No epidemiological data is available for this product.
Mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Reproductive effects	Contains no ingredient listed as toxic to reproduction
Teratogenicity	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Symptoms and target organs	Corrosive effects.

Further information Danger of very serious irreversible effects. Symptoms may be delayed.

12. Ecological Information

Ecotoxicological data

Components	Test Results
AMMONIUM HYDROXIDE (1336-21-6)	LC50 Water flea (Daphnia magna): 0.66 mg/l 48.00 hours LC50 Western mosquitofish (Gambusia affinis): 15 mg/l 96.00 hours

Ecotoxicity Expected to be very toxic to aquatic organisms.

Environmental effects Very toxic to aquatic organisms. An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and degradability Expected to be readily biodegradable.

Partition coefficient (n-octanol/water) Not available

13. Disposal Considerations

Waste codes D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel]

Disposal instructions Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.

Contaminated packaging Since emptied containers retain product residue, follow label warnings even after container is emptied. Offer rinsed packaging material to local recycling facilities.

14. Transport Information

DOT

Basic shipping requirements:

UN number UN2672
Proper shipping name Ammonia solution (with 10 - 35% ammonia)
Hazard class 8
Packing group III
Additional information:
Special provisions IB3, IP8, T7, TP1
Basic shipping requirements:
Labels required 8
Additional information:
Packaging exceptions 154
Packaging non bulk 203
Packaging bulk 241
ERG number 154

IATA

Basic shipping requirements:

UN number 2672
Proper shipping name Ammonia solution (with 10 - 35% ammonia)
Hazard class 8
Packing group III
Additional information:
ERG code 8L

IMDG

Basic shipping requirements:

UN number 2672
Proper shipping name AMMONIA SOLUTION (WITH 10 - 35% AMMONIA)

Hazard class 8
Packing group III

DOT

IATA

IMDG

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

AMMONIUM HYDROXIDE (CAS 1336-21-6) 1.0 %

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance

AMMONIUM HYDROXIDE (CAS 1336-21-6) Listed.

CERCLA (Superfund) reportable quantity

AMMONIUM HYDROXIDE: 1000.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

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

Section 311 hazardous chemical Yes

Inventory status

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

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

AMMONIUM HYDROXIDE (CAS 1336-21-6) Listed.

Saf-T-Data	Health: 2 - Moderate (Poison) Flammability: 1 - Slight Reactivity: 1 - Slight Contact: 4 - Extreme (Corrosive) Lab Protective Equip: D - GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES Storage Color Code: WS - White Stripe (Store Separately)

16. Labeling Info

Label Hazard Warning	DANGER Corrosive. Causes severe skin and eye burns. Causes digestive tract burns. Harmful if swallowed. Mist or vapor extremely irritating to eyes and respiratory tract.
Label Precautions	Do not breathe mist or vapor. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling. Keep container tightly closed in a cool, well-ventilated place.
Label First Aid	Immediately flush eyes with plenty of water for at least 15 minutes. Immediately flush skin with plenty of water. If gas/fume/vapor/dust/mist from the material is inhaled, remove the affected person immediately to fresh air. Get medical attention immediately. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance.

17. Other Information

NFPA ratings	Health: 3 Flammability: 1 Instability: 0
Disclaimer	THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED “AS IS,” AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION, WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.
Issue date	03-06-2012

Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable

protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Arsenic UNNA: UN1558 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Arsenic California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:16 PM

Last Updated: 05/21/2013 12:00 PM

Material Safety Data Sheet

Benzene

MSDS# 02610

Section 1 - Chemical Product and Company Identification

MSDS Name:	Benzene
Catalog Numbers:	AC167660000, AC167660010, AC167660025, AC167660250, AC167665000, AC168650250 AC168650250, AC295330000, AC295330010, AC295330025, AC295330250, AC296880000 AC296880000, AC296880010, AC296880025, AC296880250, AC610230010, AC610231000 AC610231000, AC611001000, B243-4, B245-4, B245-500, B411-1, B411-4, B412-1, S79920ACS
Synonyms:	Benzol; Cyclohexatriene; Phenyl hydride.

Company Identification:	Fisher Scientific One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	201-796-7100
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#:	71-43-2
Chemical Name:	Benzene
%:	> 99
EINECS#:	200-753-7

Hazard Symbols: T F

Risk Phrases: 45 46 11 36/38 48/23/24/25 65

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Danger! Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system effects. Harmful if swallowed, inhaled, or absorbed through the skin. May cause blood abnormalities. Contains benzene. Benzene can cause cancer. Extremely flammable liquid and vapor. Vapor may cause flash fire. Causes eye, skin, and respiratory tract irritation. Target Organs: Blood, central nervous system, respiratory system, eyes, bone marrow, immune system, skin.

Potential Health Effects

Eye:	Causes eye irritation.
Skin:	Causes skin irritation. Harmful if absorbed through the skin. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis.
Ingestion:	May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation:	Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and central nervous system depression. Exposure may lead to irreversible bone marrow injury. Exposure may lead to aplastic anemia.
	May cause bone marrow abnormalities with damage to blood forming tissues. May cause anemia and other blood cell abnormalities. Chronic exposure to benzene has been associated with an increased incidence of

Chronic: leukemia and multiple myeloma (tumor composed of cells of the type normally found in the bone marrow). Immunodepressive effects have been reported. This substance has caused adverse reproductive and fetal effects in laboratory animals.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid and vapor. Vapor may cause flash fire. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas. This liquid floats on water and may travel to a source of ignition and spread fire. May accumulate static electricity.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Autoignition Temperature: 498 deg C (928.40 deg F)

Flash Point: -11 deg C (12.20 deg F)

Explosion Limits: Lower: 1.3 vol %

Explosion Limits: Upper: 7.1 vol %

NFPA Rating: health: 2; flammability: 3; instability: 0;

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Provide ventilation. Approach spill from upwind. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor.

Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene	0.5 ppm; 2.5 ppm STEL; Skin - potential significant	0.1 ppm TWA 500 ppm IDLH	1 ppm TWA; 10 ppm TWA (applies to industry

	contribution to overall exposure by the cutaneous route			segments exempt from the benzene stan dard at 29 CFR 1910.1028); 25 ppm Ceiling (applies to industry segments exempt from the 1 ppm TWA and 5 ppm

OSHA Vacated PELs: Benzene: 10 ppm TWA (unless specified in 1910.1028)

Engineering Controls:

Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. See 29CFR 1910.1028 for the regulatory requirements for the control of employee exposure to benzene.

Exposure Limits

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid

Color: clear colorless

Odor: sweetish odor - aromatic odor

pH: Not applicable

Vapor Pressure: 75 mm Hg @ 20 deg C

Vapor Density: 2.8 (air=1)

Evaporation Rate: Not available

Viscosity: 0.647mPa @ 20 deg C

Boiling Point: 80.1 deg C (176.18°F)

Freezing/Melting Point: 5.5 deg C (41.90°F)

Decomposition Temperature: Not available

Solubility in water: 0.180 g/100 ml @ 25°C

Specific Gravity/Density: 0.8765 @ 20°C

Molecular Formula: C6H6

Molecular Weight: 78.11

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Ignition sources, excess heat, confined spaces.

Incompatibilities with Other Materials: Strong oxidizing agents.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#: CAS# 71-43-2: CY1400000

RTECS:

CAS# 71-43-2: Dermal, guinea pig: LD50 = >9400 uL/kg;
Draize test, rabbit, eye: 88 mg Moderate;
Draize test, rabbit, eye: 2 mg/24H Severe;

LD50/LC50:	Draize test, rabbit, skin: 20 mg/24H Moderate; Inhalation, mouse: LC50 = 9980 ppm; Inhalation, mouse: LC50 = 24 mL/kg/2H; Inhalation, rat: LC50 = 10000 ppm/7H; Inhalation, rat: LC50 = 34 mL/kg/2H; Inhalation, rat: LC50 = 6.5 mL/kg/4H; Oral, mouse: LD50 = 4700 mg/kg; Oral, rat: LD50 = 930 mg/kg; Oral, rat: LD50 = 1 mL/kg; Oral, rat: LD50 = 1800 mg/kg; Skin, rabbit: LD50 = >9400 uL/kg; . Other: Benzene is considered very toxic; probable human oral lethal dose would be 50-500 mg/kg. Human inhalation of approximately 20,000 ppm (2% in air) was fatal in 5-10 minutes.While percutaneous absorption of liquid benzene through intact human skin can be limited (e.g., 0.05% of the applied dose), the absorbed dose via direct dermal contact combined with that received from body surface exposure to benzene in workplace air is such that a substantial fraction (20-40%) of the total exposure is due to skin absorption.
Carcinogenicity:	Benzene - ACGIH: A1 - Confirmed Human Carcinogen California: carcinogen, initial date 2/27/87 NTP: Known carcinogen IARC: Group 1 carcinogen
Other:	See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity:	Fish: Mosquito Fish: TLm = 395 mg/L; 24 Hr; Unspecified Fish: Goldfish: LC50 =46 mg/L; 24 Hr; Modified ASTM D 1345 Fish: Fathead Minnow: LC50 = 15.1 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0) Fish: Rainbow trout: LC50 = 5.3 mg/L; 96 Hr; Flow-through at 25°C (pH 7.9-8.0) Fish: Bluegill/Sunfish: LD50 = 20 mg/L; 24-48 Hr; Unspecified

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: BENZENE
Hazard Class: 3
UN Number: UN1114
Packing Group: II
Canada TDG
Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

USA RQ: CAS# 71-43-2: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T F

Risk Phrases:

R 45 May cause cancer.

R 46 May cause heritable genetic damage.

R 11 Highly flammable.

R 36/38 Irritating to eyes and skin.

R 48/23/24/25 Toxic : danger of serious damage to health by prolonged exposure through inhalation, contact with skin and if swallowed.

R 65 Harmful: may cause lung damage if swallowed.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 71-43-2: 3

Canada

CAS# 71-43-2 is listed on Canada's DSL List

Canadian WHMIS Classifications: B2, D2A, D2B

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 71-43-2 is listed on Canada's Ingredient Disclosure List

US Federal

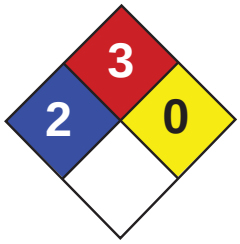
TSCA

CAS# 71-43-2 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 6/11/1999

Revision #9 Date 7/20/2009



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C8H10

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

Toxicological Data on Ingredients: Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (irritant, sensitizer). CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 432°C (809.6°F)

Flash Points:
CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001) CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001) CLOSED CUP: 21 C (70 F) (NFPA)

Flammable Limits: LOWER: 0.8% - 1.6%UPPER: 6.7% - 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Vapors may form explosive mixtures in air.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 125 (ppm) from OSHA (PEL) [United States] TWA: 435 STEL: 545 from OSHA (PEL) [United States] TWA: 435 STEL: 545 (mg/m3) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States] TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)] TWA: 100 STEL: 125 (ppm) [Belgium] TWA: 100 STEL: 125 (ppm) [Finland] TWA: 50 (ppm) [Norway] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in diethyl ether. Very slightly soluble in cold water or practically insoluble in water. Soluble in all proportions in Ethyl alcohol. Soluble in Carbon tetrachloride, Benzene. Insoluble in Ammonia. Slightly soluble in Chloroform. Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ingnition sources (flames, sparks, static), incompatible materials, light

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

Toxicity to Animals: Acute oral toxicity (LD50): 3500 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals:
Lethal Dose/Conc 50% Kill: LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg Lowest Published Lethal Dose/Conc: LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC evidence of carcinogenicity in humans inadequate. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Can cause mild skin irritation. It can be absorbed through intact skin. Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm , it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS) Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include

headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and conciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987). Ingestion: Do not drink, pipet or siphon by mouth. May cause gastroinestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through)]. 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Ethylbenzene Illinois toxic substances disclosure to employee act: Ethylbenzene Illinois chemical safety act: Ethylbenzene New York release reporting list: Ethylbenzene Rhode Island RTK hazardous substances: Ethylbenzene Pennsylvania RTK: Ethylbenzene Minnesota: Ethylbenzene Massachusetts RTK: Ethylbenzene Massachusetts spill list: Ethylbenzene New Jersey: Ethylbenzene New Jersey spill list: Ethylbenzene Louisiana spill reporting: Ethylbenzene California Director's List of Hazardous Substances: Ethylbenzene TSCA 8(b) inventory: Ethylbenzene TSCA 4(a) proposed test rules: Ethylbenzene TSCA 8(d) H and S data reporting: Ethylbenzene: Effective Date: 6/19/87; Sunset Date: 6/19/97 SARA 313 toxic chemical notification and release reporting: Ethylbenzene

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASSE D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S29- Do not empty into drains.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-Manufacturer's Material Safety Data Sheet. -Fire Protection Guide to Hazardous Materials, 13th ed., National Fire Protection Association (NFPA) -Registry of Toxic Effects of Chemical Substances (RTECS) -Chemical Hazard Response Information System (CHRIS) -Hazardous Substance Data Bank (HSDB) -New Jersey Hazardous Substance Fact Sheet -Ariel Global View -Reprotext System

Other Special Considerations: Not available.

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MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**HYDROCHLORIC ACID**
Version #	11
Revision date	01-17-2012
CAS #	Mixture
Product Codes	**J.T.Baker: 5367, 5537, 5800, 5814, 5821, 5861, 5862, 6900, 9165, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9543, 9544, 9548, 9551, 9555, 9625** **Macron: 2062, 20620, 2515, 25496, 2612, 2624, 2626, 37825, 3861, 5587, H611, H613, H616, H987, H999, IM2612, V001, V078, V187, V226**
Synonym(s)	Muriatic acid * hydrogen chloride, aqueous
Manufacturer	Avantor Performance Materials, Inc.
Address	3477 Corporate Parkway Suite #200 Center Valley, PA 18034 US
Customer Service	855-282-6867
24 Hour Emergency	908-859-2151
Chemtrec	800-424-9300

2. Hazards Identification

Emergency overview	DANGER Corrosive. Causes severe skin and eye burns. Causes digestive tract burns. Mist or vapor extremely irritating to eyes and respiratory tract.
OSHA regulatory status	This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects	
Routes of exposure	Ingestion. Inhalation. Skin contact. Eye contact.
Eyes	Corrosive. Causes severe eye burns. Vapor or spray may cause eye damage, impaired sight or blindness.
Skin	Corrosive. Causes severe skin burns.
Inhalation	Corrosive. May cause damage to mucous membranes in nose, throat, lungs and bronchial system.
Ingestion	Corrosive. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.
Target organs	Eyes. Skin. Lungs. Respiratory system.
Chronic effects	Corrosive. Prolonged contact causes serious tissue damage.
Potential environmental effects	The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

3. Composition / Information on Ingredients

Hazardous components	CAS #	Percent
HYDROCHLORIC ACID	7647-01-0	20 - 40

Non-hazardous components	CAS #	Percent
WATER	7732-18-5	60 - 80

4. First Aid Measures

First aid procedures

Eye contact	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.
Skin contact	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes.
Inhalation	Move to fresh air. If breathing stops, provide artificial respiration. If breathing is difficult, give oxygen. Call a physician or poison control center immediately.
Ingestion	Call a physician or poison control center immediately. Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs.
Notes to physician	Keep victim under observation. Treat symptomatically.
General advice	In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Show this safety data sheet to the doctor in attendance. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire Fighting Measures

Flammable properties	The product is not flammable. No unusual fire or explosion hazards noted.

Extinguishing media

Suitable extinguishing media	Water. Carbon dioxide (CO2). Dry chemical powder. Foam.
Unsuitable extinguishing media	None known.

Protection of firefighters

Specific hazards arising from the chemical	Fire may produce irritating, corrosive and/or toxic gases.
Protective equipment and precautions for firefighters	Use water spray to cool unopened containers. Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Cool containers exposed to flames with water until well after the fire is out.
Special protective equipment for fire-fighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Wear self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode when fighting fires.
Specific methods	In the event of fire and/or explosion do not breathe fumes.

6. Accidental Release Measures

Personal precautions	Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.
Methods for containment	Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Prevent entry into waterways, sewer, basements or confined areas.

Methods for cleaning up

Large Spills: Dike far ahead of spill for later disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills in original containers for re-use. Clean up in accordance with all applicable regulations. Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for prompt disposal.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Handling

Do not get in eyes, on skin, on clothing. Do not taste or swallow. Wash thoroughly after handling. Do not eat, drink or smoke when using the product. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes.

Storage

Do not store in metal containers. Keep tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

ACGIH

Components	Type	Value
HYDROCHLORIC ACID (7647-01-0)	Ceiling	2.0000 ppm

Occupational exposure limits

U.S. - OSHA

Components	Type	Value
HYDROCHLORIC ACID (7647-01-0)	Ceiling	5.0000 ppm 7.0000 mg/m3

Engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal protective equipment

Eye / face protection

Wear safety glasses with side shields (or goggles) and a face shield.

Skin protection

Wear appropriate chemical resistant clothing. Wear appropriate chemical resistant gloves.

Respiratory protection

If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Respirator type: Chemical respirator with acid gas cartridge.

General hygeine considerations

Provide eyewash station and safety shower. 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.

General

Wear chemical protective equipment that is specifically recommended by the manufacturer. Launder contaminated clothing before reuse.

9. Physical & Chemical Properties

Appearance Clear.

Color Colorless.

Odor Pungent.

Odor threshold Not available.

Physical state Liquid.

Form Liquid.

pH	0.1 (1.0 N Solution)
Melting point	-14.8 - -61.6 °F (-26 - -52 °C)
Freezing point	-14.8 - -61.6 °F (-26 - -52 °C)
Boiling point	118.4 - 194 °F (48 - 90 °C)
Flash point	Not available.
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	2.13 - 28.3 kPa
Vapor density	Not available.
Specific gravity	1.149 - 1.189
Relative density	Not available.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Molecular formula	HCl

10. Chemical Stability & Reactivity Information

Chemical stability	Material is stable under normal conditions.
Conditions to avoid	Reacts violently with strong alkaline substances. This product may react with reducing agents. Do not mix with other chemicals. This product may react with oxidizing agents. Unsuitable containers: metals.
Incompatible materials	Incompatible with bases. Metals. Oxidizing agents. Acids. Amines. Reducing agents.
Hazardous decomposition products	Hydrogen chloride. Chlorine. May decompose upon heating to produce corrosive and/or toxic fumes.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
HYDROCHLORIC ACID (Mixture)	Acute Inhalation LC50 Rat: 9188 mg/l estimated
	Acute Oral LD50 Rat: 581 mg/kg
Components	**Test Results**
HYDROCHLORIC ACID (7647-01-0)	Acute Inhalation LC50 Rat: 3124 mg/l 1.00 Hours
	Acute Oral LD50 Rat: 238 - 277 mg/kg

Sensitization	Not a skin sensitizer.
Local effects	Causes severe burns.
Chronic effects	Corrosive. Prolonged contact causes serious tissue damage.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

ACGIH Carcinogens

HYDROCHLORIC ACID (CAS 7647-01-0)	A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

HYDROCHLORIC ACID (CAS 7647-01-0)	3 Not classifiable as to carcinogenicity to humans.

Skin corrosion/irritation	Corrosive to skin and eyes.
Epidemiology	No epidemiological data is available for this product.
Mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Neurological effects	No data available for this product.
Reproductive effects	Contains no ingredient listed as toxic to reproduction
Teratogenicity	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Symptoms and target organs	Corrosive effects.
Further information	Danger of very serious irreversible effects. Symptoms may be delayed.

12. Ecological Information

Ecotoxicological data

Product	**Test Results**
HYDROCHLORIC ACID (Mixture)	LC50 Fish: 829 mg/l 96.00 hours estimated
Components	**Test Results**
HYDROCHLORIC ACID (7647-01-0)	LC50 Western mosquitofish (Gambusia affinis): 282 mg/l 96.00 hours

Ecotoxicity	The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.
Persistence and degradability	Expected to be readily biodegradable.
Partition coefficient (n-octanol/water)	Not available

13. Disposal Considerations

Waste codes	D002: Waste Corrosive material [pH <=2 or =>12.5, or corrosive to steel]
Disposal instructions	Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.
Contaminated packaging	Since emptied containers retain product residue, follow label warnings even after container is emptied. Offer rinsed packaging material to local recycling facilities.

14. Transport Information

DOT

Basic shipping requirements:

UN number	UN1789
Proper shipping name	Hydrochloric acid
Hazard class	8
Packing group	II

Additional information:

Special provisions	A3, A6, B3, B15, IB2, N41, T8, TP2, TP12

Basic shipping requirements:

Labels required	8

Additional information:

Packaging exceptions	154
Packaging non bulk	202
Packaging bulk	242
ERG number	157

IATA

Basic shipping requirements:

UN number	1789
Proper shipping name	Hydrochloric acid
Hazard class	8
Packing group	II
Additional information:	
ERG code	8L

IMDG

Basic shipping requirements:

UN number	1789
Proper shipping name	HYDROCHLORIC ACID
Hazard class	8
Packing group	II

DOT

IATA

IMDG

15. Regulatory Information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Spill: Reportable quantity

HYDROCHLORIC ACID (CAS 7647-01-0)	5000 LBS

US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Substance: Threshold Planning Quantity

HYDROCHLORIC ACID (CAS 7647-01-0)	500 LBS

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

HYDROCHLORIC ACID (CAS 7647-01-0)	1.0 %

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance

HYDROCHLORIC ACID (CAS 7647-01-0)	Listed.

CERCLA (Superfund) reportable quantity

HYDROCHLORIC ACID: 5000.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 311 hazardous chemical	Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations

This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - New Jersey Community RTK (EHS Survey): Reportable threshold

HYDROCHLORIC ACID (CAS 7647-01-0) 500 LBS

US - Pennsylvania RTK - Hazardous Substances: Listed substance

HYDROCHLORIC ACID (CAS 7647-01-0) Listed.

Saf-T-Data

Health: 3 - Severe (Poison)
Flammability: 0 - None
Reactivity: 1 - Slight
Contact: 4 - Extreme (Corrosive)
Lab Protective Equip: D - GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: W - White (Corrosive)

16. Labeling Info

Label Hazard Warning

DANGER

Corrosive. Causes severe skin and eye burns. Causes digestive tract burns. Mist or vapor extremely irritating to eyes and respiratory tract.

Label Precautions

Do not breathe mist or vapor. Do not get in eyes, on skin, or on clothing. Use only with adequate ventilation. Keep container closed. Wash thoroughly after handling.

Label First Aid

Immediately flush eyes with plenty of water for at least 15 minutes. Immediately flush skin with plenty of water. If gas/fume/vapor/dust/mist from the material is inhaled, remove the affected person immediately to fresh air. Get medical attention immediately. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance.

17. Other Information

NFPA ratings

Health: 3
Flammability: 0
Instability: 1

Disclaimer

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Issue date

01-17-2012

Fisher Scientific

Part of Thermo Fisher Scientific

Material Safety Data Sheet

Creation Date 27-Sep-2010 **Revision Date** 27-Sep-2010 **Revision Number** 1

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name **Naphthalene**

Cat No. **N7-500; N134-500**

Synonyms Tar Camphor; Naphthalin; Naphthene (Crystalline/Certified/Laboratory)

Recommended Use Laboratory chemicals

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. HAZARDS IDENTIFICATION

WARNING!

Emergency Overview

Flammable solid. Harmful if swallowed. Possible cancer hazard. May cause cancer based on animal data. May cause skin, eye, and respiratory tract irritation. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Appearance White **Physical State** Solid **odor** Characteristic

Target Organs Central nervous system (CNS), Liver, Kidney, spleen

Potential Health Effects

Acute Effects
Principle Routes of Exposure

Eyes May cause irritation.
Skin May cause irritation. May be harmful in contact with skin.
Inhalation May cause irritation of respiratory tract. May be harmful if inhaled.
Ingestion Harmful if swallowed. May cause central nervous system effects. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Chronic Effects Possible cancer hazard based on tests with laboratory animals. Tumorigenic effects have been reported in experimental animals.. Experiments have shown reproductive toxicity effects on laboratory animals. May cause adverse liver effects. May cause adverse kidney effects.

See Section 11 for additional Toxicological information.

Aggravated Medical Conditions No information available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Haz/Non-haz

Component	CAS-No	Weight %
Naphthalene	91-20-3	>95

4. FIRST AID MEASURES

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Get medical attention immediately if symptoms occur.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Notes to Physician Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flash Point 78°C / 172.4°F

Method No information available.

Autoignition Temperature 526°C / 978.8°F

Explosion Limits
Upper 5.9 vol %
Lower 0.9 vol %

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

Unsuitable Extinguishing Media No information available.

Hazardous Combustion Products No information available.

Sensitivity to mechanical impact No information available.
Sensitivity to static discharge No information available.

Specific Hazards Arising from the Chemical
Combustible material. Containers may explode when heated.

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** 2 **Flammability** 2 **Instability** 0 **Physical hazards** N/A

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable and 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. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Use explosion-proof equipment. Take precautionary measures against static discharges.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment.

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Naphthalene	TWA: 10 ppm STEL: 15 ppm Skin	(Vacated) TWA: 10 ppm (Vacated) TWA: 50 mg/m^3 (Vacated) STEL: 15 ppm (Vacated) STEL: 75 mg/m^3 TWA: 50 mg/m^3 TWA: 10 ppm	IDLH: 250 ppm TWA: 10 ppm TWA: 50 mg/m^3 STEL: 15 ppm STEL: 75 mg/m^3

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Naphthalene	TWA: 10 ppm TWA: 52 mg/m^3 STEL: 15 ppm STEL: 79 mg/m^3	TWA: 10 ppm TWA: 50 mg/m^3 STEL: 15 ppm STEL: 75 mg/m^3	TWA: 10 ppm TWA: 52 mg/m^3 STEL: 78 mg/m^3 STEL: 15 ppm

NIOSH IDLH: *Immediately Dangerous to Life or Health*

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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	White
odor	Characteristic
Odor Threshold	No information available.
pH	No information available.
Vapor Pressure	0.08 mbar @ 20 °C
Vapor Density	4.4 (Air = 1.0)
Viscosity	No information available.
Boiling Point/Range	218°C / 424.4°F
Melting Point/Range	79 - 82°C / 174.2 - 179.6°F
Decomposition temperature	540 °C
Flash Point	78°C / 172.4°F
Evaporation Rate	No information available.
Specific Gravity	0.990
Solubility	No information available.
log Pow	No data available
Molecular Weight	128.17
Molecular Formula	C10 H8

10. STABILITY AND REACTIVITY

Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO_2)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions .	None under normal processing..

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Naphthalene	490 mg/kg (Rat)	20 g/kg (Rabbit) 2500 mg/kg (Rat)	340 mg/m^3 (Rat) 1 h

Irritation	No information available.
Toxicologically Synergistic Products	No information available.

Chronic Toxicity

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	ACGIH	IARC	NTP	OSHA	Mexico
Naphthalene	Not listed	Group 2B	Reasonably Anticipated	X	Not listed

Sensitization No information available.

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects Developmental effects have occurred in experimental animals.

Teratogenicity Teratogenic effects have occurred in experimental animals..

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.. See actual entry in RTECS for complete information.

Endocrine Disruptor Information No information available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Naphthalene	0.4 mg/L EC50 = 72 h	LC50 96 h 1-6.5 mg/L (Pimephales promelas)	EC50 = 0.93 mg/L 30 min EC50 > 20 mg/L 18 h	1.96 mg/L EC50 = 48 h 2.16 mg/L LC50 = 48 h 1.09 - 3.4 mg/L EC50 48 h

Persistence and Degradability Not readily biodegradable.

Bioaccumulation/ Accumulation No information available

Mobility .

Component	log Pow
Naphthalene	3.3

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.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Naphthalene - 91-20-3	U165	-

14. TRANSPORT INFORMATION

14. TRANSPORT INFORMATION

DOT

UN-No	UN1334
Proper Shipping Name	NAPHTHALENE, CRUDE
Hazard Class	4.1
Packing Group	III

TDG

UN-No	UN1334
Proper Shipping Name	NAPHTHALENE, CRUDE
Hazard Class	4.1
Packing Group	III

IATA

UN-No	UN1334
Proper Shipping Name	NAPHTHALENE, CRUDE
Hazard Class	4.1
Packing Group	III

IMDG/IMO

UN-No	UN1334
Proper Shipping Name	NAPHTHALENE, CRUDE
Hazard Class	4.1
Packing Group	III

15. REGULATORY INFORMATION

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	CHINA	KECL
Naphthalene	T	X	-	202-049-5	-		X	X	X	X	KE-25545 X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b)

Component	TSCA 12(b)
Naphthalene	Section 4

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Naphthalene	91-20-3	>95	0.1

SARA 311/312 Hazardous Categorization

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Naphthalene	X	100 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Naphthalene	X		-

OSHA

Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Naphthalene	100 lb	-

California Proposition 65

This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop 65 NSRL
Naphthalene	91-20-3	Carcinogen	5.8 µg/day

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Naphthalene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class

B4 Flammable solid

D2A Very toxic materials

16. OTHER INFORMATION

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Tel: (412) 490-8929

Creation Date 27-Sep-2010

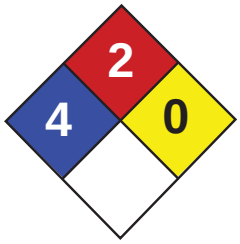
Print Date 27-Sep-2010

Revision Summary "***", and red text indicates revision

Disclaimer

The information provided on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of MSDS



Health	3
Fire	2
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Phenol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Phenol

Catalog Codes: SLP4453, SLP5251

CAS#: 108-95-2

RTECS: SJ3325000

TSCA: TSCA 8(b) inventory: Phenol

CI#: Not available.

Synonym: Monohydroxybenzene; Benzenol; Phenyl hyroxide; Phenylic acid

Chemical Name: Carbolic Acid

Chemical Formula: C6H5OH

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Phenol	108-95-2	100

Toxicological Data on Ingredients: Phenol: ORAL (LD50): Acute: 317 mg/kg [Rat]. 270 mg/kg [Mouse]. DERMAL (LD50): Acute: 630 mg/kg [Rabbit]. 669 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (sensitizer, permeator). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated

exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 715°C (1319°F)

Flash Points: CLOSED CUP: 79°C (174.2°F). OPEN CUP: 85°C (185°F).

Flammable Limits: LOWER: 1.7% UPPER: 8.6%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Phenol + nitrides results in heat and flammable gas generation. Phenol + mineral oxdizing acids results in fire. Phenol + calcium hypochlorite is an exothermic reaction producing toxic fumes which may ignite.

Special Remarks on Explosion Hazards:
Phenol + sodium nitrite causes explosion on heating. Peroxydisulfuric acid + phenol causes explosion.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Air Sensitive. Sensitive to light. Store in light-resistant containers. Moisture sensitive. Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 5 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 19 (mg/m3) from ACGIH (TLV) [United States] SKIN TWA: 5 from NIOSH [United States] TWA: 19 (mg/m3) from NIOSH [United States] TWA: 5 (ppm) from OSHA (PEL) [United States] TWA: 19 (mg/m3) from OSHA (PEL) [United States] TWA: 5 (ppm) [Canada] TWA: 19 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor:
Distinct, aromatic, somewhat sickening sweet and acrid

Taste: Burning.

Molecular Weight: 94.11 g/mole

Color: Colorless to light pink

pH (1% soln/water): Not available.

Boiling Point: 182°C (359.6°F)

Melting Point: 42°C (107.6°F)

Critical Temperature: 694.2 (1281.6°F)

Specific Gravity: 1.057 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 3.24 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.048 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 1.5

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether. Soluble in cold water, acetone. Solubility in water: 1g/15 ml water. Soluble in benzene. Very soluble in alcohol, chloroform, glycerol, petroleum, carbon disulfide, volatile and fixed oils, aqueous alkali hydroxides, carbon tetrachloride, acetic acid, liquid sulfur dioxide. Almost insoluble in petroleum ether. Miscible in acetone. Sparingly soluble in mineral oil.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks), light, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity:
Extremely corrosive in presence of copper. Slightly corrosive in presence of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass, of aluminum.

Special Remarks on Reactivity:
Air and light sensitive. Prone to redden on exposure to light and air. Incompatible with aluminum chloride, peroxydisulfuirc acid, acetaldehyde, sodium nitrite, boron trifluoride diethyl ether + 1,3-butadiene, isocyanates, nitrides, mineral oxidizing acids, calcium hypochlorite, halogens, formaldehyde, metals and alloys, lead, zinc, magnesium and their alloys, plastics, rubber, coatings, sodium nitrate + trifluoroacetic acid. Phenol + isocyanates results in heat generation, and violent polymerization. Phenol + 1,3-butadiene and boron trifluoride diethyl ether complex results in intense exothermic reaction. Phenol + acetaldehyde resultes in violent condensation.

Special Remarks on Corrosivity:
Minor corrosive effect on bronze. Severe corrosive effect on brass.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 270 mg/kg [Mouse]. Acute dermal toxicity (LD50): 630 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant), of ingestion, . Hazardous in case of skin contact (sensitizer, permeator), of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 140 mg/kg LDL [Infant] - Route: Oral; Dose: 10,000 mg/kg

Special Remarks on Chronic Effects on Humans:
Animal: passes through the placental barrier. May cause adverse reproductive effects and birth defects (teratogenic) Embryotoxic and/or foetotoxic in animal. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 125 mg/l 24 hours [Fish (Goldfish)]. >50 mg/l 1 hours [Fish (Fathead minnow)]. >50 mg/l 24 hours [Fish (Fathead minnow)]. >33 mg/l 72 hours [Fish (Fathead minnow)]. >33 ppm 96 hours [Fish (Fathead minnow)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Phenol, solid UNNA: 1671 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Phenol Illinois toxic substances disclosure to employee act: Phenol Illinois chemical safety act: Phenol New York release reporting list: Phenol Rhode Island RTK hazardous substances: Phenol Pennsylvania RTK: Phenol Minnesota: Phenol Massachusetts RTK: Phenol Massachusetts spill list: Phenol New Jersey: Phenol New Jersey spill list: Phenol Louisiana RTK reporting list: Phenol Louisiana spill reporting: Phenol TSCA 8(b) inventory: Phenol TSCA 4(a) proposed test rules: Phenol TSCA 8(a) IUR: Phenol TSCA 8(d) H and S data reporting: Phenol: effective: 6/1/87; sunset:

6/01/97 SARA 302/304/311/312 extremely hazardous substances: Phenol SARA 313 toxic chemical notification and release reporting: Phenol CERCLA: Hazardous substances.: Phenol: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive solid.

DSCL (EEC):
R24/25- Toxic in contact with skin and if swallowed. R34- Causes burns. R40- Possible risks of irreversible effects. R43- May cause sensitization by skin contact. R52- Harmful to aquatic organisms. S1/2- Keep locked up and out of the reach of children. S24- Avoid contact with skin. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water S37/39- Wear suitable gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label. S56- Dispose of this material and its container at hazardous or special waste collection point.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 2

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 4

Flammability: 2

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 11:17 AM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet

ICL Performance Products LP

RESPONSIBLE CARE®
OUR COMMITMENT TO SUSTAINABILITY

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Identification

Product Name:	PHOSPHORIC ACID (35% - 95%)
Reference Number:	AST10046
Date:	May 2, 2013
Synonyms:	Emulsi-Phos®; LuminEtch™, LuminEtch™ Ultra, PurEtch®; monophosphoric acid; orthophosphoric acid;

Use of the substance or preparation

Phosphates and fertilizers, acid cleaners, aluminum brighteners and metal phosphatizing, leather tanning, varnish, synthetic rubber, and water treatment. Food grade is used as an acidulate for cola drinks, yeast nutrient, etc. NSF International certifies phosphoric acid under Standard 60 as an acceptable drinking water treatment chemical.

Company/Undertaking Identification

ICL PERFORMANCE PRODUCTS LP
622 Emerson Road - Suite 500
St. Louis, Missouri 63141

Emergency telephone: In USA call CHEMTREC: 1 800 424 9300

Outside the USA, including ships at sea, call CHEMTREC's international and maritime telephone number (collect calls accepted): +1 (703) 527-3887.

In Canada call CANUTEC: 1 613 996 6666

General Information: +1 800 244 6169 (Worldwide)

2. HAZARDS IDENTIFICATION

GHS

Danger

Skin Corr. 1B
H314 Causes severe skin burns and eye damage.

Prevention:
P260 Do not breathe dust/fume/gas/mist/vapours/spray.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

Response:
P303+P361+P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition

Substance	CAS No.	%w/w	EINECS No.	Risk Phrase
Phosphoric Acid	7664-38-2	35 - 95	231-633-2	R34
Water	7732-18-5	5 - 65	231-791-2	None

4. FIRST AID MEASURES

General

This material is an acid; treatment is symptomatic and supportive. Phosphoric acid has irritating effects to mucous membranes.

Eye contact

Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove any contact lenses. Get medical attention. If irritation persists, contact an ophthalmologist.

Skin contact

May cause skin irritation. Wash effected area with plenty of soap and water. Get medical attention.

Inhalation

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Ingestion

IF SWALLOWED, do NOT induce vomiting. Give victim 2-4 glasses of water to drink. Get medical attention. Contact a Poison Control Center. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

5. FIRE FIGHTING MEASURES

Extinguishing media

Not combustible. No special requirements.

Unsuitable extinguishing media

Non-combustible. No special requirements.

Exposure hazard

Not combustible. May give off toxic fumes (oxides of phosphorus) in a fire. May react with metals to liberate hydrogen, a flammable gas.

Protective equipment

Firefighters should wear self-contained breathing apparatus & personal protective clothing (PPE).

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Avoid unnecessary exposure and remove all material from eyes, skin and clothing. Do not ingest or inhale mists of phosphoric acid.

Environmental precautions

Small quantities: Avoid discharge into the environment
Large quantities: May cause pollution. Avoid discharge into the environment. Note methods for cleaning up in the next section.

Methods for cleaning up

Contain large spills with dikes and transfer the material to appropriate containers for reclamation or disposal. Absorb remaining material or small spills with an inert material and then place in a chemical waste container. Neutralize washings with a base such as soda ash or lime. Flush residual spill area with large amounts of water.

Refer to Section 13 for disposal information and Sections 14 and 15 for reportable quantity information.

7. HANDLING AND STORAGE

Handling

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist or vapor.
Do not taste or swallow.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.

Engineering measures

Provide natural or mechanical ventilation to minimize exposure. The use of local mechanical exhaust ventilation is preferred at sources of air contamination such as open process equipment. Consult National Fire Protection Association (NFPA) Standard 91 for design of exhaust systems.

Transfer product from drums to process in closed system (hermetically) and if not possible use effective local exhaust ventilation. Empty drums as thoroughly as possible to facilitate disposal.

For bulk transfer, purge lines with nitrogen to remove residual liquid before disconnect. When unloading bulk vehicles, personnel should wear chemical goggles and rubber or neoprene gloves. All fittings should be properly secured prior to energizing unloading system. Care should be taken to avoid acid contact when disconnecting lines/hoses after unloading.

For bulk storage type 316L stainless is recommended. Glass, polyethylene and FRP (depending on resin used) are satisfactory, steel, aluminum and type 304 stainless are not recommended because of rapid or potential corrosion. Vessels should be vented and operated at ambient conditions. Maintenance heat (hot water preferred) may be used to prevent freezing. Dike area around storage tank with sufficient volume to hold entire tank contents.

Storage

Store in plastic, rubber-lined, or 316L stainless steel tanks designed for Phosphoric Acid. Store drums away from heat and out of direct sunlight. Store in a well-ventilated dry area away from alkalis and most metals. Store above freezing point. Contact with reactive metals, i.e. mild steel and aluminum may generate hydrogen that may form and explosive mixture in storage vessels.

For tank inspection, follow manufacturer's recommended safety guidelines (ex. temperature, etc.). In addition, corrosion data for phosphoric acid (ex. Handbook of Corrosion Engineering, McGraw-Hill, 2000) must be followed to match the storage container of choice (ex. stainless, rubber lined, etc.).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

State	Standard	Limit
Australia	Occupation Exposure Limit	1 mg/m^3 8-hr. TWA, 3 mg/m^3 STEL
Austria	Occupation Exposure Limit	MAK 1 mg/m^3 8-hr
Belgium	Occupation Exposure Limit	1 mg/m^3 8-hr. TWA, 3 mg/m^3 STEL
Denmark	Occupation Exposure Limit	1 mg/m^3 8-hr. TWA
Finland	Occupation Exposure Limit	1 mg/m^3 8-hr. TWA, 3 mg/m^3 STEL
France	Occupation Exposure Limit	VME 1 mg/m^3 VLE 3 mg/m^3
Japan	Occupation Exposure Limit	1 mg/m^3 8-hr.
United Kingdom	Occupation Exposure Limit	2 mg/m^3 STEL
United States	Occupation Exposure Limit	1 mg/m^3 8-hr. TWA, 3 mg/m^3 STEL

Respiratory protection

Avoid breathing vapor or mist. Use NIOSH/MSHA approved respiratory protection equipment (full face piece recommended) when airborne exposure limits are exceeded (see below). If used, full-face piece replaces the need for face shield and/or chemical goggles. Refer to U.S. OSHA regulations 29 CFR 1910.134 or European Standard EN 149.

Hand/Skin protection

Wear impervious protective gloves and clothing to prevent contact to skin. Wash immediately if skin is contaminated. Remove contaminated clothing promptly and launder before reuse. Clean personal protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

Eye protection

Wear chemical goggles, a face shield, and if necessary, a full face respirator when conditions warrant or exceed the Occupation Exposure Limit. Refer to U.S. OSHA regulations 29 CFR 1910.133 or European Standard EN 166.

Components referred to herein may be regulated by specific Canadian provincial legislation. Please refer to exposure limits legislated for the province in which the substance will be used.

9. PHYSICAL AND CHEMICAL PROPERTIES

General information

Chemical Formula:	H_3PO_4
Appearance:	Clear, colorless, syrupy liquid
Odor:	None
Vapor Pressure (100% acid):	0.0285 mm Hg @ 20 ^oC
Solubility in Water:	Complete

Important health, safety and environmental information

	75%	80%	85%	95%
pH (as a 1% solution @ 25 ^{o}C)	1.6	1.6	1.6	1.7
% Equivalent H_3PO_4:	75.1	80.35	85.5	95.0
Boiling Point ^{o}C :	135	144	154	202
Freezing point ^{o}C	-17.5	4.6	21.1	24.7
Viscosity @ 25 ^{o}C	12	17	23	55
Specific Gravity @ 25 ^{o}C /15.5 ^{o}C:	1.575	1.633	1.692	1.808
Kg/l @ 25 ^{o}C	1.57	1.64	1.69	1.81
lb/gallon @ 25 ^{o}C	13.17	13.66	14.15	15 - 15.2

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Product is stable under normal conditions of storage and handling.

Conditions to avoid

Incompatible materials

Materials to avoid

Avoid contact with metals (such as mild steel and aluminum), which may liberate flammable hydrogen gas that can produce an explosion in confined vessels. Avoid contact with materials such as sulfides and sulfites, which could release toxic gases. Be cautious in mixing with strong bases because high heat of reaction can generate steam.

Hazardous decomposition

Phosphorus oxides may form when heated to decomposition.

11. TOXICOLOGICAL INFORMATION

This material has been defined as a hazardous chemical under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Laboratory data

Data from ICL Performance Products LP single-dose (acute) animal studies with this material are given below:

Phosphoric Acid 75%

Oral - rat LD_{50}:	4,400 mg/kg; slightly toxic
Dermal - rabbit LD_{50}:	> 3,160 mg/kg; slightly toxic
Eye Irritation - rabbit (24-hr. exp):	corrosive
Skin Irritation - rabbit (24-hr. exp):	corrosive
DOT Skin Corrosion - rabbit (4-hr. exp):	non-corrosive

Phosphoric Acid 80%

Oral - rat LD_{50}:	4,200 mg/kg; slightly toxic
Dermal - rabbit LD_{50}:	> 3,160 mg/kg; slightly toxic
Eye Irritation - rabbit (24-hr. exp):	corrosive
Skin Irritation - rabbit (24-hr. exp):	corrosive
DOT Skin Corrosion - rabbit (4-hr. exp):	non-corrosive

Phosphoric Acid 85%

Oral - rat LD_{50}:	3,500 mg/kg; slightly toxic
Dermal - rabbit LD_{50}:	> 1,260 mg/kg; slightly toxic
Eye Irritation - rabbit (24-hr. exp):	corrosive
Skin Irritation - rabbit (24-hr. exp):	corrosive
DOT Skin Corrosion - rabbit (4-hr. exp):	corrosive

The results of single exposure tests indicate that these concentrations of Phosphoric Acid are slightly toxic orally and no more than slightly toxic after skin application. Following a 24-hour exposure, irreversible eye and skin damage occurred at all tested concentrations of Phosphoric Acid.

Phosphoric Acid has produced no genetic changes in standard tests using bacterial cells.

Additional Information

This material is severely corrosive to steel based on DOT, 49 CFR criteria.

Phosphoric Acid has a low vapor pressure at room temperature and is not expected to present a significant inhalation hazard under ambient conditions. Phosphoric Acid can, however, be irritating to the respiratory tract if inhaled as a mist or if the material is vaporized. The American Conference of Governmental Industrial Hygienists (ACGIH) has established a Threshold Limit Value (TLV) for Phosphoric Acid. For further information on this material, please refer to the current edition of the Documentation of The Threshold Limit Values and Biological Exposure Indices.

12. ECOLOGICAL INFORMATION

Environmental toxicity

Phosphoric acid is practically nontoxic to one species of freshwater fish. No toxicity data was located for other freshwater species, algae, or Daphnia magna in a search of the available scientific literature.

The following data have been classified using the criteria adopted by the European Economic Community (EEC) for aquatic organism toxicity.

96-hr. LC_{50} Mosquitofish: 138 mg/L, practically nontoxic

Environmental Fate

No specific biodegradation test data was located in a search of the available scientific literature. It was reported in the literature that while acidity of this material may be reduced readily in natural waters, the phosphate may persist indefinitely.

13. DISPOSAL CONSIDERATIONS

European waste catalog number

The data provided in this section is for information only. Please apply the appropriate classification for your waste.

06 01 04 Waste from inorganic chemical processes, phosphoric and phosphorous acid

Disposal considerations

This material when discarded is a hazardous waste as defined by the U.S. Resource Conservation and Recovery Act (RCRA), 40 CFR 261.22, due to its characteristic of corrosivity, EPA hazardous waste number D002. Best Demonstrated Available Treatment (BDAT) as defined by RCRA for D002 characteristic wastes is DEACTIVATION plus meet 40 CFR 268.48 (Universal Treatment Standards) for non-CWA/non-CWA equivalent/non-Class I SDWA systems. Dispose of in accordance with local, state and federal regulations. Consult your attorney or appropriate regulatory officials for information on such disposal.

14. TRANSPORT INFORMATION

The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

Road/Rail, Sea and Air

IMDG/UN	UN 1805, Phosphoric acid, solution, 8, III
ICOA/IATA	UN 1805, Phosphoric acid, solution, 8, III
RID/ADR	UN 1805, Phosphoric acid, solution, 8, III
Canadian TDG	UN 1805, Phosphoric acid, solution, 8, III *
US DOT	UN 1805, Phosphoric acid, solution, 8, III *

*Reportable Quantity/ Reportable Limit (RQ/RL):
Canadian: Regulated limit (RL) for packages greater than or equal to 230 kg
U.S. DOT: Reportable quantity (RQ) for packages greater than or equal to 5,000 lb

15. REGULATORY INFORMATION

EC label

Hazard symbol:	Corrosive
R34	Causes burns
S26	In case of contact with eyes, rinse immediately with plenty of water & seek medical advice.
S36	Wear suitable protective clothing
S37	Wear suitable protective gloves
S39	Wear eye/face protection

Chemical Inventory

USA TSCA	Listed	Australia	Listed
Canada DSL	Listed	Korea	Listed
EC	Listed	Philippines	Listed
Japan	Listed	China	Listed

Additional information

WHMIS Classification: D2 (B) - Materials Causing Other Toxic Effects
E - Corrosive Material

SARA Hazard Notification

Hazard Categories Under Title III Rules (40 CFR 370):	Immediate
Section 302 Extremely Hazardous Substances:	Not Applicable
Section 313 Toxic Chemical(s):	Not Applicable

CERCLA Reportable Quantity: 5,000 lbs. of phosphoric acid

Release of 5,000 lbs. or more of this product into the environment in a 24-hour period requires notification to the U.S. National Response Center (800-424-8802 or 202-426-2675). Since local, state, and federal laws vary; consult your attorney or appropriate regulatory officials for information relating to spill reporting.

FDA: Food grades of phosphoric acid are sanctioned as Generally Recognized as Safe (GRAS) by the U.S. Food and Drug Administration and is codified in 21 CFR 182.1073.

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation and the MSDS contains all the information required by the Canadian Controlled Products Regulation.

Refer to Section 11 for OSHA/HPA Hazardous Chemical(s) and Section 13 for RCRA classification.

16. OTHER INFORMATION

	Health	Fire	Reactivity	Additional Information
Suggested NFPA Rating	3	0	0	
Suggested HMIS Rating	3	0	0	H H = Splash goggles, gloves (nitrile rubber recommended), synthetic apron, dust & vapor respirator

Reason for revision: Revised section 1. Supersedes MSDS dated: April 12, 2013
Drafted in accordance with ECC Dir 2001/58/EC

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SODIUM HYDROXIDE

Company Information

Company's Name: *REAGENTS, INC.*
Company's Address: *P.O. Box 240746, Charlotte, NC 28224; USA*
Company's Info Ph #: *704/554-7474, 800/732-8484*
Emergencies, call CHEMTREC: *800-424-9300*
Date MSDS Prepared/Revised/Reviewed: *10 May 2010*

1. Product Identification

Synonyms: *Caustic soda; lye; sodium hydroxide solid; sodium hydrate*
CAS No.: *1310-73-2* ***Molecular Weight:*** *40.00* ***Chemical Formula:*** *NaOH*
Product Codes: *1-31800; 2-31800; 2-31825; 2-31850*

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Hydroxide	1310-73-2	100%	Yes

3. Hazards Identification

Emergency Overview: POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.
Health Rating: *3 – Severe* ***Flammability Rating:*** *0 - None*
Reactivity Rating: *1 - Slight* ***Contact Rating:*** *3 – Severe (Corrosive)*
Lab Protective Equip: *Goggles; Face Shield; Lab Coat; Apron; Gloves.*
Storage Color Code: *White (Corrosive)*
Potential Health Effects*:*
Inhalation: *Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.*
Ingestion: *Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appear days after exposure.*
Skin Contact: *Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.*
Eye Contact: *Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.*
Chronic Exposure: *Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.*
Aggravation of Pre-existing Conditions: *Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.*

4. First Aid Measures

Inhalation: *Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.*
Ingestion: *DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give*

anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact: *Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.*
Eye Contact: *Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.*
Note to Physician: *Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the use of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required.*

5. Fire Fighting Measures
Fire: *Not considered to be a fire hazard. Hot or molten material can react violently with water. Can react with certain metals, such as aluminum, to generate flammable hydrogen gas.*
Explosion: *Not considered to be an explosion hazard.*
Fire Extinguishing Media: *Use any means suitable for extinguishing surrounding fire. Adding water to caustic solution generates large amounts of heat.*
Special Information: *In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full-facepiece operated in the pressure demand or other positive pressure mode.*

6. Accidental Release Measures
Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal.
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage
Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product. Do not store with aluminum or magnesium. Do not mix with acids or organic materials.

8. Exposure Controls/Personal Protection
Airborne Exposure Limits: *- OSHA Permissible Exposure Limit (PEL): 2 mg/m^3 Ceiling*
- ACGIH Threshold Limit Value (TLV): 2 mg/m^3 Ceiling
Ventilation System: *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.*
Personal Respirators (NIOSH-Approved): *If the exposure limit is exceeded and engineering controls are not feasible, a half-facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-facepiece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure*

levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection: *Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.*
Eye Protection: *Use chemical safety goggles and/or a full-face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.*

9. Physical and Chemical Properties

Appearance: *White, deliquescent pellets or crystals.*
Odor: *Odorless.*
Solubility: *111 g/100 g of water.*
Specific Gravity: *2.13*
pH: *13 - 14 (0.5% soln.)*
% Volatiles by volume @ 21C (70F): *0*
Boiling Point: *1390C (2534F)*
Melting Point: *318C (604F)*
Vapor Density (Air=1): *> 1.0*
Vapor Pressure (mm Hg): *Negligible.*
Evaporation Rate (BuAc=1): *No information found.*

10. Stability and Reactivity

Stability: *Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react with carbon dioxide from air to form sodium carbonate.*
Hazardous Decomposition Products: *Sodium oxide. Decomposition by reaction with certain metals releases flammable and explosive hydrogen gas.*
Hazardous Polymerization: *Will not occur.*
Incompatibilities: *Sodium hydroxide in contact with acids and organic halogen compounds, especially trichloroethylene, may causes violent reactions. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, magnesium, tin, and zinc cause formation of flammable hydrogen gas. Sodium hydroxide, even in fairly dilute solution, reacts readily with various sugars to produce carbon monoxide. Precautions should be taken including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.*
Conditions to Avoid: *Moisture, dusting and incompatibles.*

11. Toxicological Information

Irritation data: skin, rabbit: 500 mg/24H severe; eye rabbit: 50 ug/24H severe; investigated as a mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Hydroxide (1310-73-2)	No	No	None

12. Ecological Information

Environmental Fate: *No information found.*
Environmental Toxicity: *No information found.*

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Proper Shipping Name: *SODIUM HYDROXIDE, SOLID*
Hazard Class: *8* ***UN/NA:*** *UN1823* ***Packing Group:*** *II*

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------------------------------

Ingredient	TSCA	EC	Japan	Australia
Sodium Hydroxide (1310-73-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Hydroxide (1310-73-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Hydroxide (1310-73-2)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Hydroxide (1310-73-2)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: Yes (Pure / Solid)

WHMIS: *This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.*

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16. Other Information

NFPA Ratings: *Health:* ***3*** *Flammability:* ***0*** *Reactivity:* ***1***

Product Use: *Laboratory Reagent.*

Disclaimer:

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Reagents, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. REAGENTS, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, REAGENTS, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

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MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**FERROUS SULFATE HEPTAHYDRATE**
Version #	01
Revision date	09-02-2011
CAS #	7782-63-0
Product Codes	**J.T.Baker: 2063, 2070, 2074** **Macron: 25000, 25002, 5056, 5572**
Synonym(s)	Sulfuric acid, iron(2+) salt (1:1), heptahydrate * Iron sulfate heptahydrate
Manufacturer	Avantor Performance Materials, Inc.
Address	3477 Corporate Parkway Suite #200 Center Valley, PA 18034 US
Customer Service	855-282-6867
24 Hour Emergency	908-859-2151
Chemtrec	800-424-9300

2. Hazards Identification

Emergency overview	WARNING Harmful if swallowed. Irritating to eyes, respiratory system and skin. May cause damage to the liver.
OSHA regulatory status	This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects	
Routes of exposure	Inhalation. Skin contact. Eye contact. Ingestion.
Eyes	Causes eye irritation.
Skin	Causes skin irritation. Dust or powder may irritate the skin.
Inhalation	Inhalation of dusts may cause respiratory irritation.
Ingestion	Harmful if swallowed. May irritate and cause stomach pain, vomiting and diarrhoea. Pink urine discoloration is a strong indicator or iron poisoning. Liver damage, coma, and death from iron poisoning has been recorded.
Target organs	Eyes. Skin. Upper respiratory tract. Liver.
Chronic effects	Liver injury may occur.
Potential environmental effects	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

3. Composition / Information on Ingredients

Components	CAS #	Percent
FERROUS SULFATE HEPTAHYDRATE	7782-63-0	99 - 100

Composition comments CAS # 7782-63-0 can be described by the CAS # 7720-78-7.

4. First Aid Measures

First aid procedures

Eye contact	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention if irritation develops or persists.
Skin contact	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if irritation develops or persists. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Inhalation	Move to fresh air. Treat symptomatically. Call a physician if symptoms develop or persist.
Ingestion	Call a physician or poison control center immediately. Only induce vomiting at the instruction of medical personnel. Never give anything by mouth to an unconscious person.
Notes to physician	Treat symptomatically.
General advice	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire Fighting Measures

Flammable properties	This product is not flammable.
Extinguishing media	
Suitable extinguishing media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	None known.
Protection of firefighters	
Protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Wear self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode when fighting fires.
Specific methods	In the event of fire and/or explosion do not breathe fumes. Use water spray to cool unopened containers.
Hazardous combustion products	Sulfur oxides.

6. Accidental Release Measures

Personal precautions	Keep unnecessary personnel away. Keep upwind. Ventilate the area. Avoid inhalation of dust from the spilled material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Do not discharge into drains, water courses or onto the ground.
Methods for containment	If sweeping of a contaminated area is necessary use a dust suppressant agent which does not react with the product. Prevent entry into waterways, sewer, basements or confined areas.
Methods for cleaning up	Avoid dust formation. Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. Large Spills: Reduce airborne dust and prevent scattering by moistening with water. Dike far ahead of larger spills for later disposal. Collect dust or particulates using a vacuum cleaner with a HEPA filter. Never return spills in original containers for re-use. Clean contaminated surface thoroughly. Clean up in accordance with all applicable regulations.

7. Handling and Storage

Handling	Keep formation of airborne dusts to a minimum. Wear appropriate personal protective equipment. Avoid breathing dust. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Do not eat, drink or smoke when using the product. Use only with adequate ventilation. Wash thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

ACGIH

Material	Type	Value
FERROUS SULFATE HEPTAHYDRATE (7782-63-0)	TWA	1.0000 mg/m3

Engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal protective equipment

Eye / face protection	Use tight fitting goggles if dust is generated.
Skin protection	Wear protective gloves. Wear suitable protective clothing.
Respiratory protection	Wear respirator if there is dust formation.
General hygeine considerations	Provide eyewash station and safety shower. 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.

9. Physical & Chemical Properties

Appearance	Crystalline.
Color	Blue green.
Odor	Odorless.
Odor threshold	Not available.
Physical state	Solid.
Form	Crystals.
pH	Not available.
Boiling point	> 572 °F (> 300 °C) Decomposes.
Flash point	Not available.
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor density	Not available.
Specific gravity	1.9
Relative density	Not available.
Solubility (water)	Soluble
Partition coefficient (n-octanol/water)	Not available
Auto-ignition temperature	Not available.
Molecular weight	278.02 g/mol
Molecular formula	Fe-S-O4.7H2O

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal temperature conditions.
Conditions to avoid	Avoid dust formation. Excessive heat.
Incompatible materials	Strong oxidizing agents. Alkalies.
Hazardous decomposition products	Sulfur oxides.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
FERROUS SULFATE HEPTAHYDRATE (7782-63-0)	Acute Oral LD50 Rat: 319 mg/kg

Sensitization	Not a skin sensitizer.
Acute effects	Harmful if swallowed.
Local effects	Irritating to eyes, respiratory system and skin. May cause damage to the liver.
Chronic effects	May cause damage to the liver.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Skin corrosion/irritation	Causes skin irritation.
Epidemiology	No epidemiological data is available for this product.
Mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Neurological effects	None known.
Reproductive effects	Contains no ingredient listed as toxic to reproduction
Teratogenicity	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Symptoms and target organs	Irritant effects.

12. Ecological Information

Ecotoxicological data

Product	**Test Results**
FERROUS SULFATE HEPTAHYDRATE (7782-63-0)	EC50 Water flea (Daphnia magna): 6.15 mg/l 48.00 hours LC50 Brook trout (Salvelinus fontinalis): 0.41 mg/l 96.00 hours

Ecotoxicity	Very toxic to aquatic life with long lasting effects.
Persistence and degradability	Not inherently biodegradable.
Partition coefficient (n-octanol/water)	Not available

13. Disposal Considerations

Disposal instructions	Dispose of contents/container in accordance with local/regional/national/international regulations.
Contaminated packaging	Offer rinsed packaging material to local recycling facilities. Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

This product is not listed on the U.S. EPA TSCA Inventory. Under TSCA, hydrates are considered mixtures of their anhydrous salt and water. Accordingly, the anhydrous form is subject to TSCA reporting requirements.

CERCLA (Superfund) reportable quantity

FERROUS SULFATE HEPTAHYDRATE: 1000.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 311 hazardous chemical	Yes
Clean Water Act (CWA)	Hazardous substance
Food and Drug Administration (FDA)	Total food additive Direct food additive GRAS food additive

Inventory status

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

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

FERROUS SULFATE HEPTAHYDRATE (CAS 7782-63-0)	Listed.

Saf-T-Data

Health: 3 - Severe (Life)
Flammability: 0 - None
Reactivity: 1 - Slight
Contact: 2 - Moderate
Lab Protective Equip: B - GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: G - Green (General Storage)

16. Labeling Info

Label Hazard Warning

WARNING

Harmful if swallowed. Irritating to eyes, respiratory system and skin. May cause damage to the liver.

Label Precautions Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed.

Label First Aid Immediately flush eyes with plenty of water for at least 15 minutes. Flush skin thoroughly with water. If gas/fume/vapor/dust/mist from the material is inhaled, remove the affected person immediately to fresh air. Get medical attention if irritation develops or persists. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting without advice from poison control center.

17. Other Information

NFPA ratings

Health: 2
Flammability: 0
Instability: 0

Disclaimer

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Issue date

09-02-2011

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**TOLUENE**
Version #	02
Revision date	08-30-2011
Chemical name	TOLUENE
CAS #	108-88-3
Product Codes	**J.T.Baker: 5375, 5584, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476** **Macron: 4483, 8604, 8608, V560**
Synonym(s)	Methylbenzene; Toluol; Phenylmethane
Manufacturer information	Avantor Performance Materials, Inc. 3477 Corporate Parkway Suite #200 Center Valley, PA 18034 US 24 Hour Emergency 908-859-2151 Chemtrec 800-424-9300 Customer Service 855-282-6867

2. Hazards Identification

Emergency overview

DANGER

Flammable liquid and vapor. Will be easily ignited by heat, spark or flames. Harmful if inhaled or absorbed through skin. Harmful or fatal if swallowed. Causes skin and eye irritation. Causes respiratory tract irritation. High vapor concentrations may cause drowsiness and irritation of the eyes or respiratory tract. May damage fertility or the unborn child. Prolonged exposure may cause chronic effects.

Potential health effects

Routes of exposure	Inhalation. Ingestion. Skin contact. Eye contact.
Eyes	Causes eye irritation. High vapor/aerosol concentrations may be irritating.
Skin	Harmful if absorbed through skin. Causes skin irritation. Prolonged or repeated contact with skin may cause redness, itching, irritation and eczema/chapping.
Inhalation	Harmful if inhaled. May cause irritation to the mucous membranes and upper respiratory tract. In high concentrations, vapors and aerosol mists have a narcotic effect and may cause headache, fatigue, dizziness and nausea.
Ingestion	Harmful or fatal if swallowed. Ingestion may result in vomiting; aspiration (breathing) of vomitus into lungs must be avoided as even small quantities may result in aspiration pneumonitis.
Target organs	Eyes. Respiratory system. Skin. Nervous System. Reproductive organs. Kidneys. Auditory organs.
Chronic effects	Can cause nervous system damage. May cause adverse reproductive effects - such as birth defects, miscarriages, or infertility based on animal data. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.
Potential environmental effects	Toxic to aquatic organisms.

3. Composition / Information on Ingredients

Components	CAS #	Percent
TOLUENE	108-88-3	99 - 100

4. First Aid Measures

First aid procedures

Eye contact	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.
Skin contact	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If breathing stops, provide artificial respiration. Get medical attention immediately.
Ingestion	Call a physician or poison control center immediately. Do not induce vomiting. If vomiting occurs, the head should be kept low so that stomach vomit doesn't enter the lungs.
Notes to physician	Treat symptomatically. Symptoms may be delayed.
General advice	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire Fighting Measures

Flammable properties	HIGHLY FLAMMABLE! Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Heat may cause the containers to explode.

Extinguishing media

Suitable extinguishing media	Water spray. Foam. Dry powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.

Protection of firefighters

Specific hazards arising from the chemical	Can be ignited easily and burns vigorously. Vapor from the solvent may accumulate in container headspace resulting in flammability hazard.
Protective equipment for firefighters	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
Fire fighting equipment/instructions	Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. Move containers from fire area if you can do so without risk. For massive fire in cargo area, use unmanned hose holder or monitor nozzles, if possible. If not, withdraw and let fire burn out. Some of these materials, if spilled, may evaporate leaving a flammable residue. Cool containers exposed to flames with water until well after the fire is out.
Specific methods	In the event of fire and/or explosion do not breathe fumes. Use water spray to cool unopened containers.
Hazardous combustion products	Carbon monoxide and carbon dioxide.

6. Accidental Release Measures

Personal precautions	Wear appropriate protective equipment and clothing during clean-up. Keep unnecessary personnel away. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Local authorities should be advised if significant spillages cannot be contained.
Environmental precautions	Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.
Methods for containment	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible.

Methods for cleaning up

Use only non-sparking tools. All equipment used when handling the product must be grounded.

Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Dike far ahead of spill for later disposal.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Collect in a non-combustible container for prompt disposal.

Never return spills in original containers for re-use. Clean surface thoroughly to remove residual contamination. Clean up in accordance with all applicable regulations.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Handling

DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. Wear appropriate personal protective equipment. Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Use only with adequate ventilation. Wash thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment.

Storage

Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids.

8. Exposure Controls / Personal Protection

Occupational exposure limits

Canada - British Columbia

Material	Type	Value
TOLUENE (108-88-3)	TWA	20.0000 ppm

Canada - Ontario

Material	Type	Value
TOLUENE (108-88-3)	TWA	20.0000 ppm

Canada - Quebec

Material	Type	Value
TOLUENE (108-88-3)	TWA	50.0000 ppm 188.0000 mg/m3

Engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Explosion proof exhaust ventilation should be used.

Personal protective equipment

Eye / face protection

Chemical goggles and face shield are recommended.

Skin protection

Wear appropriate chemical resistant clothing. Wear appropriate chemical resistant gloves.

Respiratory protection

Respirator type: Chemical respirator with organic vapor cartridge and full facepiece. Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

General

Provide eyewash station and safety shower.

9. Physical & Chemical Properties

Appearance

Clear.

Color	Colorless.
Odor	Aromatic. Sweet.
Odor threshold	Not available.
Physical state	Liquid.
Form	Liquid.
pH	Not available.
Melting point	-139 °F (-94.9 °C)
Freezing point	-139 °F (-94.9 °C)
Boiling point	231.8 °F (110.6 °C)
Flash point	39.2 °F (4 °C) Closed Cup
Evaporation rate	2.24 BuAc
Flammability limits in air, upper, % by volume	7.1 %
Flammability limits in air, lower, % by volume	1.1 %
Vapor pressure	3.786 kPa at 25°C
Vapor density	3.1
Specific gravity	0.8636
Relative density	Not available.
Solubility (water)	0.7 g/l at 74°F
Partition coefficient (n-octanol/water)	2.73
Auto-ignition temperature	896 °F (480 °C)
Percent volatile	100 %
Molecular weight	92.14 g/mol
Molecular formula	C7-H8

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal temperature conditions.
Conditions to avoid	Heat, flames and sparks.
Incompatible materials	Strong oxidizing agents. Chlorine.
Hazardous decomposition products	At thermal decomposition temperatures, carbon monoxide and carbon dioxide.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
TOLUENE (108-88-3)	Acute Dermal LD50 Rabbit: 12124 mg/kg
	Acute Inhalation LC50 Rat: 8000 ppm 4.00 Hours
	Acute Oral LD50 Rat: 636 mg/kg

Acute effects	Harmful if inhaled or absorbed through skin. Harmful or fatal if swallowed.
Sensitization	Not a skin sensitizer.
Local effects	Irritating to eyes, respiratory system and skin. High vapor concentrations may cause drowsiness and irritation of the eyes or respiratory tract.

Chronic effects Toluene: Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

TOLUENE (CAS 108-88-3)	3 Not classifiable as to carcinogenicity to humans.

Neurological effects High vapor/aerosol concentrations (attainable only at elevated temperatures) may cause central nervous system effects such as dizziness, drowsiness or headaches. Central and/or peripheral nervous system damage.

Mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Reproductive effects Possible risk of harm to the unborn child.

Teratogenicity Components in this product have been shown to cause birth defects and reproductive disorders in laboratory animals.

Symptoms and target organs Irritation. Upper respiratory tract irritation. Drowsiness and dizziness. Birth defects.

Epidemiology No epidemiological data is available for this product.

12. Ecological Information

Ecotoxicological data

Product	Test Results
TOLUENE (108-88-3)	EC50 Water flea (Daphnia magna): 5.46 mg/l 48.00 hours LC50 Coho salmon,silver salmon (Oncorhynchus kisutch): 5.5 mg/l 96.00 hours LC50 Fathead minnow (Pimephales promelas): 12.6 mg/l 96.00 hours

Ecotoxicity Toxic to aquatic life.

Environmental effects Toxic to aquatic organisms. Bioaccumulation is unlikely to be significant because of the low water solubility of this product. An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and degradability Expected to be readily biodegradable.

Partition coefficient 2.73

13. Disposal Considerations

Disposal instructions Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.

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

Contaminated packaging Since emptied containers retain product residue, follow label warnings even after container is emptied. Residual vapors may explode on ignition; do not cut, drill, grind, or weld on or near this container. Offer rinsed packaging material to local recycling facilities.

14. Transport Information

TDG

Proper shipping name	TOLUENE
Hazard class	3
UN number	UN1294
Packing group	II

TDG

15. Regulatory Information

Canadian regulations

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS status

Controlled

WHMIS classification

B2 - Flammable/Combustible
D2A - Other Toxic Effects-VERY TOXIC
D2B - Other Toxic Effects-TOXIC

WHMIS labeling

Inventory status

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

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

Saf-T-Data

Health: 2 - Moderate (Life)
Flammability: 3 - Severe (Flammable)
Reactivity: 1 - Slight
Contact: 2 - Moderate (Life)
Lab Protective Equip: DB - GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: R - Red (Flammable)

16. Other Information

NFPA ratings

Health: 2
Flammability: 3
Instability: 0

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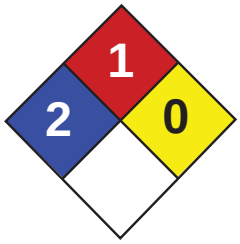
Issue date	08-30-2011
This data sheet contains changes from the previous version in section(s):	Exposure Controls / Personal Protection: Respiratory protection



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Zinc acetate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Zinc acetate

Catalog Codes: SLZ1144, SLZ1252

CAS#: 5970-45-6

RTECS: AK1500000

TSCA: TSCA 8(b) inventory: No products were found.

CI#: Not available.

Synonym: Acetic acid, zinc salt, dihydrate; Zinc diacetate, dihydrate

Chemical Name: Zinc Acetate, dihydrate

Chemical Formula: (CH3COO)2-Zn.2H2O or C4-H6-O4-Zn.2H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Zinc acetate	5970-45-6	100

Toxicological Data on Ingredients: Zinc acetate: ORAL (LD50): Acute: 794 mg/kg [Rat]. 287 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant). Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2). Some metallic oxides.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: When heated to decomposition it emits acrid smoke and irritating fumes of zinc oxide.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (slightly efflorescent)

Odor: vinegar-like (acetous) (Slight.)

Taste: Astringent.

Molecular Weight: 219.5 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: 237°C (458.6°F)

Critical Temperature: Not available.

Specific Gravity: 1.735 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in hot water. Soluble in cold water. Solubility in water: 1 gram dissolves in 2.3 ml water, 1.6 ml boiling water. Solubility in alcohol: 1 gram dissolves in 30 ml alcohol, 1 ml boiling alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Loses 2H2O at 100 deg. C.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 287 mg/kg [Mouse].

Chronic Effects on Humans: May cause damage to the following organs: kidneys.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic). May cause adverse reproductive effects based on animal test data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: Causes eye irritation. Ingestion: May be harmful if swallowed. May cause irritation of the digestive tract. Symptoms may include stomach cramps, stricture of the esophagus, nausea, vomiting. Inhalation: May cause respiratory tract (nose, throat) irritation causing coughing, and wheezing. Chronic Potential Health Effects: Ingestion: Prolonged or repeated ingestion may affect the blood, urinary system (kidneys).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois chemical safety act: Zinc acetate (Cas No. 557-34-6) New York release reporting list: Zinc acetate (Cas No. 557-34-6) Pennsylvania RTK: Zinc acetate (Cas No. 557-34-6) Massachusetts RTK: Zinc acetate (Cas No. 557-34-6) Massachusetts spill list: Zinc acetate (Cas No. 557-34-6) New Jersey: Zinc acetate (Cas No. 557-34-6) New Jersey spill list: Zinc acetate (Cas No. 557-34-6) Louisiana spill reporting: Zinc acetate (Cas No. 557-34-6) California Director's List of Hazardous Substances: Listed as Zinc compounds SARA 313 toxic chemical notification and release reporting: Listed as Zinc compounds CERCLA: Hazardous substances.: Zinc acetate (Cas No. 557-34-6): 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). Zinc Acetate (CAS no. 557-34-6) is listed on the Canadian DSL, but Zinc Acetate, dihydrate (CAS no. 5970-45-6) is not listed on the Canadian DSL

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R36- Irritating to eyes. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-Manufacturer's Material Safety Data Sheet. -Registery of Toxic Effects of Chemical Substances (RTECS). -Merck Index, 13th ed. -Ariel Global View -Hazardous Substance Data Bank -New Jersey Hazardous Substance Fact Sheets

Other Special Considerations: Not available.

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APPENDIX B
CONTROL MECHANISMS

The following Control Methods should be implemented for Hazards that were identified as part of the Tasks that will be conducted as part of this Project.

B1–Chemical–Ramboll employees shall familiarize themselves with the appropriate health and safety responses for exposure to known on-site chemicals prior to beginning work at the site. site-specific chemicals are not limited to known chemicals of concern present in environmental media. During the preparation of the site-specific HASP, Ramboll employees shall also consider historical chemical use resulting in potential chemicals of concern, as well as any current chemical use (e.g., drums, cylinders, containers) or chemicals brought on-site to complete project work (e.g., laboratory chemicals, sample preservatives). Employees shall include relevant Safety Data Sheets in the site-specific HASP and review Attachment A Hazardous Material Properties prior to work involving hazardous materials.

Ramboll employees, contractors, subcontractors, and visitors shall wear appropriate personal protective equipment (PPE) while performing site activities based on the expected COCs and additional site hazards. At a minimum, equipment shall include safety glasses, steel-toed boots, and hard hats (when overhead work is being performed or when overhead hazards exist). Additional PPE requirements, addressing the site-specific hazards and chemicals of concern, will be outlined in the site-specific Health and Safety Plan (HASP).

Air monitoring may be performed to ensure on-site exposure levels are maintained below regulatory requirements. Air monitoring equipment, monitoring plan and controls shall be specified in the site-specific HASP.

Containers of unknown origin and/or unknown contents should not be opened by Ramboll employees without approval from the Corporate Director of Health, Safety & Security (HSS). For projects in which containers are present with unknown contents, consult the site/facility representative for additional information and, if appropriate, consider retaining a qualified waste management company for testing and identification.

For additional information, refer to Standard Practice Instruction 6–Hazard Communication. Consult with your local Health, Safety & Security Coordinator (HSSC) for any personal air monitoring requirements.

B2–Dust/Particulates/Fumes–Working near operating equipment (e.g., drilling rigs, heavy machinery, excavating equipment, power tools) poses unique safety situations including generation of dusts, particulate and fumes.

When the surface is disturbed soil, dust, and other particulates (e.g., concrete dust) can be released to the air. Severe weather conditions can also generate or contribute to hazardous dust and particulate conditions. This presents a hazard to the breathing zone of Ramboll employees, subcontractors, facility employees, and other bystanders. It can also present an off-site hazard if transport of the generated dust and/or particulates off the subject property is possible. The level of risk associated with dust and particulate exposure is generally tied to the level of contamination in the soil, however, soil to dust/particulate transfer is not easily predictable and typically requires on-site real time monitoring to establish baseline exposure values.

Depending upon the work to be done by Ramboll employees, a preliminary site field survey may need to be performed prior to involvement in drilling and/or heavy equipment operations. In the pre-planning stage, the site geology, ground cover, and scope of work (i.e., methods of investigation) should be discussed with the PM, PD, and any subcontractors. If operating equipment will be utilized, and dust/particulate generation is a potential hazard, subcontractors should be directed (in the

subcontract) to be prepared to control this hazard with water spray, or other method (e.g., tenting). The site-specific HASP should include clear directives to monitor breathing the zone and/or site perimeter conditions using approved monitoring devices including, but not limited to personal air monitoring (PAM), dust meters, or perimeter monitoring with data logging equipment.

For additional information, refer to B18–Heavy Machinery, SPI 11–Trenching and Excavation Awareness, and SPI 37–Rigging and Material Lifting. Consult with your local HSSC for any additional requirements.

Both fuel operated equipment and volatile chemicals can present a fume hazard to Ramboll employees. Typically, when work is conducted outside, staff can anticipate that standard scopes of work and typically encountered constituents of concern will not present a fume hazard when best practices such as standing up wind are established and followed. However, there are scenarios in which Ramboll employees must be prepared to implement additional controls to address hazardous fumes. Certain work circumstances, specifically interior work conducted with gasoline-powered motors warrants evaluation for proper ventilation and monitoring to ensure sufficient oxygen and to avoid the buildup of harmful fumes (e.g., carbon monoxide, specific constituents of concern).

Prior to start of work, the scope of work and site-specific factors must be discussed with the PM, PD, and/or local HSSC to ensure that the site-specific HASP includes appropriate controls to address the potential site-specific hazards. Regardless of the site-specific constituents of concern, oxygen must be maintained at a percentage ranging between 19.5 percent and 23.5 percent of the total ambient air. Ramboll employees shall monitor the work area for oxygen deficiency hazards using monitoring devices that have been appropriately calibrated and are recommended for this specific use, as applicable. If direct air monitoring readings suggest an oxygen deficiency and/or the build-up of harmful substances, attempt to employ a passive corrective action such as moving the position of Ramboll employees upwind of the hazardous area or equipment exhaust. If warranted, additional corrective engineering controls may include moving or removing the equipment, venting exhaust to the exterior of the building (typically if interior work is to be conducted, contractors need to be notified in advance that venting will be required), increasing work zone ventilation by opening overhead doors, utilizing fans or the facility ventilation system and/or upgrading PPE. If engineering controls do not adequately address the hazard, leave the area and contact the PM, PD, and/or HSSC. Work will not continue until the hazardous fumes are properly addressed and safe work conditions are verified.

The presence of petroleum and solvent contaminated material presents a potential fire hazard. Smoking and use of open flame will be prohibited and the use of non-sparking tools and equipment will be required, if conditions warrant. Where the potential of fire exists, Ramboll will provide portable fire extinguishers and employees must be trained on proper use. All fire extinguishers shall be maintained as follows:

- Fully charged and in operable condition.
- Clean and free of defects.
- Readily accessible at all times.
- Be visually inspected each month and undergo a maintenance check each year.

Fire prevention and protection measures include elimination of ignition sources, where feasible, identification of combustion sources and atmospheres (e.g., Lower Explosive Limit [LEL] will be monitored), and early detection and rapid response to fire/explosion situations. In addition to standard operating procedures, the following safe work practices will be implemented:

- Site activities will comply with National Electric Code and explosion proof criteria.
- Smoking will not be permitted (or only in designated areas, if such areas are available). On sites where subcontractors are under the direction of Ramboll and fire/explosion hazards will be present, the subcontract shall state that smoking will not be permitted on-site and the Ramboll site supervisor shall enforce this requirement.
- Appropriate air monitoring will be conducted, when necessary.
- Welding, open flame or spark-producing operations will not be allowed on-site.
- Solvents with a flash point of less than or equal to 100 degrees Fahrenheit will not be used for cleaning purposes.
- Fire extinguishers shall be kept in all work vehicles.

All fires and visible smoke that are detected at the site will be dealt with immediately by the individual recognizing the fire and/or smoke. In the event of visible smoke, fire or explosion, the following emergency response procedures will be implemented:

- Immediately cease operations.
- In all emergency fire situations, contact emergency services.

For small fires, employees may attempt to extinguish the fire, if safe to do so and they have been trained. One fire extinguisher ONLY may be used to fight the fire. After one fire extinguisher is depleted, employees must evacuate the area. For larger fires, perform immediate site evacuation.

For more information, please refer to SPI 3–Emergency Action Plan. Consult with your local HSSC for any additional requirements.

B3–Job Zone Control–Implementation of Ramboll scopes of work require that field employees have a clear and organized plan prior to the start of work to control the chemical hazards of the job, ensure all contaminated materials (environmental media and otherwise) are contained and employees, PPE, and/or equipment are appropriately decontaminated. Job zone control will vary depending on the level contamination and complexity of the project and site and may include but not limited to:

- A site map.
- Site preparation for project activities (e.g., making roads, establishing traffic patterns).
- Establish work zones (i.e., Exclusion Zone, Contamination Reduction Zone, and Support Zone).
- Use of the buddy system.
- Decontamination procedures.
- Site security (e.g., fences, locks, hired security).
- Communication plan.
- Safe work practices (e.g., good hygiene, avoid contact with contaminated media).

If the site investigation/remediation is being done at hazardous waste site, the PPE requirements will be forwarded as noted in the site-specific health and safety plan. Kneeling, lying in, or sitting on contaminated ground or materials must be avoided or a protective barrier must be used. Avoid or minimize handling of contaminated materials. Clean water will be kept available for decontamination, washing, and dust control. When water is required for decontamination, the necessity of containerizing

and properly handling this water must also be evaluated. Consideration must also be given to decontamination of equipment such as drilling rigs, augers, and heavy equipment used for excavation/trenching. Subcontractors may need to include items such as decontamination pads and wash water containerization in the cost estimation stage; advance planning for job zone control is imperative.

The job zone control plan must be clearly outlined in the site-specific HASP and discussed in advance of start of work with all Ramboll project employees, associated subcontractors, and site contacts, as appropriate. Consult with your local HSSC for any additional requirements.

B4–Heat–Heat stress can be a significant hazard, especially for workers wearing protective clothing. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site employees will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and in the prevention of heat stress incidents.

Workers will be encouraged to immediately report any heat-related problems that they experience or observe in fellow workers. Any worker exhibiting signs of heat stress and exhaustion should be made to rest in a cool location and drink plenty of water. Emergency help by a medical professional is required immediately for anyone exhibiting symptoms of heat stroke, such as red, dry skin, confusion, delirium, or unconsciousness. Heat stroke is a life-threatening condition that must be treated immediately by competent medical authority.

The following American Conference of Governmental and Industrial Hygienists (ACGIH) screening criteria table shows heat stress exposure in degrees Celsius for an 8-hour work day, 5 days per week with conventional breaks will be used in determining safe exposure for acclimatized (adapted to site-specific environmental conditions) and unacclimatized (not adapted to site-specific environmental conditions) employees. Please note that at elevated temperatures, the ability to safely complete heavy or very heavy work is very limited and frequent rest breaks are required. The project schedule and budget should account for additional staff and/or a longer timeline to completion.

Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	31.0 (87.8F)	28.0 (82.4F)	--	--	28.0 (82.4F)	25.0 (77F)	--	--
50-75%	31.0 (87.8F)	29.0 (84.2F)	27.5 (81.5)	--	28.5 (83.3F)	26.0 (78.8F)	24.0 75.2F)	--
25-50%	32.0 (89.6F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	29.5 (85.1F)	27.0 (80.6F)	25.5 (77.9)	24.5 (76.1F)
0-25%	32.5 (90.5F)	31.5 (88.7F)	30.5 (86.9F)	30.0 (86F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	27.0 (80.6F)

Heat Stress Prevention

Whenever possible, or within the control of Ramboll, engineering controls should be utilized to protect workers from heat related hazards. For example, isolation from the heat source, ventilation such as

open windows, fans or other methods of creating air flow and heat shielding such as awnings or umbrellas.

Appropriate work practices can also lessen the chances of heat related hazards as follows:

- Water intake should be about equal to the amount of sweat produced (i.e., drinking 5-7 ounces of water every 15-20 minutes). Electrolyte fluids may also be necessary.
- Whenever possible, gradual exposure to heat (i.e., acclimatization) is preferred to allow the body's internal temperature to actuate to the working conditions.
- Whenever possible, adjust the work schedule to reduce risk of heat stress. For example, postpone nonessential or heavier work to the cooler part of the day and perform work in the shade if portable.
- Rotate employees to reduce the amount of time spent working in direct sun and heat. Work at sites where heat stress is a significant hazard should not be completed by Ramboll employees working alone.
- Increase the number and/or duration of rest breaks, and whenever possible, rest break areas should be in a cool area as close to the work area as is feasible.

Wear appropriate PPE when necessary, such as thermally conditioned clothing, self-contained air conditioning in a backpack and plastic jackets/vests with pockets that can be filled with dry ice or ice. However, based on the type of work being done, where work is being performed or other required PPE, these options may be prohibited or make the use of this PPE impossible or impractical.

For more information, please refer to SPI 30–Heat Stress. For additional information on Heat Stress first aid, refer to Appendix D First Aid Guidance. Consult with your local HSSC for any additional requirements.

B5–Cold-The four environmental conditions that cause cold-related stress are low temperatures, high/cool winds (wind chill), dampness, and cold water. One, or any combination of these factors, can cause cold-related hazards. Cold stress, including frostbite and hypothermia, can result in severe health effects.

A dangerous situation of rapid heat loss may arise for any individual exposed to high winds and cold temperatures. Major risk factors for cold-related stresses include:

- Wearing inadequate or wet clothing thus increasing the effects of cold on the body.
- Taking certain drugs or medications such as alcohol, nicotine, caffeine and medication thus inhibiting the body's response to the cold and/or impairing judgment.
- Having a cold or certain disease, such as diabetes, heart, vascular and thyroid problems, and thereby increasing susceptibility to the winter elements.
- Lower body-fat composition or other physiological differences. Statistics show that men experience far greater death rates due to cold exposure than women, potentially attributable to participation in risk-taking activities, lower body-fat composition and/or other physiological differences.
- Becoming exhausted or immobilized, especially due to injury or entrapment, thus speeding up the effects of cold weather.
- Advanced age. The elderly are more vulnerable to the effects of harsh winter weather.

The following table provides the resulting equivalent chill temperature to exposed skin because of increasing wind speeds at decreasing actual temperatures. Ramboll employees shall be aware of predicted weather conditions before beginning site work and stay apprised of changes.

TABLE 2. Cooling Power or Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−24	−33	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−32	−45	−58	−72	−85	−99	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−121
25	30	16	0	−15	−29	−44	−59	−74	−88	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−109	−125	−140
35	27	11	−4	−20	−35	−51	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.
Equivalent chilll temperature requiring dry clothing to maintain core body tempearture above 36°C (96.8°F) per cold stress TLV

For more information, please refer to SPI 29–Cold Stress. For additional information on Cold Stress first aid refer to Appendix D First Aid Guidance. Consult with your local HSSC for any additional requirements.

B6–Severe Weather–Monitor the potential for severe weather in the days following the project. Severe weather conditions include but are not limited to high winds, electrical storms, and heavy rain, the highest hazard being lightning. When lightning is spotted, site employees should seek shelter immediately, and use the following steps to avoid injury:

- Note the flash-boom ratio: count the time from the flash to the bang—for each 5 seconds between, the lightning is 1 mile away (activate lightning safety plan at count of 30 or 6 miles (9.6 kilometers) away) and don't resume activities for 30 minutes—it's called the **30-30 rule**).
- If the storm is more than 6 miles (9.6 kilometers) away (greater than 30 seconds between lightning and thunder), the site supervisor should monitor the storm and be prepared to cease work if the storm becomes closer than the safe distance of 6 miles (9.6 kilometers). Since storms can travel at varying speeds, and the amount of time it takes to cease, and secure operations will also vary, prudent judgment should be exercised when storms are in the vicinity and/or developing (e.g., darkening skies, increasing wind speeds, etc.).
- Regardless of travel distance to the storm, based on the flash-boom ratio, workers should not stay in exposed areas (on a roof, in an aerial lift, on a steel truss, on an ungrounded steel structure, in a golf cart, un-sided building, etc.) after lightning has been witnessed. All employees must move to a safe, preferably interior, location.

- Workers should wait 30 minutes from the last sight of lightning or sound of thunder before returning to work.
- Those required to travel from one building to another during the 30-minute wait time should do so only by enclosed vehicle.
- Once the 30-minute wait time has elapsed and no additional lightning or thunder has been seen or heard, individuals may resume normal work.

Here are some guidelines in preventing this electrifying hazard:

- Always monitor weather conditions, especially when going outdoors. Be prepared to shut down the job if thunderstorms are forecast.
- Keep an eye on the weather throughout the day. Stay tuned to the radio for updates on the weather.
- If lightning threatens, seek shelter indoors.
- If a storm is up and you are caught outdoors, seek the appropriate shelter. Here are examples of safe shelter sites:
  - substantial buildings
  - low ground — seek cover in clumps of bushes
  - fully enclosed metal vehicles with the windows rolled up
  - trees of uniform height
- The following are unsafe areas to seek shelter in:
  - electric/power poles
  - electrical equipment
  - heavy and road machinery
  - solitary trees
  - high ground and caves
  - water
  - open fields
  - all outdoor metal objects, like gates and fences
  - high mast light poles
  - metal bleachers
- If you feel your hair standing on end, and/or hear "crackling noises", you are in lightning's electric field and it is close.
- If lightning is extremely close to you and you are caught outside without shelter, immediately remove baseball cap and other metal objects and place them away from you. Put your feet together, duck your head, and crouch down low in baseball catcher's stance with hands on knees.
- Be cautious in following a thunderstorm as the lightning may not be over.

- If a co-worker gets struck by lightning, administer first aid immediately. Remember that it is safe to touch them as they do not carry an electric charge. Seek medical assistance immediately.

For more information about severe weather systems not described herein, please refer to SPI 3-Emergency Action Plan. Consult with your local HSSC for any additional requirements.

B7–Safe Walking Surfaces and Work Areas–Hazards from floor and wall openings, careless movements, protruding objects, debris, spills, placement of materials on paths or foot traffic areas, present a problem with regards to slips, trips, falls and injury. When possible, prior to site work, evaluate site ground conditions and identify areas where an increased risk of slips, trip or falls may exist. If conditions warrant, consider distinguishing a safe work path or establishing road/walk ways on longer term projects.

Ramboll employees shall minimize the risk of slips, trips and falls by establishing general good housekeeping in work areas at all times including, but not limited to keeping the work area clear of excess equipment and cleaning up wet surfaces as soon as possible. In addition, the floor of every workroom shall be maintained in a clean and, as much as possible, a dry condition. Employees should avoid walking on wet and/or cluttered surfaces and be conscious of the fact the wet surfaces could be slippery and have the potential to cause injury. Spilled materials should be cleaned up immediately.

Employees should always stay alert and, if tired or distracted, take this into account when working at the site. To minimize the possibility of injury:

- Wear sturdy, steel-toed work boots with good tread.
- Do not run.
- Slide feet when walking on slick/wet surfaces.
- Do not walk up or down steep embankments/hills, if possible. If not possible, walk at an angle when going up/down embankments/hills.
- Do not carry items that block your vision.
- Use handrails/grips when available and maintain 3-point contact whenever possible.
- Do not jump down from equipment. Look down before you step down.
- Report any floor openings that are not clearly marked and/or guarded.
- Keep paths and work areas clear of tools, equipment, boxes, cords, etc. Tape or secure cords, wires, etc. to minimize trip/fall hazard.
- If a protruding object cannot be moved, make sure the object can be easily seen or guard/pad the object, if possible.
- Use ancillary lighting, such as flashlights and headband lights, when necessary.

Sufficient lighting should always be provided in all areas. Employees should notify the responsible person of conditions where there is an absence of sufficient natural and/or permanent artificial light.

Emergency exit doors will always be kept free of obstacles. Any employee finding an emergency door blocked should immediately report the condition and correct it if possible. Exit lights and signs will also be maintained in proper condition at all times and immediately reported if deficient.

For more information about physical hazards, please refer to SPI 26–Slips, Trips and Falls. Consult with your local HSSC for any additional requirements.

B8–Noise–Hearing protection will be worn by all employees working within the vicinity of equipment where noise is sufficient to interfere with general conversation at a normal speaking volume, when noise levels exceed 85 A-weighted decibels (dBA), and/or when the manufacturers' requirements indicate that hearing protection is mandatory. Personal hearing protection, such as earplugs or earmuffs, may be used to reduce the amount of noise exposure while the above control measures are being evaluated or if such controls fail to reduce the exposure levels to below the PELs.

HPDs (hearing protective devices) may be used to reduce the amount of noise exposure while control measures are being evaluated or if controls fail to reduce the exposure levels to below 85 dBA. The use of HPDs is mandatory for Ramboll employees whose 8-hour TWA noise exposure exceeds 85 dBA. Other employees may also voluntarily wear HPDs, as long as their use does not interfere with the safe performance of on the job duties.

HPDs can prevent significant hearing loss, but only if they are used properly and the correct device is chosen. This can be difficult when employees work in a different environment for each project. When evaluating the need for hearing protection, consider the sources of noise that will be present on the project, your proximity to those sources, and the duration of your exposure. If the exact source(s) of noise are known, you can consult the manufacturer (or internet) for an accurate dBA. Conversely, example sound levels can be researched on the internet for common types of machinery and ALWAYS use conservative professional judgment.

Each type of HPD has a noise reduction rating (NRR), found on its packaging, which is the measure, in dB, of how well a hearing protector reduces noise. The higher the number, the greater the noise reduction.

Ramboll uses the following method to assess the hearing protector's adequacy:

- Obtain the employee's noise exposure A-weighted TWA, when possible, or use an estimate
- Subtract 7 dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector
- For example, if an earplug has an NRR of 26 and the 8-hour TWA is 100 dBA, the exposure would be 100-(26-7) = 81 dBA. Thus, this type of earplug, if worn properly, should provide adequate protection

Also, when dual protectors are used, the combined NRR provides approximately 5 dB more protection than the higher rated of the two products. For example, using ear plugs (NRR of 29 dB) with ear muffs (NRR 27 dB) would provide an NRR of 34 dB

(Earplugs NNR 29) + 5 = 34 dB (the combined NRR)

There are three types of HPDs:

1. Ear plugs, the most popular HPD, which are inserted into the ear canal to provide a tight seal against the canal walls to keep out excess noise
2. Ear bands, which rest outside the ear canal and provide a seal to keep out excess noise
3. Ear muffs, which enclose the entire ear inside rigid cups and the inside of the muff cup is lined with acoustic foam

Multiple types of earplugs and ear muffs should be provided to employees and the appropriate pair selected to control the noise hazards they may experience in the field.

Hearing protection should be worn when working within 25 feet of operating heavy equipment (drilling rigs, earth working equipment, etc.) as working around this type of equipment can result in exposure to hazardous levels of noise (levels greater than 90 dBA).

For more information about acoustical hazards, please refer to SPI 8–Occupational Noise Exposure. Consult with your local HSSC for any additional requirements.

B9–Unexploded Ordinances–Some sites (e.g., mines, firing ranges, former military-owned/operated sites, ordinance manufacturing facilities, etc.) may have old explosives, blasting caps, or other types of unexploded ordinances stored on site (e.g., in mines, in structures surrounding the mine or buried on site). Individuals must take immediate action in the event of finding and/or suspecting that explosives may be present. These actions include, but are not limited to, not touching or disturbing suspected explosives or making loud noises in their immediate vicinity. Slowly retreat from the area and immediately report to the PD/PM, local HSSC and Corporate HSS Director so that ordinance experts can be contacted.

B10–Closed/Abandoned Mines–Project work conducted on former mining sites presents a higher level of risk to Ramboll employees. The underground mine and associated buildings and equipment may not have been maintained over the years. The structural soundness of the mine, buildings and equipment may be compromised and could collapse. Mining sites are often in remote and dangerous areas. Mining operations are often specifically controlled by an administration or group designated by the country-specific location of the site (i.e., Mine Safety and Health Administration in the US) and have specific health and safety regulations they are accountable to meet. Additional training is typically required before Ramboll employees are permitted to work at a mine site.

Employees are to avoid all contact with mines, mine structures, and building supports without prior HS authorization. Employees are not to venture into mines or perform work in any areas should they appear structurally unstable. These conditions are to be immediately reported to the PC, Project HSSC, and Corporate HSS Director.

B11–Operational Facility –Working in an operational facility requires that Ramboll establish a safe work perimeter and cordon work area to the extent that it is possible and appropriate. Creating this safe work area will protect Ramboll employees and its subcontractors from traffic and hazards created in the operating environment and, in turn, protect facility employees or other observers, pedestrians, vehicles, adjacent property owners, etc. from hazards created by Ramboll activities. Prior to start of work, Ramboll employees shall discuss this safe work area with the operational facility representative(s) in coordination with any Ramboll subcontractors. Consideration for potential hazards including forklift traffic, pedestrian traffic, overhead and/or underground hazards, dust and/or fume generation, at a minimum, shall be discussed. If traffic control is required beyond cones, signage, and temporary fencing, etc., and the facility cannot provide in-house traffic control, Ramboll shall consider contracting with a traffic control contractor and/or conducting work during off-hours.

Working in an operational facility requires that Ramboll establish a safe work perimeter and cordon work area to the extent that it is possible and appropriate. Creating this safe work area will protect Ramboll employees and its subcontractors from traffic and hazards created in the operating environment and, in turn, protect facility employees or other bystanders from hazards created by Ramboll activities. Prior to start of work, Ramboll employees shall discuss this safe work area with the operational facility representative(s) in coordination with any Ramboll subcontractors. Considerations including forklift traffic, pedestrian traffic, overhead and/or underground hazards, dust and/or fume generation, at a minimum, shall be discussed. Consider the use of cones, signage, and temporary fencing, etc. If conditions warrant, and the facility cannot provide in-house traffic control, Ramboll

shall consider contracting with a traffic control contractor. Depending on the operations conducted by the facility, and the investigation required by Ramboll, it may be necessary to consider modifying work hours to early morning, overnight, weekend, or some other time where facility operations can be modified.

For additional information, refer to B18–Heavy Machinery, SPI 11–Trenching and Excavation Awareness, SPI 27 Subsurface and Overhead Clearance, SPI 33–Tool and Equipment Safety and SPI 37–Rigging and Material Lifting. Consult with your local HSSC for any additional requirements.

B12–Radiation–The two broad categories of radiation–non-ionizing and ionizing–are distinguished by the frequency, low and high, respectively. Non-ionizing radiation is commonly encountered, is low frequency and is typically benign (e.g., radio waves, microwaves, infrared radiation). Non-ionizing radiation also encompasses lasers and the visible light spectrum. In general, neither hazard evaluation nor controls are typically needed when conducting work where non-ionizing radiation is present. However, in a commercial/industrial occupational setting, non-ionizing radiation can present significant hazards without proper controls. Each work site presents unique hazards and as such should be evaluated for any necessary controls. At a minimum, PPE shall include appropriate eye and skin protection.

Ionizing radiation includes the higher frequency radiation classes including ultraviolet, x-ray, and gamma rays. Chronic or acute exposure to ionizing radiation can cause injury under certain circumstances and hazard evaluation is required. While there is no level of ionizing radiation that is considered “safe”, health professionals generally agree on limiting a person's exposure beyond background radiation to about 100 millirem (mrem) per year from all sources. Exceptions are occupational, medical or accidental exposures. Medical X-rays generally deliver less than 10 mrem.

Work on projects involving ionizing radiation exposure requires approval from the HS department, additional radiation training and the development or participation in an exposure monitoring program. Contact the HS Director for additional information.

B13–Confined Spaces–With the exception of Ramboll’s wastewater treatment operations, Ramboll does not have confined spaces on its premises. However, sites that are visited by Ramboll or its subcontractors could possibly have confined spaces and, as such, must obtain, and review confined-space information from the host facility.

In general, Ramboll employees are not permitted to enter a confined space or perform work in a confined space that would create a hazard and make it a permit-required confined space. If Ramboll employees are asked by a client to enter a confined space, Ramboll management must be informed, and be contacted for prior authorization.

To be a "confined space", **all** the following must be met:

- The space is large enough, and configured such that a person can bodily enter, and perform assigned work,
- The space has limited or restricted means for entry or exit, and
- The space is not designed for continuous occupancy.

Permit-required confined spaces. To be a "permit-required confined space", the space must first meet all the definitions given above, and present one or more of the following conditions:

- Contains or has a potential to contain a hazardous atmosphere,
- Contains a material that could engulf an entrant (person entering the space),

- Is configured such that an entrant could be trapped or asphyxiated by inwardly converging walls or floors, or
- Contains any other recognized serious safety or health hazard.

Ramboll's health and safety policy prohibits unauthorized entry of site and facility employees into confined spaces.

Prior to entering a confined space, Ramboll employees (or its subcontractor's employees) need additional training. Without Confined Space training, entry into confined spaces is prohibited. In addition, entry authorization will only be given after Ramboll management has reviewed the nature of the confined space, the hazards present, and the measures needed to ensure safety. Under these circumstances, Ramboll will work with the host facility to determine training requirements, sampling requirements, written program requirements, and equipment needed to safely enter the confined space. Ramboll shall develop a standardized training format to meet the requirement for a safe confined space entry, as applicable.

Ramboll employees should prevent unknowing entry into confined spaces through heightened awareness when assessing new or unfamiliar facilities and job tasks. Some common structures employees may encounter in the field that *may* trigger confined space entry requirements include crawl spaces, ditches, trenches/excavations, underground equipment rooms or vaults and other industrial equipment spaces. Early identification of potential confined space issues allows the project team and the HS department to assess the hazards and implement the appropriate controls prior to the start of work activities. If you are unsure if a space at your worksite triggers confined space requirements, contact your PM, HSSC and the HS department for addition assistance.

For more information, please refer to SPI 10–Confined Space Awareness. Consult with your local HSSC for any additional requirements.

B14–Live Electrical Equipment–Electricity may pose a hazard to site workers due to the need to supply power to operate a newly installed system (e.g., remediation system) or the ongoing operations at the job site (e.g., electrically powered pumps/sampling devices, electrically generated lighting)). If wiring or other electrical work is needed to complete a Ramboll project scope of work, a qualified, licensed electrician must perform it.

In advance of starting work, it is important to understand the environment where work will be performed to ensure that work can be conducted safely. Depending on the environment, electrical equipment may need to be labeled as inherently safe and/or grounded in a specific manner. Consult with facility employees for any site-specific directives.

General electrical safety requirements include:

- All electrical wiring and equipment must be a type listed by Underwriters Laboratories (UL), Factory Mutual Engineering Corporation (FM), or other recognized testing or listing agency.
- All portable generators or other portable internal combustion type devices used on site will be grounded. All grounds will be validated twice daily with a multimeter to confirm a resistance of less than ten ohms.
- All installations must comply with the National Electrical Safety Code (NESC), the National Electrical Code (NEC), or United States Coast Guard regulations.

- Portable and semi-portable tools and equipment must be grounded by a multiconductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double-insulated tools must be distinctly marked and listed by UL or FM.
- Live parts of wiring or equipment must be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- All circuits must be protected from overload.
- Temporary power lines, switchboxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless constructed for submersion.
- All extension cord outlets must be equipped with ground-fault-circuit interrupters (GFCIs), if possible.
- Attachment plugs, or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use and replaced if worn or damaged.
- Cords and cables must not be fastened with staples, hung from nails or suspended by bare wire.
- Flexible cords must be used only in continuous lengths without splice, except for molded or vulcanized splices made by a qualified electrician.

If a live electrical hazard presents the potential for fire, Ramboll will provide portable fire extinguishers and employees shall be trained on proper use. All fire extinguishers shall be maintained as follows:

- Fully charged and in operable condition.
- Clean and free of defects.
- Readily accessible at all times.
- Be visually inspected each month and undergo a maintenance check each year.

Fire prevention and protection measures include elimination of ignition sources, where feasible, identification of combustion sources and atmospheres, and early detection and rapid response to fire/explosion situations. In addition to standard operating procedures, the following safe work practices will be implemented:

- Site activities will comply with National Electric Code and explosion proof criteria.
- Smoking will not be permitted (or only in designated areas, if available). On sites where subcontractors are under the direction of Ramboll and fire/explosion hazards will be present, the subcontract shall state that smoking will not be permitted on-site and the Ramboll site supervisor shall enforce this requirement.
- Appropriate air monitoring will be conducted, when necessary.

- Welding, open flame or spark-producing operations will not be allowed on-site.
- Solvents with a flash point of less than or equal to 100 degrees Fahrenheit will not be used for cleaning purposes.
- Fire extinguishers shall be kept in all work vehicles

All fires and visible smoke that are detected at the site will be dealt with immediately by the individual recognizing the fire and/or smoke. In the event of visible smoke, fire or explosion, the following emergency response procedures will be implemented:

- Immediately cease operations.
- In all emergency fire situations, contact emergency services.

For small fires, employees may attempt to extinguish the fire, if safe to do so and they have been trained. One fire extinguisher ONLY may be used to fight the fire. After one fire extinguisher is depleted, employees must evacuate the area. For larger fires, perform immediate site evacuation.

For more information, please refer to SPI 3–Emergency Action Plan and SPI 9–Electrical Safety. Consult with your local HSSC for any additional requirements.

B15–Overhead Hazards-Work near operating equipment (e.g., drill rigs, heavy machinery, excavating equipment, etc.), near structural features such as scaffolding, cranes/rigging, low overhead clearance, and in unstable environments with falling debris presents overhead safety hazards. Ramboll employees shall evaluate the presence of overhead hazards prior to the start of work and ensure that appropriate controls are put in place to protect site employees including, but not limited to PPE (i.e., hard hats). As circumstances may change after work begins, Ramboll employees should be aware that site controls to address overhead hazards may need to change as well.

When conducting work around a scaffold, controls are required in addition to wearing hardhats. Employees shall be provided with additional protection from falling hand tools, debris, and other small objects through the installation of toe boards, screens, or guardrail systems, or through the erection of debris nets, catch platforms, or canopy structures that contain or deflect the falling objects. When the falling objects are too large, heavy or massive to be contained or deflected by any of the above-listed measures, the employer shall place such potential falling objects away from the edge of the surface from which they could fall and shall secure those materials as necessary to prevent their falling.

When Ramboll is conducting work at an operational site and/or with the assistance of a subcontractor, these precautions and safety mechanisms must be discussed and established prior to the start of work and documented in the site-specific HASP.

B16–Work Near Railroads-In the event that work activities are required adjacent (within 25 feet) to a railroad track, the rail company must be contacted prior to the start of work and access provided. Access may require additional discussion, planning, fees and employees. The health and safety procedures must be coordinated with the rail company.

If work activities are planned near a rail line (greater than 25 feet), the following procedures will be implemented:

- The hazards of working near railroad lines will be included in job briefings prior to commencing work and when the activity changes.
- Mounting, dismounting, or crossing over moving locomotives or cars is prohibited.

- Employees will be alert for the movement of cars, locomotives, or equipment at any time, in either direction, on any track and will remain at least 25 feet (8 meters) from the end of standing cars, equipment, or locomotives, except when proper protection is provided (e.g., a flagman is present or the track is taken out of service by the proper authority, prior to starting any work on or about the tracks).
- Employees will not take refuge under any car, equipment, or locomotive.

Please refer to SPI 33–Tool and Equipment Safety for additional information. Consult with your local HSSC for any additional requirements.

B17–Traffic Management–If Ramboll employees are required to conduct work within an active public roadway, the appropriate entity–local, state, federal–responsible for the roadway must be contacted. Specialized permits may be required in addition to retention of specialized traffic management contractors. Various degrees of barrier protection may be required based on site-specific traffic conditions.

In addition to and in the absence of local traffic management requirements, Ramboll employees will take the appropriate steps to protect the worksite from interference with traffic/pedestrians and vice versa. The following measures for safe coexistence of traffic and employees shall be considered:

- Alternative walkways where possible;
- Use of an air horn to alert drivers or other workers;
- Maintain good housekeeping and clean the areas as work is completes;
- Use the buddy system while performing work;
- Use a spotter for backing, tight maneuvers and equipment/tank/bin drop-offs;
- Use traffic control devices, field vehicles and barricades;
- Park all vehicles (with wheels in a safe direction away from fieldwork) to block traffic with a flashing yellow light. Also, park so that access to the vehicle is away from oncoming traffic while working;
- When parking a vehicle and equipment, utilize a 'first move forward' driving practice;
- Work in an upright position, facing traffic when possible;
- Make eye contact with vehicle drivers so that they can recognize your presence;
- Minimize work time in traffic through scheduling, and;
- Establish a 'stop work' hand signal.

If controls have been reviewed and upgraded but the situation with speeding vehicles is still unsatisfactory, request additional assistance from the local Police department.

Please refer to SPI 33–Tool and Equipment Safety for additional information. Consult with your local HSSC for any additional requirements.

B18-Heavy Machinery/Drilling Rigs–Working near operating equipment (e.g., drill rigs, heavy machinery, excavating equipment, power tools, pumps, etc.) poses unique safety situations such as high-pressure hazards from hoses and pipes, overhead hazards, and material releases. Also, other hazards may be present such as falls from elevation, electrical contact and improper machine guarding. Ramboll employees shall only operate equipment they are trained to operate and that is

equipped with appropriate protection devices. For equipment operated by subcontractors, Ramboll employees shall familiarize themselves with the equipment being utilized, and shall, at a minimum, know how to stop or turn off the equipment in the event of an emergency. Ramboll employees do not operate drilling or other heavy equipment, however, it is every employee's responsibility to recognize safe, appropriate use and be familiar with all potential and/or existing hazards related to the use of operating equipment. In the event of unsafe work practices by facility employees, subcontractors, and/or other Ramboll employees, all Ramboll employees have stop work authority for any unsafe operations.

Certain scopes of work conducted during Ramboll projects, require the use of heavy equipment (e.g., excavators, loaders, cranes, etc.) that must be subcontracted with a qualified subcontractor. Ramboll employees should, under no circumstances, operate or ride on heavy equipment. Site employees will don high visibility vests and maintain a safe distance of at least 20 feet (6.1 meters) from all heavy equipment in operation. If the equipment has a mast or an arm characteristic of a drill rig, crane, or excavator, a safe distance is approximately one and a half times the height of the equipment. If activities warrant closer proximities to operating equipment employees will discuss this need and safe procedures for approach with the equipment operator in advance of the start of work. Prior to approach, personal shall make eye contact with the operator and ensure that the equipment is powered down, or at a minimum, in a resting position. A second Ramboll employee will stand watch to keep him/her out of the path of equipment while performing the required activity. Further, employees shall keep a minimum distance of 3 feet from an open drill hole, excavation, mud pit, or any other opening. Ramboll employees will not place tools, meters, etc. in a position that could create a fall, trip or slip hazard. As much as is possible, employees will work with the appropriate site employees to ensure the area near the operating equipment is clean, orderly and free of slip, trip and fall hazards. The following procedures should be followed when heavy equipment is in use:

- Use common sense. Do no assume that the equipment operator is keeping track of your whereabouts. Never walk directly behind, or to the side of, heavy equipment without advance discussion and agreed upon procedures, the operator's knowledge, eye contact and acknowledgement.
- All heavy equipment must be shut down during refueling.
- Maintain visual contact of moving equipment at all times.
- Establish hand signal communication prior to the start of work in circumstances when verbal communication is difficult. This mode of communication should be discussed at the start of each work day during the health and safety tailgate meeting.
- All heavy equipment shall have backup alarms of some type.
- Use chains, hoist, straps, and any other equipment to safely aid in moving heavy materials.
- Be sure that no underground or overhead power lines, sewer lines, gas lines, or telephone lines, will present a hazard in the work area. Specifically note overhead hazards in the area where equipment will need to mobilize across the site from the site entrance to the work area.
- Restrict all non-essential people from of the work area. If observation by non-essential third parties (e.g., the client, facility personnel, stakeholders) is necessary, determine a safe zone outside the active work area and cordon the area in some manner.

- Prohibit loose-fitting clothing or loose long hair around moving machinery.
- Instruct equipment operators to report any abnormalities such as equipment failures, unusual odors, etc.
- Store tools in clean, secure areas so that they will not be damaged, lost or stolen.
- When an equipment operator must negotiate in tight quarters, request that the subcontractor provide a second person to ensure adequate clearance. Ramboll employees shall not provide specific direction as to how to operate equipment–it is the responsibility of the subcontractor.
- All heavy equipment must be properly leveled and supported prior to use.
- When heavy equipment is utilized inside a building, precautions must be taken to ensure that there is appropriate ventilation and exhaust is vented to the outside.
- Heavy equipment and trucks will be operated in specific site control zones and marked traffic lanes.
- Materials, tools, or other objects will not be thrown, tossed or dropped. Always hand off or lower items as needed.

Employee Restrictions and Responsibilities

Under no circumstances will a Ramboll employee operate a heavy machinery, a portion thereof, or any other piece of contractor or facility equipment.

In addition, Ramboll employees will not:

- Direct equipment operator to a work location, provide specific guidance to subcontractor with respect to the operation of the equipment, assist in the movement of equipment or participate in the movement or breaking down of any portion of the equipment.
- Climb on the equipment.
- Watch a subcontractor arc-weld.
- Smoke while at the work site.
- Refuel an engine while it is still running or hot, siphon gasoline or park near equipment exhaust.
- Wear loose fitting clothing or PPE near operating equipment.

B19-Trenching/Excavation–An excavation is any manmade cut, cavity, trench, or depression in the ground surface, formed by earth removal. A trench is narrow excavation (in relation to its length) made below the surface of the ground. The following safe operating guidelines apply to open trenches or excavations exceeding four (4) feet (1.3 meters) in depth **or** of any depth if unstable soil conditions exist.

Excavations and trenches present a heightened risk on Ramboll projects. In addition to the heavy equipment hazards discussed in control B18, trenches and excavation create hazards associated with confined spaces, dangerous gas build up, unstable soil conditions, water retention, etc. For these reasons, excavation and trenching work shall only be performed by competent contractors training in the health and safety requirement associated with this type of work, in accordance with corporate standards and local/region regulations. When excavation/trenching work in managed by Ramboll

employees under a direct subcontractor, additional health and safety planning should be performed in conjunction with the subcontractor to ensure all HS requirements are satisfied.

Regardless of the management of the excavation or trenching work, Ramboll employees working on projects where this type of work is being performed shall have an awareness level of training on the topic and ensure best practices are followed, including but not limited to:

- Excavated materials will be stored and retained at least 2 feet (0.6 meters) from the edge of the excavation. This procedure must be observed even when excavation/trench entry will not occur. The location for staging soil shall be determined by Ramboll employees, the subcontractor, and facility personnel, if applicable, in advance of the start of work.
- Trees, boulders, and other surface encumbrances that create a hazard will be removed or made safe before the start of work.
- Special precautions will be taken in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation.
- Except in hard rock, excavations below the level of the base of the footing of any foundation or retaining wall will not be permitted, unless the wall is underpinned and all other precautions have been taken to ensure the stability of the adjacent walls. Please consult directly with the project PM, PD, local HSSC, and the Corporate Director of HSS when planned excavations potentially threaten the integrity of any structures.
- Excavations will be inspected at least daily, or more often as conditions warrant, by a **competent person** (i.e., the subcontractor in coordinator with the Ramboll site supervisor) to ensure that changes in temperature, precipitation, shallow groundwater, overburden, nearby building weight, vibrations, or nearby equipment operation has not caused weakening of sides, faces and flows. Without proper training in confined space entry, Ramboll employees shall not enter any excavation greater than four (4) feet (1.3 meters) in depth (or less if soil is deemed unstable by a competent person). If a Ramboll employee is properly trained in confined space entry and has project-specific approval from the Corporate Director of HSS prior to entry, the atmosphere of the excavation must be tested to ensure that an oxygen deficient or hazardous atmosphere does not exist. If, at any time, the concentration of any airborne contaminant exceeds one-half its permissible exposure limit (PEL), or other applicable occupational exposure limit (OEL), the airborne oxygen concentration is less than 19.5 percent, or explosivity exceeds ten percent of the lower explosive limit (LEL), employees shall not be permitted to enter the excavation. Engineering controls or other hazard controls (i.e., upgraded PPE) shall be instituted to eliminate or control the hazard.
- Field employees shall not enter any excavation, greater than 4 feet in depth, without specific direction, for any reason. If employees fall into the excavation and require rescue, properly trained emergency personnel shall be contacted for support.
- Ramboll employees shall not operate trenching or excavation equipment. However, prior to start of work, the subcontractors shall direct Ramboll staff to the emergency stop for all equipment.

Ramboll employees directing subcontractors conducting trenching/excavation activities shall request, at the subcontracting stage, if possible, the following safe work practices:

- When mobile equipment is used or allowed adjacent to excavations, stop logs, or barricades will be installed. The grade will always be away from the excavation. Construction of such features shall be the responsibility of the subcontractor.
- A means of egress (ladder, ramps, stairways, etc.) shall be accessible at any location inside the excavation without requiring more than 25 feet (8.3 meters) of lateral travel distance.
- Dust conditions during excavation will be kept to a minimum. Wetting agents shall be used when appropriate.
- Diversion ditches, dikes, or other suitable means will be used to prevent water from entering an excavation and for drainage of the excavation. Construction of such features shall be the responsibility of the subcontractor.
- All excavations will be marked and protected at all times to ensure site employees, visitors, or unauthorized employees do not enter without permission or fall into the trench.
- Employees will work in pairs when working around an excavation of 2 feet (0.6 meters) or more.

In the event of unsafe work practices by facility personnel, subcontractors, and/or other Ramboll employees, all Ramboll employees have stop work authority for any unsafe operations. For more information, please refer to SPI 11–Trenching and Excavation Awareness. Consult with your local HSSC for any additional requirements.

B20-Vehicle Use–Work areas and site conditions must be considered when designating and selecting a vehicle for use (i.e., rental or company-owned). The vehicle shall be maintained in safe working order as required by the manufacturer. This would include a routine preventive maintenance schedule for servicing and checking of safety-related equipment. Special consideration should be taken when weather conditions reduce the safety and visibility while driving. Appropriate measures should be taken while driving during inclement weather including snow, icy and/or wet conditions; high winds; hail, heavy rains; debris or other impairments to safe driving caused by natural weather.

Special-use vehicles (e.g., All-Terrain Vehicles (ATV), snowmobiles, etc.) are vehicles with a light engine or electric motor, other than construction equipment, and are not intended and/or allowed for highway use. These vehicles may not have seat belts and **do not** meet substantial roll over protection standards (ROPS).

When operating vehicles, the following general practices will be followed:

- All vehicles will be operated in accordance with the manufacturer's requirements and specifications.
- Drivers should use prudent judgment and proceed cautiously when driving on non-paved roads. If using a rental car, ensure that the rental agreement allows driving on non-paved roads.
- Drivers will adhere to all site, local and state traffic laws including, but not limited to use of a hands-free device when speaking on a mobile phone. TEXTING WHILE DRIVING ANY VEHICLE IS STRICTLY PROHIBITED.

- Operators of special-use vehicles shall be trained by a competent person–senior Ramboll employees or otherwise. At a minimum, the training will be hands-on, and the operator shall demonstrate basic skills prior to the conclusion of the training exercise. All individuals are required meet all training aspects before vehicle operation. This training shall be documented with the local HSSC prior to the start of work.
- Vehicles shall always remain on flat surfaces and shall not be operated on slopes steeper than a 30 percent grade;
- Daily inspections of vehicles for safety and maintenance will be required (i.e., fluid leaks/levels, tire pressure, tire surfaces, lights, fuel levels, brakes, etc.).
- Speed limits shall be maintained relative to legal requirements, safe operating speeds for the vehicle and in compliance with any facility-specific directives.
- Make sure the engine is turned OFF before dismounting the vehicle.
- Avoid driving over any extreme obstacles (i.e. wood/logs, fences, boulders, etc.).
- Operation is limited to the daylight hours, if possible.
- Do not carry passengers.
- Slow down before coming to a stop.
- Shut engine down prior to refueling.
- Each driver will have a valid driver's license.

For more information, please refer to SPI 40–Driving Safety. Consult with your local HSSC for any additional requirements.

B21-Water On/Near Water–Certain scopes of work conducted during Ramboll projects, require work on, over, or near water. All employees and visitors must wear a United States Coast Guard (USCG) approved personal floatation device (PFD), or location-specific equivalent, when near water (i.e., within 4 feet/1.22 meter), over water, wading in water or on any vessel, where the danger of drowning exists. This PFD must be properly secured to the wearer, free of all defects including rips, tears, stress, and fading, and be kept clean and free of excessive dirt and oil. Several factors are relevant to determining whether a danger of drowning exists. These include the type of water body (i.e., a pool, a river, and a canal), depth, presence, or absence of a current, height above the water surface, the use of fall protection when working above a water body, and other site-specific/work-specific factors. Prior to the start of work, the contemplated scope of work shall be discussed with the PM, PD, and local HSSC to determine appropriate controls.

Depending on the factors present, there are some circumstances where a drowning hazard could exist where workers are near or over water that is relatively shallow (i.e., less than 2 feet/0.6 meters) in depth. For example, where workers are not using fall protection and are 10 feet above a river, a worker may fall and be knocked unconscious. Without the use of a life jacket or buoyant work vest, a worker in such a scenario could drown.

A life ring equipped with 90 feet of solid braid polycarbonate line, or equivalent must be close to the working area and accessible for use. This includes activities on board all vessels.

USCG boating safety guidelines or equivalent should be adhered to when operating a boat during sampling activities. Boats must be equipped with the required running lights for night-time and/or,

country-specific poor visibility conditions. Boats must be equipped with an anchor and alternate means of locomotion (e.g., extra motor, floatable oars).

All water work shall be performed by at least a two-person team. Both people shall be equipped with the proper safety gear and capable of readily summoning emergency rescue if needed. Ramboll employees are prohibited from working in or near water by themselves.

At least one lifesaving rescue vessel (e.g., a skiff) shall be immediately available at locations where employees are working over, in, on or adjacent to water where the danger of drowning exists. The need to have a rescue vessel "immediately available" for use is dependent upon a number of factors, including but not limited to:

- The number of work locations operating;
- The distance to each of those locations;
- Water temperature;
- Currents, and;
- Other hazards such as, but not limited to, rapids, dams, and water intakes.

In general, if the water is so shallow that rescuers could simply run into the water body without endangering themselves and/or others or the work was being conducted very close to shore (e.g., the length of the skiff from shore would be greater than the working distance from shore and/or the skiff would foul on the bottom anyway), a skiff would not be required.

All work aboard a vessel shall be performed by at least a two-person team. If work is performed at times when water temperatures are less than 38°F (3-4°C), it is recommended, but not mandatory, that sampling employees wear float coats. The vessel should be operated only by designated, experienced staff.

For additional information, please refer to SPI 31–Water Safety. Consult with your local HSSC for any additional requirements.

B22–Working from Heights (Less than 4 feet [1.2m])–Fall protection is not required for work conducted at heights less than 4 feet above ground level. However, when the potential for work at varying heights exists, or the potential that implementation of the scope of work may increase the height at which work is being conducted (e.g., excavation/trenching), hazards associated with work at heights should be considered. Further, a mechanism for monitoring and documenting the potential changing conditions and a contingency plan for controlling potential hazards should be included in the site-specific HASP.

In the event that unanticipated conditions resulting in work at heights greater than 4 feet (1.2 m) are encountered during implementation of the scope of work, site work should be stopped immediately and the Ramboll site supervisor shall contact the project PM, PD, and/or local HSSC.

Work up to four feet (1.2 meters) in height presents an increased risk of slips, trips, and falls and an increased severity of injury. Working off the back of a pick up or sport utility vehicle is a common low height situation encountered in the field. When ascending and descending a truck bed, dock or other raised structure implement best work practices like two-person teams and safe, deliberate movements.

For additional information, please refer to SPI 10–Fall Protection and SPI 26-Scaffolding. Consult with your local HSSC for any additional requirements.

B23–Working from Heights (Greater than 4 feet (1.2m)) increased risk is presented when Ramboll employees work from heights greater than 4 feet (1.2m) and an increase awareness and frequent assessment of changing work conditions is expected. Work from height greater than six feet (1.8m) requires additional fall protection requirements, potentially fall prevention devices and PPE, and additional HS training. Since the height of the work required for many projects may vary (e.g., work near and around excavations), Ramboll employees must evaluate the need to fall protection controls when work is conducted at heights greater than 4 feet (1.2m).

The best fall protection control is to eliminate the hazard using engineering controls or modification of the scope of work. However, at times hazards are identified during project work or develop because of changing site conditions. If dangerous or unexpected work conditions are identified, site work should be stopped immediately and the Ramboll site supervisor shall contact the project PM, PD, and/or local HSSC and the appropriate controls shall be implemented before work begins again.

In general, due to the tasks included in the scope of work, the hazards associated with working at heights can be anticipated in advance and depending on the objectives of the work, cannot be avoided. Hazard controls shall be documented in the site-specific HASP. At a minimum, the HASP shall include the hazards and risks associated with working at heights and control methods and will detail the required steps for protecting employees from fall hazards. Fall protection includes but is not limited to personal fall arrest systems consisting of a full body harness, a lifeline, and an attachment point. HS department notification and additional training is required for job tasks that involve fall protection equipment (i.e., body harness and lifeline, etc.).

Ramboll will provide training to ensure that the purpose, function, and proper use of fall protection is understood by employees and that the knowledge and skills required for the safe application, and usage is acquired by employees. Training will be conducted prior to job assignment and will include, as a minimum the types of fall protection equipment appropriate for use; recognition of applicable fall hazards associated with the work location and the work to be completed; and load determination and balancing requirements. All other employees whose work operations are or may be in an area where fall protection devices may be utilized, will be instructed to an awareness level concerning hazards associated with fall protection operations.

For additional information, please refer to SPI 10–Fall Protection and SPI 26-Scaffolding. Consult with your local HSSC for any additional requirements.

B24–Overhead/Underground Utilities–Various forms of underground and overhead utility lines, pipes (carrying water, wastewater, gas, electricity, and/or communication lines), or other hazards may be encountered during work activities. Every effort shall be made to locate and mark underground utilities, pipes, and other hazards prior to the start of intrusive work. Intrusive work includes any work activity where the work surface is penetrated. At a minimum, Ramboll will conduct a historical site review to develop a plot plan with the most up to date utility information, contact the appropriate One Call service (where available), contract a private utility locating service (where available [REQUIRED IN THE US]), and clear the critical zone around any intrusive location to 5 feet (1.3 meters) in every direction. The measures described herein are required for interior work as well, including, but not limited to sub-slab soil gas probe installation. It is imperative, prior to any utility locating activities conducted by Ramboll employees and/or a subcontractor, that the geology, surface covering (e.g., asphalt, concrete), and other potential interfering factors such as reinforced flooring, the presence of metal in the subsurface are identified and understood. This information must be transmitted to the private locating service in advance of start of work and preferably during the contracting phase so that appropriate locating equipment is selected.

As line voltage increases, your safe working distance will also increase. If overhead lines are present, call the utility company and find out what voltage is on the lines, so the safe working distance can be calculated, or stay at least 28 feet (9m) from cables supported on wooden poles, and 50 feet (15m) from cables supported on metal poles. Work involving machinery with high extensions (drill rigs, backhoes, etc.) will remain at least 10 feet (3.3 meters) from overhead power lines or further depending on the voltage of the line.

Should any operations cause equipment to come into contact with utility lines, the appropriate authority will be notified immediately and an Incident Report consistent with SPI 19–Incident Reporting will be completed. Work will be suspended until the appropriate actions for the situation can be taken.

Please reference Section 6 of the site-specific HASP and SPI 27–Subsurface and Overhead Clearance for additional information. Consult with your local HSSC for any additional requirements.

B25–Electrically Powered Equipment and Tools–Many Ramboll scopes of work require that Ramboll employees and/or its subcontractors utilize electrically powered equipment and tools. To use this equipment safely, ensure that all electrical equipment is properly grounded prior to use. Avoid standing in water when operating electrical equipment. Ground fault outlets or adapters shall be used for any electrical equipment, if possible. Apparatus, tools, equipment, and machinery will not be repaired while in operation; lockout/tagout (LOTO) procedures will be implemented when necessary (See B28–LOTO).

Tools can be hazardous when improperly used since these types of tools utilize energy in the form of electricity, liquid fuel, hydraulics, pneumatics, and/or powder-actuated. The following precautions will be taken by employees to prevent injury:

- Power tools will always be operated within their design limitations, and only by employees who have been appropriately trained in the use, operation, and proper handling of such tools.
- Guards are not to be removed or rendered inoperative.
- Eye protection, gloves, and steel-toed safety footwear are required during operation. Refer to the equipment manuals for guidance and include this information in the site-specific HASP.
- Store tools in an appropriate dry location when not in use.
- Work only in well illuminated locations.
- If power tools will be used to penetrate a ground, parking, floor surface or other surface, Ramboll employees must first evaluate the presence of underground utilities or obstructions.
- Tools will not be carried by the cord or hose and cords or hoses will not be yanked to disconnect from the power receptacle.
- Cords and hoses will be kept away from heat, oils and sharp edges or any other source that could result in damage.
- Tools will be disconnected when not in use, before servicing and when changing accessories such as blades, bits and cutters.
- Observers will always be kept at a safe distance from the work area.

- Tools will be maintained in a clean manner, and properly maintained in accordance with the manufacturer's guidelines. Pre-use inspection of hand and portable power tools should occur.
- Ensure that the work area is kept clean to maintain proper footing and good balance.
- Ensure that proper apparel is worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- Tools that are damaged will be removed from service immediately and tagged "Do Not Use" until proper repair or disposal.

Please refer to SPI 9–Electrical Safety, SPI 33–Tool and Equipment Safety, and SPI 34–Equipment Grounding. Consult with your local HSSC for any additional requirements.

B26–Cutting Devices and Tools-Cutting devices are a type of hand tool that may frequently be encountered on Ramboll projects. The devices range from household scissors to box cutters and other sharp, exposed blades used to cut materials. Cutting devices should only be used by Ramboll employees when it is an inherent part of their job task, like cutting open packing tape on a box that has been shipped to you for your project. For further example, cutting soil sample liners is a job task generally appointed to our drilling subcontractors and should not be performed by Ramboll employees. If the use of a cutting device is required for a certain task, the safest device available that meets the needs of the job should be used. Safety cutting devices, like the "Klever Kutter" should be the first choice, when they are appropriate for the job. This device is designed to naturally shield the blade from the user. Some other guidance to consider:

- Always cut away from the body.
- Evaluate the need for work gloves or cut-resistant gloves during the planning stages of the project. Different types of gloves provide varying levels of protection that should be considered during the risk assessment. The materials used to make the gloves and the tensile strength of the weave determine exactly how much pressure can be applied before the fabric fails and cuts through. Usually the more protective gloves have less dexterity (or ease of movement) for the user, increasing other hazards in the process. A risk assessment should consider all these factors when evaluating PPE.

Please refer to SPI 33 –Tool and Equipment Safety for further information. Consult with your local HSSC for any additional requirements.

B27–Lifting Operations-Ramboll will ensure that all potential hazards regarding rigging and material lifting in our job sites are properly evaluated; however, Ramboll does not intend to provide employees with the knowledge/skill/ training to erect and/or dismantle rigging and/or material lifting equipment. The site-specific HASP should include provide documentation of the factors involved when rigging and material equipment is used by our direct subcontractors. In general, all scaffolds, rigging, and material lifting equipment must be erected and dismantled by a qualified and competent 3rd party contractor.

For lifting operations, even those conducted by a contractor, Ramboll employees shall be aware of proper procedures and observe the following precautions:

- Store materials and equipment in designated areas to avoid creating additional hazards (e.g., block exits and/or unstable storage). Properly demarcate areas where materials and/or equipment may be placed, loaded or unloaded by adequate guarding and posting.

- Safely arrange materials and equipment to prevent tipping, falling, collapsing, rolling (i.e., properly stack, secure and/or stabilize items by interlocking, strapping or securing by an effective method to protect persons and property from potential injury and/or damage).
- Ensure that storage areas are kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage. Vegetation control must be exercised when necessary.
- Manual lifting and handling of material must be done by methods that ensure the safety of both the employee, the material, and the structure. Tag lines may be used to stabilize loads unless their use creates an unsafe condition.
- Employees are prohibited from walking and/or working under loads that are about to be lifted and/or are suspended.
- Wear required employee protective equipment as applicable, including, but not limited to a hard hat to protect against overhead hazards. See B15–Overhead Hazards for additional control information.

Please refer to SPI 37–Rigging and Material Lifting for further information. Consult with your local HSSC for any additional requirements.

B28–Lock Out/Tag Out (LOTO)-LOTO applies to the control of energy during servicing and/or maintenance of machines and equipment. In general, Ramboll employees will not be authorized to perform LOTO job tasks unless additional training has been provided and employees are considered competent in that task. Where applicable, Ramboll will establish a program and utilize procedures for affixing appropriate LOTO devices to energy isolating devices, and to otherwise disable machines or equipment to prevent unexpected energization, start-up or release of stored energy to prevent injury to employees. Any LOTO procedure will be clearly identified and will be incorporated into the site-specific HASP. Ramboll will ensure that all equipment and machinery meeting the criteria for LOTO that are part of the work activities are evaluated, and that information and training programs, and LOTO procedures are implemented.

LOTO requirements do not apply to minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations if they are routine, repetitive, and integral to the use of the equipment for production. This exception is appropriate provided that the work is performed using alternative measures which provide effective protection in accordance with the site-specific HASP and equipment manual recommended procedures.

Please refer to SPI 20–Control of Hazardous Energy Sources (Lockout/Tagout) for further information. Consult with your local HSSC for any additional requirements.

B29 –Material Handling/Ergonomics–Lifting, carrying and lowering objects represent a potential physical hazard to Ramboll employees. Therefore, it is every employee's responsibility to realistically evaluate the object to determine if the weight and size exceeds the employee's ability to lift, lower or carry it. To eliminate or minimize the risk of lifting hazards, utilize proper techniques, such as keeping the back straight and legs bent. Objects should always be lifted, lowered and carried as close to the body as possible. If the equipment cannot be lifted in this manner, it is too heavy to lift alone. Call other employee or use a mechanical device for aid in lifting. Mechanical aids, like hand trucks and carts, or the buddy system should be used to move heavy objects, objects with poor handgrips, or large bulky objects. Some other things to consider:

- Evaluate the object for the presence of any physical hazards such as pinch points, sharp or jagged edges, burrs or rough and slippery surfaces.
- The route in which the object will be moved should be free from obstructions, which could cause difficulty in moving the object.
- Asses other hazards such as stairs before you move the object and consider smaller loads with multiple trips as a safe alternative
- If an object is stored at a level higher than five feet, or on the floor, an appropriate mechanical device may be necessary to move the object.
- Recognized lifting hazards should be designed out of the work process whenever possible.
- Seek help when handling loads that are too bulky to grasp or lift, when employees cannot see around or over a load, or when they cannot safely handle a load for any other reason.
- Consider the use of PPE, such as gloves and forearm protection, when appropriate.

Proper lifting and lowering techniques should be followed even if the object or material to be lifted is of lighter weight. Keep the objects as close to the body as possible and:

- Establish a firm footing with feet at approximately shoulder width and one foot slightly ahead of the other. This posture will aid in keeping good balance and will establish a stable lifting base.
- Always bend at the knees, not at the waist when lifting or lowering an object.
- Obtain a good secure grip on the object.
- When beginning to lift, tighten your stomach muscles and use your legs to lift the object, as leg muscles are generally stronger than back muscles.
- Lift slowly and smoothly.
- If you need to turn as you lift, **do not twist** at the waist, but instead pivot with the feet. When lowering the object, reverse the procedure.
- When possible, conduct lifting activities over a period with adequate rest breaks. If material handling must take place over a short period of time, use mechanical means and/or the buddy system.

When it is necessary to move heavy and/or bulky objects, a non-powered hand truck should be used whenever possible. Some things to consider are:

- Keep the center of gravity of the load as low as possible, and place heavy objects below lighter ones.
- Place loads where the weight of the load will be carried by the axle, not the handles, and where it will not slip, shift of fall during movement.
- Load only to height to allow a clear view ahead. Only walk backwards with a hand truck in specific instances such as when going up an incline.
- When going down an incline the hand truck should be in front of the operator and when going up an incline, it should be downhill from the operator.

- Move the hand truck at a safe speed.

Please refer to SPI 44–Occupational Ergonomics for additional information. Consult with your local HSSC for any additional requirements.

B30–SIMOPS (Simultaneous Operations)-SIMOPS are one or more activities or work taking place at the same time, with the potential to affect one another. The operations must be occurring within significant proximity to each other that they create new or additional hazards. The Designated Site Supervisor will be responsible for determining when SIMOPS are present on a Ramboll work site and coordinating safe work for all activities.

SIMOPS shall be identified on the site-specific HASP/RA and appropriate mitigation/hazard controls shall be identified and implemented to eliminate or minimize risks through the hierarchy of controls:

- Eliminating SIMOPS via scheduling or permitting;
- Substituting work processes with less hazardous processes;
- Separating SIMOPS by distance, barricade, signage, isolation or engineering controls; and/or
- Implementing other controls such as training, communication, PPE and Stop Work authority.

Planning, scheduling, communication, and cooperation are essential for safe and effective SIMOPS on Ramboll work sites and should be documented in the site-specific HASP/RA. A communication plan should be established between each work group to include coordination meetings prior to projects where multiple operations are scheduled and the appropriate response if an unexpected event occurs.

B31–Bloodborne Pathogens–In general, Ramboll must determine which employee(s) have a potential occupational exposure to bloodborne pathogens and establish an exposure control plan. Ramboll currently does not have employees that have a continuous potential for occupational exposures to bloodborne pathogens; however, during the implementation of Ramboll scopes of work, there is potential for injury and the potential for employees to respond and all employees approved to conduct field work are required to complete first aid or country-equivalent training. Procedures in which a potential for occupational exposure may occur without regard to the use of PPE include, but are not limited to, basic first aid treatment and Cardio Pulmonary Resuscitation (CPR).

The best method for ensuring the health of the employees at risk is to understand and follow the concept of Universal Precautions. This concept refers to the assumption that all blood and bodily fluids are contaminated with pathogens. Universal Precautions shall be observed by all Ramboll employees. Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. When differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

Engineering and work practice controls shall be used to eliminate or minimize employee exposure. Where occupational exposure remains after institution of these controls, PPE shall also be used. Hand washing is a primary work practice control. If this is not available or feasible, then alternative methods, such as antiseptic hand cleaners, in conjunction with clean cloths or paper towels, or antiseptic towels will be provided. When these alternative methods are used, employees shall wash their hands (or other affected areas) with soap and running water as soon as feasible thereafter. Ramboll will provide hand washing facilities or alternative methods which will be readily accessible to employees. Additional considerations include the following:

- Eating, drinking, smoking, etc. are prohibited in first-aid and restroom areas where there is reasonable likelihood of occupational exposure.
- Employees should don appropriate personal protective equipment prior to performing any first aid to ensure that they will not contact blood. Each office will maintain the appropriate personal protective equipment with the first aid supplies. This equipment should include impervious gloves and mouth shields. Gloves worn should be compatible with cleaning and disinfection solutions used.

In any circumstance where there is a potential exposure to bloodborne pathogens by a Ramboll employee or its subcontractors, an Incident Report must be filed in a timely manner in accordance with SPI 19–Incident Reporting.

Please refer to SPI 4–Medical and First Aid Program and SPI 20–Bloodborne Pathogens for additional information. Consult with your local HSSC for any additional requirements.

B32 –Plants and Animals–Care will be taken by all site workers to avoid poisonous plants, animals, and/or stinging or biting insects such as ticks, mosquitos, spiders, bees, wasps, hornets, and yellow jackets. Workers allergic to any plant, animal exposure, or insect sting or bite should notify the local HSSC and all site employees (including facility and subcontractor personnel) prior to start of work. If stung, bitten, or otherwise exposed to an allergen, the affected person shall utilize emergency medicine, if prescribed by their doctor, and seek emergency support when appropriate.

The first step in controlling the risks presented by certain plants and animals is thorough field preparations, including but not limited to the following:

- Research local species that are present or active in your area
- Identify important information to aid in identification and plan for appropriate control mechanisms
- Document hazards in your field-specific project plan (i.e. HASP, HSP or RA) and communicate with field employees
- Follow the hierarchy of controls to reduce risks, which we will discuss later in this lesson
- Identify first aid treatments and emergency protocols

Animals and insects that pose a threat to human safety vary greatly by region and local environment. Furthermore, the level of threat they pose varies greatly by species and situation. Some animals only pose nuisance threats while others can be life threatening. Of those animals that can be harmful to humans, few will outright attack unless they feel threatened or are protecting their young. Therefore, it is very important to evaluate each situation where animals can be encountered individually to assess the risk.

The hazards posed by poisonous plants are different because plants are stationary. Once properly identified, harmful species can typically be removed or cordoned off, so employees do not encounter them. But be cautious! If poisonous plants are identified in one area of the site, it’s likely they may be in others as well.

Before you travel to a site to perform field work, perform your due diligence by identifying the plants and animals that may pose a threat in that area. This information can be conducted through internet research but be sure to consider only reputable sources and cross-reference important information. Field guides from various sources, including Peterson and Oxford, provide valuable information on a wide variety of plant and animal hazards. Some guides are specific to a certain geographical location.

These guides are a great resource for local staff; share them when possible! Finally, many local regional agencies supply information on dangerous plants and animals in their area.

Even though you may be familiar with the plants and animals in your area, you might not be as familiar with things in another region of your country, another country, or even another continent! So, when traveling to different areas for your projects it is prudent to consult with:

- Site contact (client, maintenance staff, etc.)
- Ramboll employees who have previously been on-site
- Ramboll employees who are local to the region
- Local and regional wildlife agencies
- Reputable field guides

Document important species-specific information to the site HASP/HSP/RA or other site-specific plan. Keeping track of this information will help everyone on the project to identify and control plant and animal hazards. It will also be useful as a quick guide in the event of a field encounter. Further, this information should be used during daily HS meetings to keep employees aware and informed of site risks. Consider providing the following:

- Names of species
- Photographs of the animals/plants discussed
- Indicators of animal/plant presence
- Measures of what to do if animals/plants are encountered
- Controls and safe work practices, which will be discussed next
- First aid measures

Please refer to SPI 28–Plants and Animals for additional information. For species-specific information and first aid procedures, including information on tick removal and first aid, refer to Appendix D First Aid Guidance. If first aid is required for any encounter with a poisonous plant, insect, or animal, an incident report, consistent with SPI 19–Incident Reporting, must be completed. Consult with your local HSSC for any additional requirements.

B33–Job Safety–If it is deemed that a work site is in an area where Ramboll employees and/or the job site may be at risk from potential criminal acts, wild animals, etc. the risks will be evaluated, and implementation of site-specific preventative measures will be taken to minimize the risk. Consideration shall also be given to security for equipment left on-site. For example, if Ramboll installed a remediation system on an isolated client site, it is prudent, at a minimum, to plan for site and equipment security with fencing and locking devices on any valves.

Informational resources such as the client, local law enforcement officials, Park or Wildlife Service, and Animal Control could be utilized to assess the risk and to ensure the safest possible work environment. For example, local law enforcement can be made present or make frequent patrols in the area while work is being done, outside security can be hired, and work can occur only during certain times of the day. It is also possible that after initial risk evaluation, the PM, PD, local HSSC and/or the Corporate Director of HSS may determine that work may not proceed at all.

B34–Personal Safety–If it is deemed that a work site is in an area where an employee's personal safety may be at risk from working in an isolated area, working early/late, or in areas of limited cell

phone service, the risks will be evaluated, and implementation of site-specific preventative measures will be taken to minimize the risk. Informational resources such as the client and local law enforcement officials, could be utilized to assess the risk and to ensure the safest possible work environment. For example, when working early/late, or in areas of limited cell phone service, local law enforcement can be made present or make frequent patrols in the area while work is being done or check in with on-site client representatives may be arranged. It is also possible that after initial risk evaluation, the PM, PD, local HSSC and/or the Corporate Director of HSS may determine that work may not proceed at all. Some general guidelines are provided here, but each situation is different, and actions must be taken based on the specifics of each.

In areas of risk, employees will communicate via cell phones or 2-way radios and will check-in at predetermined times throughout each workday. The communication schedule and the responsible parties shall be clearly documented in the site-specific HASP. See SPI 42 Working Alone for additional information.

B35-Working Alone–Further personal safety risk evaluation is warranted when working alone. Ramboll considers employees to be working alone when they cannot be seen or heard by another worker, and/or where assistance is not readily available in the event of an injury, illness or emergency. Whenever possible, employees will not work alone in isolated areas or under extreme conditions. If conducting high risk activities, such as confined space entry, electrical system work or work involving the use of respirators, work may not be performed alone. If the isolated area work involves hiking/walking into areas that are unmarked, or if there is potential to become directionally disoriented (e.g., no trails, unmarked trails, forested or highly vegetated areas), employees will be trained on the use of a compass and trail/topography maps. If necessary, Ramboll employees will complete wilderness safety training. The employee will work with the Park/Wildlife service in advance to determine what emergency planning is necessary to prepare to complete the proposed scope of work including scenarios such as unexpected weather, animal attack, and search/rescue.

Communicating through cell phones or 2-Way Radios will be utilized whenever possible. Employees will check-in at predetermined times throughout each workday and if the risk rating increases, employees will check-in more frequently. If employees do not call in to the PM, or designated representative, the employee will be contacted. If contacting the employee is unsuccessful, the appropriate authorities will be notified. In addition, the planned start and estimated finish times for each work day will be communicated by the site supervisor to the PM, or designated representative, and employees will check in at the beginning and end of the work day. If employees will be moving from isolated area to isolated area, there will be established beginning and ending locations, planned start and estimated finish times, and planned routes that will be followed throughout the day. Employees will not deviate from this schedule without first contacting the appropriate employees. It may also be necessary to notify the client, law enforcement, or Park/Wildlife officials of these schedules.

The communication schedule and the responsible parties shall be clearly documented in the site-specific HASP.

Please refer to SPI 42–Working Alone for additional information. Consult with your local HSSC for any additional requirements.

B36–Seasonal Hunting and Dangerous Wildlife–When planning to complete a scope of work in an isolated and/or wooded area, seasonal hunting hazards should be considered. Contact the client, local law enforcement, and/or Park/Wildlife officials to evaluate this risk. During recreational hunting seasons, field employees will wear appropriate clothing, such as fluorescent orange high visibility

vests, to enhance visibility to potential hunters and not blend in with the landscape. Field employees should also use whistles, air horns and/or other means to make their presence known to hunters and wildlife alike. The schedule of the hunting season, if applicable, will be included as an addendum to the site-specific HASP to inform employees of the type of game (e.g., deer, pheasant, duck, etc.) that is being hunted and the type of weapon being used (e.g., bow & arrow, shot gun, single shot rifle, etc.). Be aware that even if "No Trespassing" and/or "No Hunting Allowed" signs are posted, trespassers and/or hunting may still be on-going in the work area. At no point should field employees or contractors confront trespassers.

Local authorities should be contacted about any hunting season that may be in session, and if it is possible that hunters may be present in the area in which Ramboll employees will be working. If so, employees will wear brightly colored hardhats/hats and reflective vests, will not work before dawn. Work will end 30 minutes before dusk.

If you see wild animals while driving, stay in your vehicle. Never get out for a photo or a closer look. Keep windows up and do not try to keep the animal from crossing a road with your vehicle. If you see a wild animal while on foot, never approach the animal. If the animal has not seen you, go back the way you came. Do NOT turn your back and run which could evoke their natural predator instinct. Instead, keep facing the animal and back away at a steady pace. If you are near a car or building, get inside. In addition, in areas of higher risk (i.e., contacted officials have indicated that wild animals are a nuisance), employees may want to consider carrying "pepper spray".

If, while on the project site, and despite any precautions set forth, if an employee feels that their personal safety is at risk, they shall cease work, leave the work area and immediately report their concerns to the project PM, PD and local HSSC so that appropriate steps can be taken.

Please refer to SPI 28–Plants and Animals for additional information. Consult with your local HSSC for any additional requirements.

APPENDIX C
PRE-PROJECT PLANNING CHECKLIST AND SUBSURFACE CLEARANCE FIELD CHECKLIST

Table 8: Pre-Project Planning Checklist

Subsurface Clearance (SSC) Pre-Project Planning Worksheet
Document the steps that must be followed and justify any exceptions.
This checklist MUST be completed in its entirety.

SSC Requirements	Yes	No	N/A	Comments
Clearance Site Supervisor: SSC Area Expert:	☒	☐	☐	Name: Dave Markelz Contact: 262-422-9422 Name: Kristen Heitman Contact: 773-879-2235
Identify a **Knowledgeable Site Representative**, as available Name: Ray Kultgen (Denver Gardner) Contact: 920-457-4891	☒	☐	☐	Describe information exchanges and site utility documents gathered from the Knowledgeable Site Representative, as applicable, including request and receipt of site maps, built-as drawings, etc. Make plans to have them present during the Private Locate.
Gather applicable **Site Utility Information** Note: If no Site Utility information and/or no Knowledgeable Site Representative is provided consider additional controls such as soft digging.	☒	☐	☐	Shallow hand auger samples only samples collected no deeper than one foot below ground surface. *List documents reviewed (e.g., aerial photos, built as drawings, etc. and attach as reference, review potential for UXO)*
Create a Site-specific **Plot Plan**	☒	☐	☐	*Must depict all known utilities identified prior to intrusive work from review of aerial photos, site documents/maps/plans gathered and discussions with knowledgeable site person(s).*
Mark **Intrusive Locations**/**Areas** and **Alternate Locations** on the Plot Plan	☒	☐	☐	*All proposed Intrusive Locations must be marked on the Plot Plan prior to work beginning. ONLY Alternate locations/areas cleared using the SSC Program are permitted for continued drilling if refusal is meet on site.*
Private Locator responsible for Private Locate.	☒	☐	☐	Name of subcontractor: SRS Locating Contact information: Tony Savino
Discuss SSC Site Investigation with **Private Locate**	☒	☐	☐	*Discuss with subcontractor, as applicable, and document the specific technology(s) that will be used to confirm Public Utilities, actively clear the site, and clear specific intrusive locations. Discuss specifics site details such as ground surface, soil conditions, known utilities and underground structures, and any site-specific features that may create interference.*
Assess **Public Utilities** Note: Either via One Call, 811, directly with utility owners or via a webservice - confirm the presence and absence of commonly expected services in the area. In some cases, the utility company may need to be contacted directly to request a utility locate. All commonly expected utilities must be marked or positively confirmed to be absent from our work area prior to intrusive work.	☐	☐	☒	Work is being completed inside the building – all private utilities – SRS will locate utilities identified by facility personnel - all sampling work conducted with hand methods or shallow hand augers
Proposed date for SSC site locate and participants (Clearance Site Supervisor must participate for the duration of the site locate)	☒	☐	☐	Date: October 9, 2019 Participants: *(Clearance Site Supervisor, Site Representative, private utility locator, etc.)*

SUBSURFACE and OVERHEAD CLEARANCE (SSC) FIELD CHECK LIST (1 of __) DATE: _____

(Use this form to document & identify field elements of SSC. Retain the completed form with the project file)

Site Name/Project No.: _____ Clearance Site Supervisor: _____

RAMBOLL SUBSURFACE CLEARANCE ACTIVITIES	**Yes**	**No**	**N/A**	Notes/Comments
1. Confirm Public Utilities on-site have been marked by a public locate, where available. Public utilities should be marked to the edge of the private property on all areas surrounding our work site.	☐	☐	☐	Many Public utilities are members of a program (e.g., One Call, 811) and will mark or positively confirm if no utilities are present. Each expected utility type must be marked or confirmed as absent, or Ramboll must follow up directly with the utility owner.
Electric:	☐	☐	☐	
Gas (natural gas lines, oil):	☐	☐	☐	
Water (potable) pipes, hydrants/fire lines:	☐	☐	☐	
Sewers (storm/process water/sanitary):	☐	☐	☐	
Public lighting (street and traffic):	☐	☐	☐	
Telephone and Data Lines:	☐	☐	☐	
Other underground hazards, Potential for UXO:	☐	☐	☐	
2. Accompany Private Utility locator, as applicable, during site locate. Supervise the Identification of each expected major utility onto private property and the respective emergency shut off.	☐	☐	☐	All surrounding Public utility lines should be confirmed and traced by the Private locate onto site, and to termination or outside our work zone.
Electric:	☐	☐	☐	
Water (potable) pipes, hydrants/fire lines, sprinklers:	☐	☐	☐	
Sewers (storm/process water/sanitary):	☐	☐	☐	
Gas (natural gas lines, oil):	☐	☐	☐	
Private lighting (signs, security lighting):	☐	☐	☐	
Telephone and Data Lines:	☐	☐	☐	
Other underground utilities:	☐	☐	☐	
3. Site Walkover performed to assess potential of additional private utility lines and high-risk areas. Confirm the presence or absence of each of the following Visual Indicators:	☐	☐	☐	The presence of certain Visual Indicators can signal an associated underground utility. When Visual Indicators are present underground utilities must be investigated prior to intrusive activities.
Manways, indication of underground storage tank/piping and dispenser islands	☐	☐	☐	
Non-native soils, surface depressions, new/dead vegetation, which may indicate recent underground work	☐	☐	☐	
Saw cuts, patched surfaces, warning tape, or other surficial indicators of below ground work	☐	☐	☐	
Pumps, pump galleries, piping manifolds and/or racks, process equipment, compressors, etc.	☐	☐	☐	
On or below-grade transformers	☐	☐	☐	
Fuel oil lines, tanks, fill ports, observation wells, vent stacks, hydraulic lift systems	☐	☐	☐	
Adjacent/supplemental buildings with no apparent utility feeds (electricity, water, gas)	☐	☐	☐	
Other On-Site Visual Indicators:	☐	☐	☐	
4.. Overhead areas examined to determine above head utility hazards	☐	☐	☐	Where overhead lines exist, approach distances are based on line voltage, which can be determined by contacting the utility owner.
5. Update Site Plot Plan to reflect most accurate site SSC information based on Private locate and Site Walkover.	☐	☐	☐	Using the Plot Plan initiated in pre-planning, confirm existing utility markings based on ground conditions and update further with based on Site Locate.
6. Confirm intrusive location(s) and Critical Zones (5ft/1.5m distance in every horizontal direction surrounding intrusive locations) are cleared of utilities, anomalies and visual indicators.	☐	☐	☐	Contact PD/PM and HSS Director if utilities pass through the Critical Zone of a planned intrusive location
7. Communicate updated site utility information, including updated Plot Plan with Project Management and mutually agree on clearance of intrusive points in accordance with SSC Policy.	☐	☐	☐	
If uncertainties regarding the presence or absence of underground utilities exist, intrusive activities may not proceed!	☐	☐	☐	Additional controls should be implemented when underground uncertainties exist including employment of additional and diverse locating technologies, soft digging, further communication with client and HSS, etc.

To the best of my knowledge all known site utilities have been located or confirm to not interfere with planned intrusive locations. All intrusive locations have been cleared with a 5ft (1.2m) critical around the intrusive point.

Form completed by:

_____ _____ _____

Name date signature

Site Representative:

_____ _____ _____

Name date signature

RAMBOLL

APPENDIX D
FIRST AID GUIDANCE

HEALTH AND SAFETY PLAN
GARDNER DENVER-THOMAS PRODUCTS DIVISION
1419 ILLINOIS AVENUE, SHEBOYGAN, WI

Prepared By:
Ramboll EHS Group
333 W. Wacker Drive, Suite 2700
Chicago, Illinois

Implementation Date
January 2016

Revision Date
January 2016

Version Number
2016 Version 2

SITE-SPECIFIC FIRST AID GUIDANCE

CONTENTS

1. FIELD PREPARATIONS

The first step in controlling the risks presented by certain plants and animals is thorough field preparations, including but not limited to the following:

- Research local species that are present or active in your area
- Identify important information to aid in identification and plan for appropriate control mechanisms
- Document hazards in your field-specific project plan (i.e. HASP, HSP or RA) and communicate with field employees
- Follow the hierarchy of controls to reduce risks, which we'll discuss later in this lesson
- Identify first aid treatments and emergency protocols

Animals and insects that pose a threat to human safety vary greatly by region and local environment. Furthermore, the level of threat they pose varies greatly by species and situation. Some animals only pose nuisance threats while others can be life threatening. Of those animals that can be harmful to humans, few will outright attack unless they feel threatened or are protecting their young. Therefore, it is very important to evaluate each situation where animals can be encountered individually to assess the risk.

2. INSECT BITES AND STINGS

Care will be taken by all site workers to avoid stinging or biting insects such as ticks, spiders, bees, wasps, hornets, and yellow jackets. Workers allergic to any insect sting or bite should seek medical attention if stung or bitten and may need to carry emergency medicine prescribed by their doctor.

Care should always be taken to avoid these insects and increased vigilance is necessary during high infestation seasons, when opening protective casings of monitoring wells, and when walking through areas of heavy vegetation or areas known to be infested.

To minimize the chance of bites/stings:

- Wear appropriate PPE such as light-colored clothing so you can see insects, long pants tucked into boots, long sleeves when possible, a hat, and gloves if you are cutting brush or need to handle or move vegetation.
- Check your body and clothing for insects, shower after work and wash/dry clothes at as high a temperature as possible.
- Do not swat at insects and do not eat in areas where there are insects.
- Avoid sweet smelling personal hygiene products and, unless contraindicated by the work being performed (e.g., sampling, data collection), wear EPA approved repellants such as those containing DEET.

2.1 Spider Bites

Spider bites generally cause only localized reactions such as swelling, pain, and redness. However, bites from a Black Widow or Brown Recluse, or if you are allergic to spiders, can cause symptoms that are more serious.

Black Widow Spider

Brown Recluse Spider

2.1.1 First Aid for Spider and Scorpion Bites and Stings

- Clean the bite area with soap and water and place a cold pack over the bite area to reduce swelling.
- Monitor for allergic reactions. If the victim has more than minor pain or if nausea, vomiting, difficulty breathing, or swallowing occurs: medical attention should be sought immediately. CALL 911.

2.2 Ticks

Ticks are common in tropic & temperate regions across the world. They prefer moist areas with dense vegetation/long grass, but they can survive in many places including urban parks and gardens.

Ticks are small and easily overlooked. They vary in size, depending on the species, stage of development, gender, and whether the tick has recently fed. Ticks do not fly or jump but patiently wait for a mammal to pass by and then climb on. They are most active between spring and autumn.

Ticks feed off the blood of mammals, birds, amphibians, and reptiles. However, they are more likely to feed off mammals as they mature from nymphs into adulthood and as adults. Ticks find their hosts by detecting animals´ breath and body odors, body heat, moisture, and vibrations. Some species can even recognize a shadow.

They wait in a position call "questing," resting on the tips of grasses and shrubs. When the host brushes by the tick, it will climb aboard. Some ticks will attach quickly, and others will wander, looking for places like the ear, or other areas where the skin is thinner.

The main hazard associated with ticks is the transmission of disease. The ability of a tick to transmit disease, however, depends on a number of factors:

- The type of tick (only certain species carry transmittable diseases)
- The region of the world the tick inhabits
- The duration of time it is attached to a host

In most cases, tick bites are unlikely to result in a tick-borne illness, especially when removed soon after the bite. For example, the Lyme disease research foundation estimates that only about 2% of all tick bites result in Lyme disease. In addition, in most cases, a tick must be attached for at least 24 hours before disease can be transmitted.

To determine the risk of a tick-borne disease, it is important to research the risk prior to starting field activities. Research should include species of tick(s) local to jobsite and diseases the tick species can carry. Some common tick-borne diseases include:

- Bacteria: Lyme disease & Rocky Mountain spotted fever
- Viruses: Heartland virus & tick-borne encephalitis virus (TBEV)
- Parasites: Babesiosis

Once you are knowledgeable about the hazards and risks presented by ticks at your site you should take as much of the following preventative measures as needed:

- Identify potential tick habitats and avoid them when possible

- Treat clothes and/or yourself with bug repellent prior to going to the site (check in with PM prior to use)
- Tuck and/or tape pants and long sleeves
- Wear light colors or Tyvek suits
- Clear vegetation if possible
- Perform tick checks periodically throughout the day
- Perform a thorough tick check at the end of the day.

It is important to conduct regular tick checks throughout the day and at the end of a work shift, since risk of disease transmission is directly related to the length of time a tick is attached. You may not know you have been bitten as ticks can secrete small amounts of saliva with anesthetic properties. Ticks prefer warm, moist places and may look like a freckle or dirt. Nymphs will be harder to spot!

2.2.1 First Aid for Tick Bites

If you are bitten by a tick -

- Remove tick as soon as possible using tweezers or a tick removing tool
- Grasp the tick as close to skin as possible to grab the head and slowly pull upwards with even pressure. Do not twist or jerk the tick, as mouthparts left behind can cause a local infection
- If you are unable to remove the mouthpart, leave it alone and let the skin heal. DO NOT attempt to remove the tick with heat or "painting" the tick with nail polish or petroleum jelly. You should remove the tick as quickly as possible, do not wait for it to detach.
- Wash the bite area (soap and water or rubbing alcohol) and apply antiseptic. Monitor the bits spot for several weeks.

Some regions have tools specific to the removal of ticks. Ask your local HSSC if they can get you one.

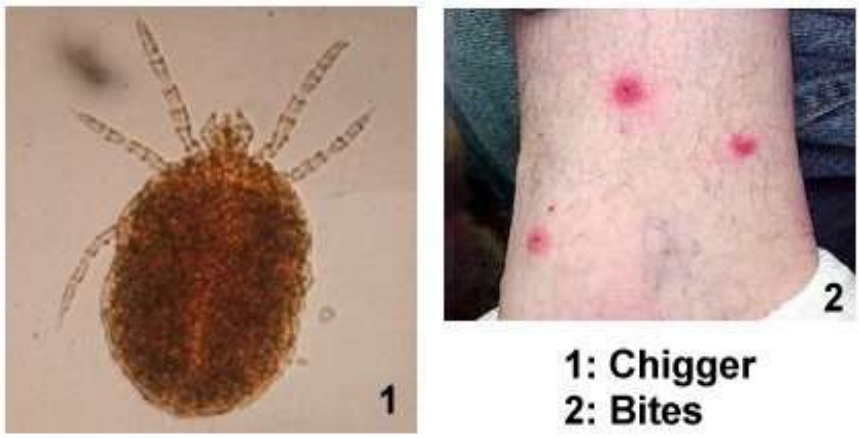
After you remove a tick, monitor the bite area and yourself for several weeks. If you begin to feel unwell (common symptoms of tick-related illnesses are fever/chills, aches and pains, like the flu) or start to develop a red bulls-eye like rash around the bite area, see a doctor immediately.

If you seek or need medical attention, employees are encouraged, when possible, to go to occupational clinics familiar with the hazards and risks that our type of work incurs, as opposed to going to a generic doc-in-the-box or an Emergency Room. In the US, Ramboll's third party medical surveillance partner WorkCare provides an Incident Intervention service that includes a 24 hour help

line and information/access to hundreds of clinics around the US. Employees are encouraged to contact WorkCare with their questions/concerns.

2.3 Chiggers

Chiggers are tiny, s-legged wingless organisms that grow up to become a type of mite. They are found in tall grass and weeds and their bites cause severe itching.



2.3.1 First Aid for Chiggers

- Reduce discomfort and prevent infection
- The affected area should be kept clean by washing with soap and water
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing the itching
- The wounds should not be scratched, if possible
- If signs of infection occur, consult your physician

2.4 Bees and Wasps

Bees and wasps belong to the phylum Arthropod family, and they are crucially important to the pollination of plants, specifically flowers, fruits, and vegetables. A sting from a bee or wasp will cause itching, irritation, redness and/or swelling at the sting site.

A small percentage of people are allergic to stings and a sting can be fatal, caused by a disruption to breathing and circulatory systems called anaphylactic shock. If the sting is followed by severe symptoms, seek medical attention immediately. Allergic people should never be alone for outdoor activities since help may be needed for prompt emergency treatment. Allergic people should have an

identification bracelet as well as carry something like an "EpiPen" for immediate treatment for anaphylactic shock.

2.4.1 First Aid for Bee Stings

- Remove the stinger as quickly as possible-venom continues to enter the skin from the stinger for 45 to 60 seconds following a sting–using a flat dull object, like a credit card. Slid the flat object in the opposite direction of the stinger to remove it from the skin.
- Wash the wound using soap and water
- Apply ice for swelling and pain
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing the itching
- If the sting occurs on the neck or mouth, seek medical attention immediately, swelling in these areas may cause suffocation

2.5 Fire Ants

Fire ants are a variety of stinging ants with over 280 species worldwide. Typically, a colony produces large mounds in open areas, and feeds mostly on young plants, seeds, and insects. They nest in the soil, often near moist areas such as river banks and pond edges. Unlike other ants which bite and then spray acid on the wound, fire ants bite only to get a grip and then sting, injecting toxic alkaloid venom. This results in a painful stinging sensation, like what a fire burn feels like.



2.5.1 First Aid for Fire Ant Bites

- Move rapidly away from the nest
- Quickly remove or kill ants on skin and clothing to prevent further stings
- Wash the area gently with soap and water to rid the skin of any venom.
- Place cool cloth or ice cloth on sites for 15 minutes, and to relieve pain, dab the area with calamine lotion, a topical (cortisone) or oral antihistamine (e.g., Benadryl) to help with swelling
- Do not scratch the blister because this can lead to infection
- Allergic response is rare, but symptoms are difficulty breathing, light headedness, and weakness. Immediate medical attention is required.

3. SNAKES

Snakes serve as an important role as predators in the ecosystem and help maintain populations of rodents and other prey.

3.1 First Aid for Venomous Snake Bites

- Wash and immobilize the injured area, keeping it lower than the heart if possible
- Seek medical attention immediately
- DO NOT apply ice, cut the wound, or apply a tourniquet
- Do not cut or suck the bite
- Remain calm and try not to move the bitten body part
- Remove jewelry or other items that may be affected by rapid swelling of affected body parts
- Try to identify the type of snake: note color, size, patterns, and markings
- The bite will be painful and have two distinct puncture wounds
- If venom is injected there will be burning and swelling
- ONLY FOR CORAL SNAKE BITES: apply a mild wrapping on the bite wound

Water Moccasin
(aka cotton mouth)

Rattlesnake

Coral Snake

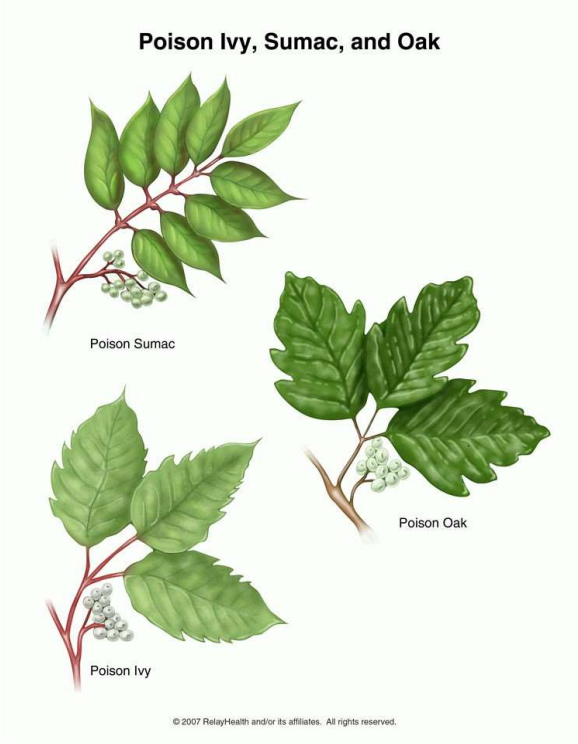
Copperhead

4. POISONOUS PLANTS

Poisonous Plants – Plants poison on contact, through ingestion, or by absorption or inhalation. They cause painful skin irritations upon contact and can cause internal poisoning when eaten.

4.1 First Aid for Poisonous Plants

- Wash exposed areas with cold running water as soon as you can
- When possible, wash your clothing
- Relieve itching by taking cool showers and applying topical anti-itch medications or hydrocortisone
- The rash is often arranged in streaks or lines where you brushed against the plant
- In a few days, the blisters become crusted and take 10 days or longer to heal
- If the reaction is severe or worsens, seek medical attention



POISON IVY

POISON SUMAC



POISON OAK



Poison Pacific Oaks

GIANT HOGWEED

5. HEAT STRESS

Heat stress can be a significant hazard, especially for workers wearing protective clothing.

Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site employees will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and in the prevention of heat stress incidents.

Workers will be encouraged to immediately report any heat-related problems that they experience or observe in fellow workers. Any worker exhibiting signs of heat stress and exhaustion should be made to rest in a cool location and drink plenty of water. Emergency help by a medical professional is required immediately for anyone exhibiting symptoms of heat stroke, such as red, dry skin, confusion, delirium, or unconsciousness. Heat stroke is a life-threatening condition that must be treated by competent medical authority.

ACGIH screening criteria for heat stress exposure in degrees Celsius for an 8-hour work day 5 days per week with conventional breaks will be used in determining safe exposure for acclimatized and unacclimatized employees.

Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	31.0 (87.8F)	28.0 (82.4F)	--	--	28.0 (82.4F)	25.0 (77F)	--	--
50-75%	31.0 (87.8F)	29.0 (84.2F)	27.5 (81.5)	--	28.5 (83.3F)	26.0 (78.8F)	24.0 (75.2F)	--
25-50%	32.0 (89.6F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	29.5 (85.1F)	27.0 (80.6F)	25.5 (77.9)	24.5 (76.1F)
0-25%	32.5 (90.5F)	31.5 (88.7F)	30.5 (86.9F)	30.0 (86F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	27.0 (80.6F)

5.1 Heat Stress Prevention

Whenever possible or within the control of Ramboll, engineering controls should be utilized to protect workers from heat related hazards (e.g., heat shielding such as using awnings or umbrellas). Appropriate work practices can also lessen the chances of heat related hazards. Some of these include:

- Water and/or electrolyte fluids should be about equal to the amount of sweat produced (i.e., drinking 5-7 ounces (150 -200 mL) of water every 15-20 minutes). Ideally, fluids should be at room temperature to allow for quicker absorption. Consider keeping water at room temperature and electrolyte fluids chilled. Do NOT chill both.
- Whenever possible, gradual exposure to heat is preferred to allow the body's internal temperature to actuate to the working conditions.

- Whenever possible, adjust the work schedule to reduce risk of heat stress. For example, postpone nonessential or heavier work to the cooler part of the day and perform work in the shade if portable.
- Rotate employees to reduce the amount of time spent working in direct sun and heat.
- Increase the number and/or duration of rest breaks, and whenever possible, rest break areas should be in a cool area and as close to the work area as is feasible.

Wear appropriate PPE when necessary, such as thermally conditioned clothing, self-contained air conditioning in a backpack, and plastic jackets/vests with pockets that can be filled with dry ice or ice. However, based on the type of work being done, where work is being performed, or other required PPE, these options may be prohibited or make the use of this PPE impossible or impractical.

5.2 Heat Related Illnesses

5.2.1 Heat Stress

This is the mildest heat-related illness, but prompt action may prevent it from turning into a more severe heat-related illness. Symptoms include irritability, lethargy, significant sweating, headache, or nausea. The following guidance can be used in the identification and treatment of heat related illness.

5.2.2 Heat Stress First Aid

- Take victim to a protected (e.g., shaded, cool) area, remove any excess protective clothing, and provide cool fluids.
- If an air-conditioned spot is available, this is an ideal break location.
- Once the victim shows improvement he/she may resume working, however the work pace and practices (e.g., does fluid intake need to be increased) should be moderated to prevent recurrence of the symptoms.

5.2.3 Heat Exhaustion

Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Symptoms include pale, clammy skin, and profuse sweating, vomiting, and the bowels may move involuntarily. The pulse is weak and fast, breathing is shallow. Fainting can occur.

5.2.4 Heat Exhaustion First Aid

Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling – you do not want the victim to shiver).

- Call a physician or emergency service or transport the victim to medical care.
- Remove all protective outerwear.
- If the victim is conscious, it may be helpful to give him/her sips of water.

5.2.5 Heat Stroke

Heat stroke is a severe medical condition requiring first aid and emergency treatment by a medical professional as death can occur without appropriate care. Heat Stroke represents the collapse of the body's cooling mechanisms. As a result, body temperatures often rise to between 105° – 110° F (40.5° – 43.3° C). As the victim progresses toward heat stroke symptoms include hot and usually dry, red and spotted skin, headache, dizziness, nausea, mental confusion, delirium, possible convulsions and loss of consciousness.

5.2.6 Heat Stroke First Aid

- Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling – you do not want the victim to shiver).
- Summon emergency medical help to provide on-site treatment and transportation to a medical facility.
- Remove all protective outerwear and loosen personal clothing.
- Apply cool wet towels, ice bags, etc. to the head, armpits, and thighs. Sponge off the bare skin with cool water or even place the victim in a tub of cool water.

5.2.7 Skin Hazards

Sunburn and prickly heat are both symptoms of skin irritation/damage produced through exposure to sunlight and operating in hot work environments.

- Protect exposed skin with an appropriate sunscreen. A sunscreen with a sun protection factor (SPF) of 15 or greater is required for work in the sun with reapplication at breaks and lunch.
- Heat rash, also known as prickly heat, can be prevented by the application of a hydrophobic, water repellent barrier cream such as Kerodex 71.

6. COLD STRESS

The four environmental conditions that cause cold-related stress are low temperatures, high/cool winds (wind chill), dampness, and cold water. One or any combination of these factors can cause cold-related hazards. Cold stress, including frostbite and hypothermia, can result in severe health effects.

A dangerous situation of rapid heat loss may arise for any individual exposed to high winds and cold temperatures. Major risk factors for cold-related stresses include:

- Wearing inadequate or wet clothing increases the effects of cold on the body.
- Taking certain drugs or medications such as alcohol, nicotine, caffeine, and medication that inhibits the body's response to the cold or impairs judgment.
- Having a cold or certain disease, such as diabetes, heart, vascular, and thyroid problems, may make a person more susceptible to the winter elements.
- Being male increases a person's risk to cold-related stresses. Men experience far greater death rates due to cold exposure than women, perhaps due to inherent risk-taking activities, body-fat composition, or other physiological differences.
- Becoming exhausted or immobilized, especially due to injury or entrapment, may speed up the effects of cold weather.
- Aging -- the elderly are more vulnerable to the effects of harsh winter weather.

TABLE 2. Cooling Power or Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−24	−33	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−32	−45	−58	−72	−85	−99	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−121
25	30	16	0	−15	−29	−44	−59	−74	−88	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−109	−125	−140
35	27	11	−4	−20	−35	−51	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.
Equivalent chilll temperature requiring dry clothing to maintain core body tempearture above 36°C (96.8°F) per cold stress TLV

6.1 Cold Stress Prevention

Engineering controls should be utilized whenever possible to protect workers from cold related hazards. For example, on-site heat sources, heated shelters, work areas shielded from drafty or windy

conditions, and the use of thermal insulating material on equipment handles. Effects arising from cold exposure will be minimized by the following control measures:

- Employees will be trained to recognize cold stress symptoms.
- Field activities will be curtailed or halted if the equivalent chill temperature is below 20 F (7C).
- As much as possible, work that exposes employees to the cold will be done during the warmest hours of the day.
- Inactivity in cold conditions will be kept to a minimum.
- Frequent short breaks in warm, dry shelters will be taken.
- Vehicles will be equipped with supplies in case the vehicle becomes inoperable (e.g., blanket, dry clothing, water, food, a shovel, etc.

TABLE 3. Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift*

Air Temperature—Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
–26° to –28°	–15° to –19°	(Norm. Breaks)	1	(Norm. Breaks)		75 min	2	55 min	3	40 min	4
–29° to –31°	–20° to –24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
–32° to –34°	–25° to –29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
–35° to –37°	–30° to –34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
–38° to –39°	–35° to –39°	40 min	4	30 min	5	Non-emergency work should cease					
–40° to –42°	–40° to –44°	30 min	5	Non-emergency work should cease							
–43° & below	–45° & below	Non-emergency work should cease									

Notes for Table 3

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at –35°C (–30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m^2; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m^2. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.
4. TLVs apply only for workers in dry clothing.

*Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour.

6.2 Cold-Related Illness

6.2.1 Hypothermia

Hypothermia occurs when the body temperature falls to a level where normal muscular and cerebral functions are impaired. Although it usually occurs in freezing air and water temperatures, it can occur in any climate if a person's internal body temperature falls below normal. Symptoms should not be ignored, and a supervisor should be notified as soon as hypothermia is suspected.

Initially, symptoms may include shivering, an inability to do complex motor functions, sluggishness and mild confusion as the body temperature drops to around 95 F. As the body temperature falls, speech may become slurred, and behavior may be irrational, simple motor functions may be difficult to do and a state of "dazed consciousness" may exist. In severe state (below 90 F or 32 C), heart rate, blood flow, and breathing will slow. Unconsciousness and full heart failure can occur.

6.2.2 Hypothermia First Aid

6.2.2.1 On Land

- Call for emergency, and then help move the victim (unless other injuries prohibit their being moved) to a warm, dry area and replace wet clothing with warm, dry clothing or a blanket. Move the person carefully because movement can increase the irritability of the heart.
- If the person is conscious and lucid, warm liquids can be provided, but never alcohol or caffeinated drinks. If possible, have them to move their arms and legs to create muscle heat.
- If the person is unconscious or unable to assist, place warm bottles/packs in the person's arm pits, groin, neck and head areas.
- Do not rub the person's body or place them in warm water.

6.2.2.2 In Water

- Call for emergency help and get the victim out of the water. Move them carefully because movement can increase the irritability of the heart.
- If it is you in the water, do not swim unless a floating object or person can be reached quickly as swimming uses the body's heat and reduces survival time by about 50%.
- If you are in the water, conserve body heat by folding arms across the chest, keeping thighs together, bending knees and crossing ankles, if another person is in the water with you, huddle together.
- If you are in the water, do not remove clothing-button, buckle, zip, and tighten collars, cuffs, shoes, and hoods as the water trapped next to the body provides a layer of insulation that may slow the loss of heat.

6.2.3 Frostbite

Frostbite occurs when the skin literally freezes, and deep frostbite can affect deeper tissues such as tendons and muscles. Frostbite usually occurs when temperatures drop below 30 F (1C), but wind chill effects can cause frostbite at above-freezing temperatures. The ears, fingers, toes, cheeks, and nose are the most commonly affected body parts. Initially, symptoms include an uncomfortable sensation of coldness. Tingling, stinging or an aching feeling of the exposed area is followed by numbness. Frostbitten areas appear white and cold to the touch and with deeper frostbite, the area becomes numb, painless, and hard, and can turn black.

6.2.4 Frostbite First Aid

- Seek medical attention as soon as possible and treat any existing hypothermia first.
- Warm liquid can be provided, but not alcohol or caffeinated drinks such as tea and coffee.
- Do not rub the affected areas, but cover them with dry, sterile gauze or soft, clean bandages.
- Do not try rewarming the affected area if you have not been specifically trained to do so and/or if there is a chance the affected area will get cold again

7. SMALL CHEMICAL SPILLS

Chemical hazards present in environmental samples or in the environment being sampled are NOT the only "chemicals of concern". Toxic chemicals may also be brought onto a site as part of the sampling event in the form of sample preservatives. In general, sample preservation is required for most water samples. Two practices exist for adding a preservative: 1) addition of the preservative to the samples in the field; and 2) addition of the preservative to the sampling containers prior to sending the samplers into the field. In either case, EXTREME caution MUST be exercised when adding a preservative to a sample vial or using vials which already contain a preservative since these preservatives will vary in concentration and type. Some examples of the type of preservatives which may be encountered include sodium thiosulfate to remove chlorine; hydrochloric acid or ammonium chloride to stabilize pH and reduce biological activity; or sodium bisulfate.

7.1 Chemical First Aid (Body)

In the event that you suspect that you have been exposed to a chemical, whether or not you were wearing PPE, you should:

- Remove yourself or the victim from the accident area.
- Remove any contaminated clothing.
- Wash the injured area to dilute or remove the substance, using large volumes of water.
- Wash for at least 20 minutes, taking care not to allow runoff to contact unaffected parts of your body.
- Gently brush away any solid materials, again avoiding unaffected body surfaces.
- Especially wash away any chemical in your eye. Sometimes the best way to get large amounts of water to your eye is to step into the shower.

7.2 Chemical First Aid (Eye)

For all chemical injuries to the eye, the first thing you should do is immediately irrigate the eye copiously. Ideally, specific eye irrigating solutions should be used for this, but if none are available regular tap water will do just fine.

- Begin washing your eye before taking any other action and continue for at least 10 minutes. The longer a chemical is in your eye, the more damage will occur. Diluting the substance and washing away any particles that may have been in the chemical are extremely important.
- Ideally, in a work setting, you would be placed in an emergency eyewash or shower station and your eye washed with sterile isotonic saline solution. If sterile saline is not available, use cold tap water.
- All acid or alkali eye burns require immediate treatment and evaluation by a doctor. You should be taken immediately to the closest emergency department. If you suspect a serious injury may have occurred or are otherwise not able to make the trip to the emergency room quickly, then you should call an ambulance to shorten transport time. Take the Safety Data Sheet (SDS) on the chemical you were exposed to with you to the hospital.

Any time you experience pain, tearing, redness, irritation, or vision loss, go to a hospital's emergency department for immediate evaluation, even if you believe the chemical is only a mild irritant.

APPENDIX E
EMERGENCY INFORMATION

Table 1A: Emergency Response Telephone Roster		
	Office	**Cell**
PROJECT TEAM		
Ramboll Corporation		
Project Director: Erin Veder	312-288-3810	312-953-4905
Project Manager: Donna Volk	262-901-3504	414-429-5151
Designated Site Supervisor: Duncan Glasford	262-901-0130	262-573-6315
Health, Safety & Security Coordinator: David Markelz	262-901-0131	262-422-9422
Corporate HS&S Director: Kristen Heitman	312-288-3824	773-879-2235
Contractors		
Company: Pace Labs Contact: Steve Mleczko	920-321-9440	920-469-2436
Company: SRS Locating Contact Tony Savino	[redacted]	815-405-5185
Client/Security		
Site Contact: Ray Kultgen	920-457-4891	[redacted]
EMERGENCY RESPONSE AGENCIES		
Hospital: St. Nickolas Hospital	920-459-8300	
Emergency Fire	911	
Emergency Police	911	
Health Department	920-459-4382	
OTHER EMERGENCY ASSISTANCE		
National Response Center (oil and chemical spills)	800-424-8802	[redacted]
Poison Control Center	800-222-1222	[redacted]
Federal Emergency Management Agency	202-646-2500	[redacted]
NON-EMERGENCY PHONE NUMBERS		
Police	920-459-3333	[redacted]
Ambulance Service: Orange Cross	920-694-0347	[redacted]
Occupational Clinic: WorkCare	888-449-7787	[redacted]
Fire Department	920-459-3327	[redacted]

Table 1B: Emergency Services Instructions

For Emergency Medical Incidents, Emergency Fire Response, or Hazardous Materials Incidents

Emergency Telephone Numbers:

- Hospital: 911
- Police: 911
- Fire Department: 911
- Site Security/Client: 920-457-4891

4. Remember to speak SLOWLY and CLEARLY. Do NOT hang up first: let the dispatcher conclude the call.
5. Provide the following information:
   d. Location: Thomas Products – (1419 Illinois Avenue, Sheboygan, WI)
   e. Your name and phone number
6. Describe nature of Incident:
   f. Emergency Medical Incident
      - How many victims
      - Type of incident-physical injury, etc.
      - Assessment of victims' condition if known (whether victim is conscious/unconscious, breathing/not breathing, pulse/no pulse, nature of injuries, first aid measures used, etc.)
      - Where incident occurred
   g. Fire:
      - Location of Fire
   h. Hazardous Materials Incident:
      - This is a hazardous materials incident requiring dispatch of HAZMAT unit
      - Type of incident (fire, explosion, spill, etc.)
      - Type of material (specific chemicals or general description)
      - Whether there is also a Medical Emergency
7. Give your location at the Site.

Note: Security, Site Supervisor or designee must meet the emergency personnel at the staging area to brief them on the situation.

ROUTE DESCRIPTION AND MAP TO HOSPITAL

Hospital Information:

Hospital Name: *St. Nickolas Hospital*

Hospital Address: *3100 Superior Avenue*

Hospital Phone Number: *920-459-8300*

Directions to Area Hospital:

- Head northeast on Broadway toward Jefferson St/West St
- Continue onto Old Bus Line Rd
- Turn right at E Willow Ave
- Turn left at Vandalia Rd
- Continue onto S Main St
- Turn right at School St
- Turn right at Leva St
- End: 1200 E. Tremont Street, Hillsboro, IL (Destination will be on the right)

SITE EMERGENCY EVACUATION ROUTE AND MAP

Rally Point(s):

Location: Parking lot in the northeast corner of the site.

Directions to Rally Point:

- Head to the parking lot in northeast corner of the site.