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June 18, 2018

Ms. Margaret Gielniewski
USEPA Region 5 – SR6J
77 W. Jackson Boulevard
Chicago, Illinois 60604-3507

SUBJECT: **Draft Remedial Design Workplan Rev. 1 – Former Marinette MGP**
Wisconsin Public Service Corporation
CERCLA Docket No. V-W-06-C-847
Spill Site ID – B5BT

Dear Ms. Gielniewski:

Attached is the revised draft Remedial Design Work Plan (RDWP) – Rev. 1 for the USEPA-selected remedy at Wisconsin Public Service Corporation's former Marinette Manufactured Gas Plant Site. This revised RDWP was based on USEPA comments received on 5/29/18. A table summarizing the responses to those comments is also included for your reference. Consistent with the RD-AOC requirements, RDWP – Rev. 1 also includes the draft Health and Safety Plan and a revised draft Emergency Response Plan as appendices.

If you have any questions, please contact me at your convenience at (414) 221-2156 or via email at frank.dombrowski@we-energies.com.

Sincerely,

Frank Dombrowski
Principal Environmental Consultant
WEC Energy Group - Business Services
Environmental Dept.

Enclosure

cc: Project File
Brian Bartoszek – WEC Business Services
Marcus Byker – OBG
Kevin McKnight, WDNR (Hardcopy and email)
Bill Fitzpatrick, WDNR (Hardcopy and email)
Cheryl Bougie, WDNR (Hardcopy and email)
WDNR Northeast Region (via email to DNRRRNER@wisconsin.gov)
Jennifer Knoepfle, Jacobs (email)

Table 1. Comments on Draft *Remedial Design Work Plan, Wisconsin Public Service Corporation's Former Marinette Manufactured Gas Plant Site, Marinette, Wisconsin*					
Comment Number	**Page**	**Section**	**Title**	**Comment 5/23/2018**	**Response**
1	3	1.5.1	Soil Excavation	The first paragraph, second sentence indicates that "During construction activities, MGP residuals and groundwater were reported by the City to the WDNR." Please clarify the reference to "groundwater". Contaminated groundwater?	Section 1.5.1 was updated to state MGP residuals and affected groundwater.
2	3	1.5.1	Soil Excavation	The last two sentences of this section are duplicated at the top of Page 4 of 21.	Page break has been adjusted accordingly and the duplication of the last two sentences of this section has been addressed.
3	6	2.3	Development of Remedial Goals	First paragraph under Table B, last sentence states that, "If the post-remedy risk assessment concludes cumulative site risk is below the target cancer risk and noncancerous hazard index for the targeted exposure scenario, then no additional RA will be required." If the post-remedy risk assessment finds that risk is below various criteria (as to be concurred with by the Agencies), the Record of Decision (2017 ROD) will need to be amended. Furthermore, in the event that cumulative risk is below a target cancer risk and/or an appropriate hazard index, this does not preclude the need for further remedial action such as institutional controls and long-term monitoring.	Section 2.3 was updated to reference the need for USEPA concurrence with the post-remedy risk assessment and to note that non-intrusive remedies, such as institutional controls and/or long-term monitoring may be necessary.
4	6	2.4	EPA-Selected Remedy	States that the selected remedy is a "USEPA-modified version of Alternative 4…"; however, the Section 1.D. and Section L. in the ROD states that a modified Alternative 3 was selected. Clarification is required.	The following sentence was added to Section 2.4: *When developing the ROD, USEPA elected to eliminate Alternative 2 from further consideration, resulting in the FS -Revision 3 Alternative 4 to be referred to as Alternative 3 in the ROD.*
5	7	2.4.2	Groundwater Remedial Action	As part of Alternatives 3 and 4 of the Feasibility Study (FS) Revision 3, one additional monitoring well was proposed to be installed (and sampled) in the former log run and adjacent to the Reactive Core Mat (RCM). Although EPA selected a modified Alternative 3, it does include addressing "effectiveness of the existing RCM", as described in the ROD (2017). As a component of RCM monitoring, this monitoring well installation and associated sampling should be a part of this remedial design work plan, and it does not appear to be included.	Section 2.4.3 (Sediment Remedial Action) was updated to state: *RCM effectiveness monitoring will consist of visual surface water sheen monitoring coupled with installation of an additional groundwater well within the former log run (pending utility clearance) and sampling of the newly-installed well and two existing shoreline wells.* Update to Section 2.4.3 was more appropriate than 2.4.2, as the well installation is being completed to assess the effectiveness of the sediment remedy.
6	8	2.4.3	Sediment Remedial Action	The text states that regular effectiveness monitoring of the RCM and the sand cover will be conducted. Please define the sampling frequency and further details of the long-term sediment monitoring plan. The sand cover was last sampled in October 2014 and bathymetry was last collected in April 2015. When is it anticipated that monitoring of both the sand cover and the RCM will next occur?	Sand cover monitoring and bathymetry activities in 2014 and 2015 satisfied the monitoring requirements in the USEPA-approved Sand Cover Monitoring Work Plan (NRT, September 2013). Additional monitoring will be part of the permanent remedy and will commence following USEPA-approval of Final Remedial Design, which will detail means and methods for future monitoring events. No changes were made to the document to address this comment
7	10	4.1	Access Agreements	This section indicates that the City of Marinette has concerns with the scope of the remedial action. When EPA and DNR met with the City in 2017, they were no longer concerned. Design the excavation near the WWTP infrastructures so there are no structural impacts while taking out as much MGP-impacted material as possible. Coordinate schedule for excavation with the WWTP folks and City; they are willing and able to work with us. I suggest a meeting in Marinette prior to the first design submittal.	WPSC has been in regular communication with the City of Marinette and will continue to engage throughout the remedial design process to ensure that the scope and implementation strategy of intrusive remedial action accounts for potential concerns or restrictions imposed by City of Marinette. No changes were made to the document to address this comment.
8	12	6	Plan for Remedial Design Execution	A milestone for completion and delivery of all treatability testing should be included. If this document will be integrated to a milestone task already listed, please annotate text to document when treatability testing results would be presented for agency review.	The following text was added to Section 6.3 - *The PDI Evaluation Report will also present the findings from the treatability study testing.*

Table 1. Comments on Draft *Remedial Design Work Plan, Wisconsin Public Service Corporation's Former Marinette Manufactured Gas Plant Site, Marinette, Wisconsin*					
Comment Number	**Page**	**Section**	**Title**	**Comment 5/23/2018**	**Response**
9	12	6.3	Preliminary Design Evaluation Report	Results of the treatability study will be needed before the 30 percent design document can be completed. If the treatability test report(s) are not constructed as standalone documents, inclusion in the preliminary design investigation report seems reasonable. Please update text in this section to describe how and when testing results will be presented to the agency.	See response to comment 8.
10	14	6.4.4	Remedial Action Monitoring and Control Measures	The first paragraph in this sections states, "The RD will develop engineering controls for odor and vapor emissions at or below established levels during execution of the remedial action." Experience has shown that excavation has the potential to create significant nuisance odor for surrounding property owners. Managing odors by limiting open work areas, covers, or suppressing foams have the potential to delay production rates for excavation, which could potentially delay completion of the selected remedial action. In the absence of numeric "odor standards" for MGP-derived contaminants, it is unclear how engineering controls can be developed to maintain odor below "established levels". Please ensure that future plans associated with vapor monitoring and odor mitigation are premised on criteria and measurements, which can be used to direct change in the methods, materials, or implementation sequence for the selected remedy.	WPSC agrees that excavation of MGP-affected soil can result in short-term nuisance odor. Additional details related to air monitoring and mitigation of fugitive emissions will be provided as part of the Air Monitoring Plan and Fugitive Emissions Mitigation Plan as the remedial design progresses. No changes were made to the document to address this comment
11	16	6.4.6.5	Draft Institutional Controls Implementation and Assurance Plan	"The draft Institutional Controls and Implementation and Assurance Plan (ICIAP) will provide specifications for the implementation and maintenance of institutional controls to impose land and groundwater use limitations over areas that do not support unlimited use/unrestricted exposure as set forth in the ROD." Institutional controls (ICs) are also needed to protect the sand cover and RCM in the river.	The following text was added to Section 6.4.6.5: *The ICIAP will also detail notification requirements regarding the presence of residual sediment above the remedial action level located under the residual sand cover and RCM.*
12	17	6.5.5	Operations and Maintenance Plan and Operations and Maintenance Manual	When will ICs be put in place, and when will the long-term operations and maintenance (O&M) plan and O&M Manual for the existing sediment remedy be prepared and initiated? Since no further active remediation is planned for the sediment, it seems these activities can proceed without waiting until the completion of the remedial design and remedial action of the upland components.	See response to comment 6.
13	20	7.2	Contracting Approach	Any potential change to the scope of the remedial action must first be communicated to the oversight agency and project stakeholders. Removal of language suggesting preliminary design investigation-driven changes in the selected remedy should be removed from this section given the nature and complexity of decisions associated with modification(s) to an approved ROD for a CERCLA site.	Text related to the potential for the preliminary design investigation to affect the scope of the remedy and affected procurement strategy has been removed from Section 7.2.
14	Table 1	Tables	Preliminary List of ARARs and TBC Guidance/Criteria	This table provides for Relevant Alternatives ranging from 1 to 4. Only the selected Alternative should be included in this table. Also, since the selected Alternative is an EPA-modified version of Alternative 3, the table does not actually reference the selected Alternative.	Table 1 was updated to include only the ARARs related to the ROD-selected remedy.
15	Table 1	Tables	Preliminary List of ARARs and TBC Guidance/Criteria; Sediment	WDNR publication PUBL-RR-606 is listed as a reference for surface water quality but RR-606 is a guidance document on case closure. Remove the sentence that refers to WDNR Publication PUBL-RR- 606 and replace it with DNR guidance that lists surface water standards (search here: https://dnr.wi.gov/topic/SurfaceWater/standars.html).	Reference to WDNR publication PUBL-RR-606 has been replaced by https://dnr.wi.gov/topic/SurfaceWater/standards.html

Table 1. Comments on Draft *Remedial Design Work Plan, Wisconsin Public Service Corporation's Former Marinette Manufactured Gas Plant Site, Marinette, Wisconsin*					
Comment Number	**Page**	**Section**	**Title**	**Comment 5/23/2018**	**Response**
16	Appendix B	Appendix B	Draft Emergency Response Plan, Spills	The plan should have specific language on compliance with Wisconsin laws and rules on environmental spills. Incorporate the following (or equivalent) language: *The Wisconsin spill law, Chapter 292.11(2) Wis. Stats., requires that a person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance shall notify the DNR immediately of the discharge that is not exempted. Spill reporting requirements are contained in NR706 Wis. Admin. Code. The spill Hotline telephone number is (800-943-0003). Information on spill reporting requirements is available in* the Immediate Reporting Required for Hazardous Substance Spills *PUB-RR-560 fact sheet.*	Requested text has been added to Section 7.9

Remedial Design Work Plan
Revision 1

Wisconsin Public Service Corporation's
Former Marinette Manufactured Gas Plant Site
Marinette, Wisconsin

WEC Business Services, LLC

June 18, 2018

OBG

JUNE 18, 2018| PROJECT #67979

Remedial Design Work Plan Revision 1

Wisconsin Public Service Corporation's Former Marinette Manufactured Gas Plant Site Marinette, Wisconsin

Prepared for:

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ACRONYMS AND ABBREVIATIONS

µg/kg	Micrograms per kilogram
ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA ("Superfund")	Comprehensive Environmental Response, Compensation, and Liability Act
City	City of Marinette, WI
CFR	Code of Federal Regulations
CN	Canadian National Railway Company
COC(s)	Constituents of Concern
CQAP	Construction Quality Assurance/Quality Control Plan
CY	Cubic Yards
FSP	Field Sampling Plan
GIS	Geographic Information System
IBS	Integrys Business Support
ICIAP	Institutional Controls and Implementation and Assurance Plan
MasterFormat 2012	Construction Specifications Institute's Master Format 2012
RCM	Reactive Core Mat
mg/kg	milligrams per kilogram
MGP	Manufactured Gas Plant
NAPL	Non-aqueous Phase Liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRT	Natural Resource Technology, Inc.
NTCRA	Non-Time Critical Removal Action
O&M	Operation and Maintenance
OBG	O'Brien and Gere Engineers, Inc.
OSWER	Office of Solid Waste and Emergency Response
PAH	Polynuclear Aromatic Hydrocarbon
PDI	Preliminary Design Investigation
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAL	Remedial Action Level
RAO	Remedial Action Objectives
RD	Remedial Design
RD AOC	Administrative Settlement Agreement and Order on Consent for Remedial Design
RDWP	Remedial Design Work Plan
RG	Remediation Goal
ROD	Record of Decision
SOW	Statement of Work
TBC	To Be Considered
tPAH	Total Petroleum Aromatic Hydrocarbon (13)
USEPA	United States Environmental Protection Agency
WDNR	Wisconsin Department of Natural Resources
WPSC	Wisconsin Public Service Corporation
WWTP	Wastewater Treatment Plant

1 INTRODUCTION

O'Brien & Gere Engineers, Inc. (OBG) has prepared this Remedial Design Work Plan (RDWP) on behalf of Wisconsin Public Service Corporation (WPSC) for the design of the remedy selected by the U.S. Environmental Protection Agency (USEPA) in the *Record of Decision (ROD) - Wisconsin Public Service Corporation Marinette Former Manufactured Gas Plant Site Marinette, Wisconsin* (USEPA, 2017) for the WPSC Marinette Former Manufactured Gas Plant (MGP) Superfund Alternative Site located in Marinette County, Wisconsin (Figure 1; Site).

1.1 OVERVIEW

WPSC and USEPA entered into an *Administrative Settlement Agreement and Order on Consent for Remedial Design* (RD AOC) (USEPA, 2018) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Docket No. V-W-18-C-009 which became effective March 26, 2018. The RD AOC requires WPSC to perform remedial design (RD) activities at the Site. In accordance with the RD AOC and corresponding Statement of Work (SOW), this RDWP outlines information bulleted below. The location within the RDWP where the required information is located is noted parenthesis following each item.

- Descriptions of areas requiring clarification and/or anticipated problems (Section 2)
- Description of proposed Preliminary Design Investigation (PDI) activities (Section 2)
- Description of proposed treatability studies (Section 2)
- Descriptions of applicable permitting requirements and other regulatory requirements (Section 3)
- Description of plans for obtaining access in connection with the SOW, such as property acquisition, property leases, and/or easements (Section 3)
- Plans for implementing all RD activities identified in the SOW (Section 4)
- A description of the overall management strategy for performing the RD, including a proposal for phasing of design and construction (Section 5)
- A description of the proposed general approach to contracting, construction, operation, maintenance, and monitoring of the Remedial Action (RA) as necessary to implement the SOW (Section 5)
- A description of the responsibility and authority of all organizations and key personnel involved with the development of the RD (Section 5)
- A Draft Health and Safety Plan (Refer to Appendix A)
- A Draft Emergency Response Plan (Refer to Appendix B)

1.2 SITE BACKGROUND

The former MGP property encompasses approximately four acres and is currently owned by the City of Marinette (or "the City") and 1428 Main Street Holdings (Figure 2). The following definitions are used herein:

- **Site:** areas where contamination related to the former MGP has been discovered through remedial investigation (RI) or routine monitoring activities completed to date
- **MGP residuals or source material:** oil-wetted or oil-coated soil or non-aqueous phase liquid (NAPL)
- **MGP-affected soil or non-sources areas** soil potentially affected by the former MGP based on constituents of concern (COC) exceeding the remediation goals (RG)

1.2.1 Site Description and Surrounding Land Use

The approximate extent of the upland Site is approximately 15 acres and is primarily located within areas zoned as heavy manufacturing and park districts (Figure 3). Small portions of the Site also are located within areas zoned as community business and waterfront overlay districts. Most of the Site is covered with pavement, buildings, or well-maintained lawn. The Site includes properties owned by WPSC, Canadian National Railway

Company (CN), Marinette Central Broadcasting, and the City of Marinette (Boom Landing, wastewater treatment plant [WWTP], fire station, and City right-of-way), as discussed below. Corresponding zoning for these properties is depicted in Figure 3.

- **WPSC Property** – The triangle shaped property located on the west side of the Site and north of Mann Street is owned by WPSC. The property is zoned community business and waterfront overlay district.
- **Canadian National Railway Company** – The railroad in the middle of the Site, parallel to Mann Street is owned by CN Railroad.
- **Marinette Central Broadcasting** – Marinette Central Broadcasting owns the property to the west of Boom Landing, in the northern part of the Site. The property is zoned for community business and waterfront overlay district.
- **City of Marinette** – The City owns properties covering the majority of the Site, including Boom Landing in the north and along the Menominee River, the City WWTP in the south, the fire station in the southwest corner, and Mann Street, Ely Street and Ludington Street bordering the WWTP to the north, southeast and southwest, respectively. Boom Landing is zoned either as a park district or community business district and waterfront overlay district. The WWTP is zoned as a heavy manufacturing district, and the fire station is zoned as a commercial business district.

For purposes of this RDWP, the Site has been divided into two remediation zones: Boom Landing Zone and WWTP Zone, separated by the CN railroad as shown on Figure 4. These zones were previously described in approved regulatory submittals and were developed to combine areas with shared land ownership and/or similar physical access limitations.

1.3 SITE HISTORY

1.3.1 Former MGP Property

The former MGP facility was constructed between 1901 and 1910 and operated through 1960. Prior to 1903, the Marinette Lighting Company owned the former MGP property. In 1903, electric and gas utilities in Marinette, Wisconsin and Menominee, Michigan were merged to form the Menominee and Marinette Light and Traction Company. In 1922, WPSC acquired Menominee and Marinette Light and Traction Company and operated it as a wholly owned subsidiary. In 1953, the subsidiary was merged with the parent company. In 1962, the former MGP property was sold to the City of Marinette under a land contract. The City subsequently used the property to expand the WWTP facilities.

Many of the MGP buildings and structures were present in 1962 when the City purchased the property from WPSC. All the aboveground and most of the below ground structures associated with the MGP were removed and/or demolished by the City of Marinette in the 1960s in conjunction with the WWTP expansion.

1.3.2 City of Marinette Waste Water Treatment Plant Property

The City of Marinette WWTP was originally constructed east of a former slough in 1938 and expanded in 1945 and 1952. Historic WWTP infrastructure included fuel oil underground storage tanks and an asphalt plant. Following the purchase of the former MGP property by the City in 1962, the City WWTP was expanded in 1972 and 1989 to the current layout. A 10,000-gallon aboveground storage tank storing tar/oil associated with the City's asphalt facility, located northeast of the former MGP, across the slough, was replaced in 1985 due to failure of the tank's heating elements *Phase I Remedial Investigation Report* [Natural Resource Technology (NRT, 1994)]. From the early 1960s to 1990, the WWTP property was also used by the City to manufacture asphalt.

The WWTP property was also used as a service garage and had a gasoline storage tank. A release from the gasoline tank was reported to the Wisconsin Department of Natural Resources (WDNR). According to the City Engineer at the time, soil affected by the release from the gasoline tank was subsequently aerated and the case was closed by the WDNR.

1.3.3 Former Slough/Boom Landing

A slough that was a meander of the Menominee River was present at the Site until approximately 1945. The history of the former slough is summarized below.

Date	Description
1800s	The slough was a meander of the Menominee River. Water flow direction of the slough was from north to south.
1945	Southern portion of the slough was filled during the expansion of the WWTP. Water flow direction changed from south to north due to fill placement.
1960	The slough/channel south of the MGP plant was completely filled by May 1960.
1970	The slough was gradually filled with silt from apparent natural deposition.
1982	The slough was completely filled to the Menominee River and the boat landing was. constructed
1987	The area around Boom Landing was developed.
2004	The current boat landing was reconstructed including the expansion of the parking area, a wider boat ramp, and two floating piers.

1.4 PREVIOUS SITE INVESTIGATION

RI activities occurred at the Site from November 2011 through October 2016 and are summarized in the *Remedial Investigation Report – Revision 2* (NRT, 2015). RI activities included surface and subsurface soil sampling, groundwater sampling, soil gas sampling, and sediment sampling. Based on the RI Report (NRT, 2015) findings, USEPA identified soil and groundwater as media of concern and selected the following COCs in the ROD (USEPA, 2017):

- **Soil COCs**: ethylbenzene, benzo(a)pyrene, and naphthalene
- **Groundwater COCs**: benzene, ethylbenzene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and naphthalene

Based on UESPA assessment, the USEPA-selected remedy summarized in Section 2.4 will address remediation areas at the Site where the above COC exceed human health risk criteria.

1.5 PREVIOUS REMEDIAL ACTION

1.5.1 Soil Excavation

MGP residuals were encountered during excavations for the expansion of the WWTP in 1989. During construction activities, MGP residuals and affected groundwater were reported by the City to the WDNR. The City mandated no MGP residuals be left in place underneath the proposed WWTP structures. Thus, approximately 9,700 tons of MGP residuals encountered during construction activities were excavated and stockpiled on a lined holding pad until transport and disposal at the licensed Michigan Environs Landfill.

In 2003, a small amount of MGP residuals were encountered in an excavation for electrical lines associated with the boat launch expansion. This material was drummed and disposed of at the Waste Management Landfill in Menominee, Michigan.

In June 2004, the City began another sewer expansion project requiring excavation of additional soils on the former MGP property. Approximately 1,030 tons of MGP residuals were excavated during the sewer expansion project and disposed of at the Waste Management landfill in Menominee, Michigan.

In October 2013, the City completed utility maintenance and road improvements on Mann Street between the WWTP and Boom Landing. During these activities, approximately 187 tons of fill material with visual observations of MGP residuals was excavated from water and sewer lines crossing the former slough. This material was transported and disposed at the Waste Management Landfill in Menominee, Michigan.

1.5.2 Sediment Non-Time Critical Removal Action

A Non-Time Critical Removal Action (NTCRA) was performed to remediate NAPL and MGP-affected sediment from Menominee River adjacent to the mouth of the former slough. Activities were initiated on October 15, 2012 and substantially completed by March 25, 2013 and described in the *Focused NAPL and Sediment Removal Action, Revision 1* (NRT, 2013). During the NTCRA, approximately 14,800 cubic yards (CY) of sediment were removed. An additional 422 CY were removed for navigational purposes as part of an access agreement established between WPSC and an adjacent property owner, Nestegg Marine. The objective of the NTCRA was to mechanically excavate contaminated sediments in areas with elevated polynuclear aromatic hydrocarbon (PAH) concentrations and NAPL until post-dredge verification samples contained Total PAH (13) (tPAH) concentrations less than the remedial action level (RAL) of 22.8 milligrams per kilogram (mg/kg) and no visual NAPL remained.

Despite multiple attempts by the dredging contractor, there were a few areas where sediment on the uneven bedrock surface could not be fully removed. Consequently, a total of approximately 12,000 square feet of sand (residual sand cover) with a minimum thickness of 10 inches was placed in areas where post-dredge verification samples indicated tPAH concentrations greater than 22.8 mg/kg.

Dredging progressed upland into the shoreline in areas where debris and small stringers of residual NAPL were suspected to be present. Due to upland land use and associated space constraints, not all small stringers of residual upland NAPL could be removed. Consequently, a Reactive Core Mat (RCM) was placed along the shoreline in these areas to prevent potential future migration of small stringers of residual upland NAPL into the river. This RCM extends out onto the riverbed from the shoreline and covers some of the residual sediments on the irregular bedrock surface with concentrations of tPAH greater than 22.8 mg/kg. Upland excavation required removal and replacement of an existing sewer outfall structure on the shoreline. In this area, RCM was placed on the side slope of the upland excavation prior to backfill to prevent potential contamination of clean backfill adjacent to the replacement outfall structure.

Sediment removed from the river was mixed with stabilization additives on a geomembrane-lined asphalt pad before being transported and disposed at Waste Management Landfill in Menominee, Michigan. Debris encountered during dredging activities and from removal of the former outfall structure was also disposed of at the aforementioned landfill under a separate waste profile. Sediment contact water collected at the stabilization pad was treated on a batch basis with an on-site treatment system in accordance with the substantive requirements of the Wisconsin Pollution Discharge Elimination System. Pre-and post-upland surface soil sampling was conducted to determine if the sediment NTCRA negatively affected upland soil. This sampling indicated that an approximately 0.2-acre area west of the boat launch may have been affected. During demobilization activities, the top 1-foot of soil in this area was removed and disposed offsite.

2 OVERVIEW OF USEPA-SELECTED REMEDY

An overview of the USEPA-selected remedy detailed in the ROD (USEPA, 2017), as it pertains to the RDWP development, is provided in the following subsections.

2.1 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) for the Site were developed based on COCs, pathways, receptors, and an acceptable constituent level for each medium assuming continuation of current use of the Site.

- **Soil/Soil Vapor:**
  - **RAO-1:** Prevent human exposure, including dermal contact and incidental ingestion of particulates and vapor to NAPL-saturated soil and subsurface soil containing MGP-related contaminants greater than RGs.
- **Groundwater:**
  - **RAO-2:** Prevent human exposure including dermal contact, incidental ingestion and inhalation (as a result of vapor intrusion) of groundwater containing MGP residuals exceeding RGs.
  - **RAO-3:** Restore groundwater to RGs for MGP-related contaminants within a reasonable timeframe.
  - **RAO-4:** Minimize, to the extent practicable, the potential for migration of groundwater with MGP-related constituents above the RGs to surface water.
- **Sediment:**
  - **RAO-5:** Demonstrate the RCM remains effective at preventing NAPL from migrating into the Menominee River and that at least six inches of clean sand remains over areas with remaining MGP-residuals.
  - **NTCRA RAO:** Remove NAPL and PAH-contaminated sediment that have the potential to affect human health and ecological receptors. The NTCRA RAO was satisfied, to the extent practicable, as part of the NTCRA activities.

2.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121 of CERCLA requires, subject to specified exceptions, that remedial actions must be protective of human health and the environment. In addition, RAs performed under the Superfund program must be undertaken in compliance both state and federal Applicable or Relevant and Appropriate Requirements (ARAR). The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) defines applicable requirements as:

> "…those clean-up standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable."

The NCP defines relevant and appropriate requirements as:

> "…those clean-up standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws, that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate."

In addition to ARARs, the USEPA may identify other relevant information, criteria, or guidance as to be considered (TBC). TBCs may not be legally binding or enforceable but may be useful for consideration when developing remedial alternatives. Both ARARs and TBCs may be chemical-specific, location specific, or action specific. Table 1 summarizes preliminary federal and state ARARs and TBCs related to remedial action at the Site as memorialized in the ROD (USEPA, 2017). The ARARs and TBCs may be reexamined during the five-year review process.

2.3 DEVELOPMENT OF REMEDIATION GOALS

RGs are long-term target goals used during analysis, evaluation, and implementation of remedial alternatives. Achieving the RGs through RA will result in protection of human health and the environment. The RGs for soil and groundwater that were finalized by USEPA in the ROD (USEPA, 2017) are provided in Tables A and B, respectively.

Table A – Soil Remediation Goals

Constituent of Concern	Remediation Goal (mg/kg)
Ethylbenzene	37
Benzo(a)pyrene	2.11
Naphthalene	26

Table B – Groundwater Remediation Goals

Constituent of Concern	Remediation Goal (µg/L)
Benzene	5
Ethylbenzene	700
Benzo(a)pyrene	0.2
Benzo(b)fluoranthene	0.2
Chrysene	0.2
Naphthalene	100

During implementation of a remedy, flexibility will be provided to potentially modify the RGs by conducting a post-remedy risk assessment following the *Multi-site Risk Assessment Framework, Former Manufactured Gas Plant Sites Revision 0* (Exponent, 2007), as negotiated in the *Settlement Agreement and Administrative Order on Consent for the conduct of Remedial Investigations and Feasibility studies at six WPSC MGP Sites in Green Bay, Manitowoc, Marinette, Oshkosh, Stevens Point and Two Rivers, Wisconsin* (USEPA, 2006). If the post-remedy risk assessment (pending review and concurrence from USEPA) concludes that cumulative site risk is below the target cancer risk and noncancerous hazard index for the targeted exposure scenario, then no additional intrusive RA will be required. Non-intrusive remedies, such as institutional controls and/or long-term monitoring may be implemented, as necessary, dependent on the supplemental risk assessment findings.

2.4 USEPA-SELECTED REMEDY

USEPA selected a remedy at the Site, which represented a USEPA-modified version of Alternative 4 as presented in the USEPA-approved FS - Revision 3 (NRT, 2017). When developing the ROD, USEPA elected to eliminate Alternative 2 from further consideration, resulting in the FS - Revision 3 Alternative 4 to be referred to as Alternative 3 in the ROD. The following subsections summarize the ROD-selected remedy.

2.4.1 Soil Remedial Action

The first element of the soil remedial action selected by USEPA involves excavation and off-site disposal of accessible subsurface source material located within the Boom Landing Zone, which will include the following elements:

- Completing a PDI to further define the horizontal and vertical extent of subsurface contamination in the areas of previously identified MGP-source material, and provide waste characterization sampling.
- Obtaining access agreements and demolish/remove parking lot, fish house, utilities, and existing concrete and asphalt pavement areas in the Boom Landing Zone.
- Installing temporary shoring to support deeper excavations.
- Installing a temporary dewatering system to lower the water table within the excavation footprint.
- Excavating non-affected overburden soil and stockpile on-site for use as post-excavation backfill.
- Excavating MGP-source material and transport to Subtitle D Landfill.
- Backfilling excavation to surrounding grades with granular backfill and stockpiled overburden material.
- Restoring the Site to previous pre-RA conditions.

The WWTP Zone remedial action will include the following elements:

- Completing a PDI and waste characterization sampling to further define horizontal and vertical extent of subsurface contamination in the areas of previous identified MGP-source material, and provide waste characterization sampling.
- Obtaining access agreement from the City to allow for a deep excavation adjacent to the WWTP infrastructure, including an aeration basin.
- Installing temporary shoring to support deeper excavations.
- Installing a temporary dewatering system to lower the water table within the excavation footprint.
- Excavate non-affected overburden soil and stockpile on-site for use as post- excavation backfill.
- Excavating accessible MGP-source material to maximize principal threat waste removal while minimizing impact to surrounding infrastructure and transport to Subtitle D Landfill.
- Backfilling excavation to surrounding grades with granular backfill and stockpiled overburden material.
- Restoring the Site to previous pre-RA conditions.

The soil RA selected by USEPA involves installation of horizontal engineered surface barriers at Boom Landing and WWTP Zones, which will include the following elements:

- Monitor and maintain existing engineered surface barriers including paved parking lots and paved roadways.
- For the PDI, further investigate the horizontal extent of surficial soil containing contaminants of concern above RGs.
- Mitigate potential exposure by excavating accessible surficial soil containing COCs above RGs, backfilling the two feet depth of excavated areas with 18 inches of clean fill and six inches of clean topsoil. Alternative barrier approaches, including gravel and/or asphalt, will be evaluated during the RD phase. In addition, consistent with the ROD (USEPA, 2017) Section L2, institutional controls without a horizontal engineered barrier will also be considered during the RD phase for the WWTP Zone.

2.4.2 Groundwater Remedial Action

Removal of accessible source material will greatly reduce the mass of sorbed contaminant mass dissolving into groundwater. Groundwater monitoring will be performed to assess on-going monitored natural attenuation. To enhance restoration of groundwater quality, the USEPA selected one-time placement of an in-situ treatment reagent within the base of excavations prior to backfilling. Groundwater remedial action includes the following elements:

- Performing bench-scale testing of Site soils and groundwater with varying types and percentages of reagents to determine the most effective approach to address COCs.

- Completing one-time placement of reagent into the exposed saturated zone resulting from excavation of Boom Landing and WWTP Zones.
- Conducting groundwater monitoring until groundwater trends indicate RGs will be achieved.

2.4.3 Sediment Remedial Action

The NTCRA removed NAPL and sediment with tPAH concentrations above 22.8 mg/kg to the extent practical. A residual sand cover was placed on a portion of the river bottom and a RCM was placed on a portion of the river bank. The USEPA selected long term-effectiveness monitoring of the residual sand cover and the RCM, which includes the following elements:

- Completing regular effectiveness monitoring of the RCM to access potential for ebullition or migration of MGP-source materials that were not addressed during the 2012 removal action. RCM effectiveness monitoring will consist of visual surface water sheen monitoring coupled with installation of an additional groundwater well within the former log run (pending utility clearance) and sampling of the newly-installed well and two existing shoreline wells.
- Monitoring the 160 cubic yards of dredge inventory that remained after the NTCRA to ensure at least six inches of clean sand remain over those areas with MGP-residuals remaining, and that the 0-6-inch zone remains below RA levels.

2.4.4 Institutional Controls for Soil, Soil Gas, Groundwater, and Sediment

Boundaries for institutional controls will be based on delineation of MGP COCs on affected parcels to RGs. Wisconsin DNR's Geographic Information System (GIS) Registry will be used to implement institutional controls; however, alternate continuing obligation mechanisms, including deed restrictions, may be considered as part of the remedial design. Requirements, limitations, or conditions relating to restrictions of sites listed on the Wisconsin DNR GIS database are required to be met by all property owners [Wisconsin State Statutes § 292.12(5)]. As a result, the statute requires that the GIS database conditions be maintained for a property, regardless of changes in ownership. A violation of Section 292.12 is enforceable under Wisconsin Statutes §§ 292.93 and 292.99.

3 PRELIMINARY DATA GAPS EVALUATION AND PRELIMINARY DESIGN INVESTIGATION

A preliminary evaluation of data gaps was completed as part of development of this RDWP. The subsequent bullets detail the preliminary data gaps as well as preliminary concepts for how data gaps may be addressed as part of preliminary design investigation/treatability study work. Results of the data gap evaluation may support modified excavation areas/volumes and direct contact barrier extents for the RA.

3.1 GENERAL

- **Data Gap 1:** Topographic, property boundary, and utility location information is out of date and the accuracy is unknown.
  - **Potential Resolution:** Obtain a topographic, property boundary and utility survey, including Diggers Hotline and private utility locates to serve as the design base map.

3.2 SOURCE MATERIAL AREAS

- **Data Gap 2:** The horizontal and vertical extent of potential source material at the WWTP Zone and Boom Landing is insufficient for design purposes.
  - **Potential Resolution:** Complete a PDI to further define horizontal and vertical extent of source materials and provide waste characterization sampling.
- **Data Gap 3:** Characterization of the nature of WWTP Zone source material areas is predominantly based on limited borings and test pits completed in the 1990s. The current quality of this material is unknown, particularly in terms of the potential solubility and mobility of source material.
  - **Potential Resolution:** Advance borings and other testing equipment in the presumed WWTP Zone source material areas to document the current nature of WWTP Zone source material.
- **Data Gap 4:** There is insufficient geotechnical information for use in design of shoring systems required for proposed excavations.
  - **Potential Resolution:** Conduct comprehensive geotechnical investigations in all locations proposed for excavation to facilitate design of shoring and earth retention systems.
- **Data Gap 5:** There is insufficient hydrogeologic information for use in design of a dewatering system.
  - **Potential Resolution:** Conduct aquifer testing and other hydrogeologic and/or hydrostratigraphic testing and analysis sufficient to design a dewatering system that can be contained with the footprints of proposed excavations.

3.3 HORIZONTAL BARRIERS

- **Data Gap 6:** The required extent of horizontal barriers is unknown due to insufficient density of surface soil samples and uncertainty regarding the adequacy of existing barriers.
  - **Potential Resolution**: Complete a PDI to further define horizontal and vertical extent of affected surface soil and provide waste characterization sampling. In addition, conduct visual or physical surveys to determine the adequacy of existing barriers.

3.4 GROUNDWATER

- **Data Gap 7:** There is uncertainty regarding the type and concentration of reagents and/or activating agents required to address to address post-excavation COCs.
  - **Potential Resolution:** Perform bench-scale testing of Site soil and groundwater with varying types and percentages of reagents and activators.

Additional details regarding the types of investigation and assessment activities that will be implemented to resolve these data gaps and the potential identification of additional gaps will be provided in the PDI Work Plan. The PDI Work Plan may also detail the scope of investigation activities to further assess the necessity and implementability of source material excavations in the WWTP Zone.

4 ACCESS AND PERMITTING

Access agreements and permitting are critical path elements that are important to continuously consider throughout the RD process. Preliminary concepts related to how these critical path items will be addressed through the RD process are discussed below.

4.1 ACCESS AGREEMENTS

The ROD-specified RA will be performed on City-owned property, both in the WWTP Property on the southern portion of the Site and Boom Landing on the northern portion of the Site. WPSC holds an access agreement with the City to complete the investigation activities on City-owned property. WPSC intends to use this access agreement to facilitate implementation of the PDI and/or as the basis for an expanded or modified agreement with the City, as necessary. Prior to submittal of the Preliminary Design to USEPA, WPSC will be in communication with the City to review refinements to the scope of remedial action based on the results of the PDI. City of Marinette concerns with the scope of RA have been raised with the USEPA and these concerns will be taken into account while developing the Preliminary Design with the goal of simplifying the process of obtaining a final access agreement for remedial action. The City will remain engaged throughout the RD process and a draft access agreement will be developed to minimize the delay in obtaining an access agreement once the Final Design is approved by USEPA.

4.2 PERMITTING

Although CERCLA projects are exempted from federal, state, and local permitting requirements, the remedial action will still need to meet the substantive requirements of the associated permitting programs. A list of all permits, including a summary of permit technical requirements, data needs for each permit, and a schedule for meeting substantive permit requirements will be compiled and provided with the Preliminary Design.

5 SUPPORTING PLANS FOR THE REMEDIAL DESIGN WORK PLAN

5.1 DRAFT HEALTH AND SAFETY PLAN

The *Multi-Site Health and Safety Plan - Revision 2* (Integrys, 2007) that was previously approved by the USEPA will be used for a draft HASP purposes of the RDWP. This Multi-Site HASP is included in Appendix A. This plan will be modified with additional Site-specific information as the PDI and RD process progresses.

5.2 DRAFT EMERGENCY RESPONSE PLAN

The Emergency Response Plan was requested by USEPA in the RDWP stage to describe procedures to be used in the event of an accident or emergency at the Site. The Draft Emergency Response Plan is included in Appendix B. This plan will be modified with additional Site-specific information as the PDI and RD process progresses.

6 PLAN FOR REMEDIAL DESIGN EXECUTION

The RD process generally involves a series of sequenced deliverables to the USEPA. The WPSC plan for RD execution involves completing these deliverables in a timely manner, as specified in the RD AOC (USEPA, 2018). This section presents a description of the submittals to be provided to USEPA, including content required by the deliverables as was set forth in the RD AOC (USEPA, 2018) and summarized in the list below:

- Monthly and Annual Progress Reports
- Preliminary Design Investigation Work Plan/Treatability Study Work Plan
- Preliminary Design Investigation Evaluation Report
- Preliminary Remedial Design (30% Complete)
- Pre-Final Remedial Design (95% Complete)
- Final Remedial Design (100% Complete)

The above documents will be developed in accordance with *USEPA's Superfund Remedial Design and Remedial Action Guidance* [Office of Solid Waste and Emergency Response (*OSWER) Directive No. 9355.0-4A* (USEPA, 1995)] to meet the objectives of the ROD (USEPA, 2017) and the RD AOC (USEPA, 2018). Preliminary details regarding the scope of each document is provided in the subsequent subsections.

6.1 PROGRESS REPORTS

As required in the RD AOC (USEPA, 2018), progress reports will be submitted monthly to USEPA summarizing the activities performed the previous month, results of sampling and/or tests and analytical data generated while implementing the AOC, a description of all deliverables submitted to USEPA including any modifications to the work plans or other schedules that have been proposed or approved by USEPA, and all activities undertaken in support of the Community Involvement Plan during the reporting period and those to be undertaken in the subsequent six weeks from the date in the progress report.

6.2 PRELIMINARY DESIGN INVESTIGATION WORK PLAN

A PDI Work Plan will be issued to the USEPA following the USEPA approval of the Final RDWP. The content of the Preliminary Design Work Plan will include the following:

- An evaluation and summary of existing data and description of data gaps.
- A detailed plan of PDI activities targeted at resolving identified data gaps. Among other elements, this plan will include data quality objectives, media to be sampled, contaminants or parameters for which sampling will be conducted, location, and number of samples anticipated.
- A description of a treatability study to determine the most appropriate treatment reagent and activator(s) to be applied in the source area excavations.
- Cross references to quality assurance/quality control requirements.

The PDI Work Plan may also detail the scope of investigation activities to further assess the physio-chemical characteristics of the source material and the necessity and implementability of source material excavations in the WWTP Zone.

6.3 PRELIMINARY DESIGN INVESTIGATION EVALUATION REPORT

Following implementation of the PDI Work Plan, a PDI Evaluation Report will be developed to summarize investigation methodologies, investigation findings, summary of data, laboratory data reports, and photographs of PDI activities. The PDI Evaluation Report will also present the findings from the treatability study testing. The report will also provide a narrative of how the PDI results influence the remedial design (i.e., horizontal and lateral extents of excavations, potentially implementability considerations, etc.), and recommendations of

preliminary design criteria and parameters that should be considered during development of the Preliminary Design.

6.4 PRELIMINARY (30%) REMEDIAL DESIGN

The preliminary RD will be submitted when the RD is approximately 30% complete and will include the following:

- A Design Criteria Report, as described in the *Remedial Design/Remedial Action Handbook*, EPA 540/R-95/059 (USEPA, 1995)
- Preliminary drawings and outline of specifications
- Descriptions of permit requirements
- A description of how the RA will be implemented in a manner that minimizes environmental impacts in accordance with *Principles for Greener Cleanups* (USEPA, 2009)
- A description of monitoring and control measures to protect human health and the environment during the RA, such as air monitoring and dust suppression
- A preliminary construction schedule

A description of these items is provided below the following subsections.

6.4.1 Design Criteria Report

The Design Criteria Report will describe the technical parameters on which the design will be based. The purpose of this report is to document that the performance standards, ARARs, and engineering requirements specified in the ROD are translated in to Site-specific engineering parameters. The Design Criteria Report will summarize the project description, design requirements (waste management, technical standards, ARAR compliance, and design and constructability analysis), preliminary process flow diagrams for treatment processes, and operations and maintenance (O&M) requirements.

6.4.2 Preliminary Drawings and Outline of Specifications

As part of the Preliminary Design, typical drawings will be submitted. The content on these drawings will be continually refined through the RD process. The preliminary list of drawings is anticipated to be organized as follows:

- TS, Title Sheet
- Sheet C010, Preconstruction Site Conditions
- Sheet C020, Existing Site Utilities
- Sheet C030, Site Preparation
- Sheet C040, Source Area Excavation Plan
- Sheet C050, Source Area Excavation Profile and Cross-Sections
- Sheet C060, Horizontal Barrier Plan
- Sheet C070, Horizontal Barrier Profile and Cross-Sections
- Sheet C080, Site Restoration
- Sheet C090, Details

Design elements may be combined onto one sheet and additional sheets may be added, as appropriate. In addition, an outline of the required specifications, including the performance standards will be submitted as part of the Preliminary Design. The specifications package will likely include Division 01, Division 02, Division 31, Division 32, and Division 33 to address the following aspects of remediation:

- General Requirements (Division 01), that address submittals, quality control/assurance, temporary facilities, mobilization/demobilization, erosion controls, protections/health and safety, construction waste management, closeout procedures, and project record documents.
- Existing Conditions (Division 02), that addresses surveying requirements and contact water management.
- Earthwork (Division 31), that addresses site clearing, earth moving, shoring and retention, erosion and sedimentation controls, and trenching and backfilling.
- Exterior Improvements (Division 32), that addresses soil preparation and seeding requirements, asphalt placement, and other site improvements.

6.4.3 Principles for Greener Cleanups

In August 2009, USEPA issued Principles for Greener Cleanups, which establish a USEPA goal to evaluate cleanup actions comprehensively for ensuring protection of human health and the environment and reducing the environmental footprint of cleanup activities, to the maximum extent possible. The USEPA recommends that the following five elements be evaluated and documented when selecting and implementing protective cleanup activities:

- Total Energy Use and Renewable Energy Use
- Air Pollutants and Greenhouse Gas Emissions
- Water Use and Impacts to Water Resources
- Materials Management and Waste Reduction
- Land Management and Ecosystems Protection

Throughout the RD process, WPSC will continuously evaluate alternative remedial construction techniques that will provide sufficient protection of human health and the environment while reducing the environmental footprint of remedy implementation. WPSC will present concepts for reducing the environmental footprint of the remedy to USEPA during the various stages of the RD process to obtain preliminary feedback and determine if the concept is consistent with the intent of the ROD and USEPA's green cleanup goals.

6.4.4 Remedial Action Monitoring and Control Measures

The potential exists for MGP-impacted soil to generate odors and organic vapors when exposed during remediation activities including excavation, treatment, storage, and transportation. Particulate emissions may also be generated during these activities. The RD will include the development of engineering controls for maintaining particulate, odor, and vapor emissions at or below established levels during execution of the remedial action. Controls may include the following:

- An Air Monitoring Plan may be developed to protect workers and maintain vapor emissions at or below established levels. The Air Monitoring Plan may consist of discrete or real-time perimeter air monitoring and/or personnel work zone air monitoring. The specific air monitoring methodologies will be provided in the Air Monitoring Plan, which will be included as an attachment to the Construction Quality Assurance/Quality Control Plan (CQAP).
- Material handling procedures and strategies, targeted at preventing or mitigating emissions, will be provided in the Fugitive Emissions Mitigation Section of the Air Monitoring Plan.
- Specification of materials that can be applied to impacted soils to suppress emissions, including odor control products (i.e., odor control foams and long duration foams) or equivalent and temporary plastic sheeting.

Engineering and administrative controls that can be undertaken if monitoring data indicate conditions exceed established action levels will be provided in the RD. Planning for and documenting the control of particulate, odor, and organic vapor emissions is customary in the design of a remedy for a former MGP site.

6.4.5 Preliminary Construction Schedule

A draft construction schedule at the preliminary design phase will identify critical path tasks and a detailed outline for completion of project phases and major remedial action milestones.

6.4.6 Support Deliverables

In addition to the drawings, specifications, and details, the Preliminary RD will also include the following supporting deliverables.

6.4.6.1 Draft Field Sampling Plan

The *Multi-Site Field Sampling Plan* (FSP) - *Revision 4* (Integrys Business Support (IBS), 2008) that was previously approved by the USEPA will be used for the draft FSP and supplemented with additional standard operating procedures, as necessary, as the RD progresses. The FSP will address all sample collection activities proposed during remedial design. The FSP conforms to the RD AOC and *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988).

6.4.6.2 Draft Quality Assurance Project Plan

The *Multi-Site Quality Assurance Project Plan* (QAP*P) – Revision 2* (IBS, 2007) and subsequent QAPP Addenda that were previously approved by the USEPA will be used as the basis for the QAPP, and a site-specific addendum to the multi-site QAPP will be prepared, as necessary, to ensure the methods and reporting limits are accurate and current. The organization, policy, and functional activities identified in the QAPP are in accordance with the *Intergovernmental Data Quality Task Force Uniform Federal Policy for QAPPs,* EPA-505-B-04-900A, (EPA, 2005).

6.4.6.3 Draft Construction Quality Assurance/Quality Control Plan

A draft CQAP will be prepared to provide a detailed approach to quality assurance during remedial construction activities. The CQAP will describe the site-specific components of the quality assurance program, which will ensure the completed project meets or exceeds design criteria, plans, and specifications. The CQAP will contain, at a minimum, the following elements:

- Responsibilities and authorities of organizations and key personnel involved in the design and construction of the RA
- Qualifications of the quality assurance official to demonstrate the training and experience necessary to fulfill identified responsibilities
- Protocols for sampling and testing used to monitor construction
- Identification of proposed quality assurance sampling activities including, as appropriate, the sample size, locations, frequency of testing, acceptance and rejection data sheets, problem identification and corrective measures reports, evaluation reports, acceptance reports, and final documentation
- Reporting requirements for CQAP activities will be described in the CQAP which will include such items as daily summary reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports, and final documentation.
- Disposal documentation of any debris disposed of off-site. These waste streams include, but are not limited to: soils, solids, and liquids resulting from decontamination of equipment, additional investigations, and RA construction.

A description of the provisions for final storage of records consistent with the requirements of the RD AOC will be presented in the CQAP.

6.4.6.4 Draft Transportation and Off-Site Disposal Plan

A draft Transportation and Off-Site Disposal Plan will be developed to detail protocols for loading waste into on-road trucks, identifying the receiving disposal facilities that are capable of receiving the various anticipated

waste streams, and detailing manifesting or other acceptable disposal documentation procedures to sufficiently track wastes removed from the Site.

6.4.6.5 Draft Institutional Controls Implementation and Assurance Plan

The draft Institutional Controls and Implementation and Assurance Plan (ICIAP) will provide specifications for the implementation and maintenance of institutional controls to impose land and groundwater use limitations over areas that do not support unlimited use/unrestricted exposure as set forth in the ROD. The ICIAP will also detail notification requirements regarding the presence of residual sediment above the RAL located under the residual sand cover and RCM. The ICIAP will be developed in accordance with *A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites*, OSWER 9355.0-89, EPA/540/R-09/001 (USEPA, 2012a), and *Institutional Controls: A Guide to Preparing Institutional Controls Implementation and Assurance Plans at Contaminated Sites*, OSWER 9200.0-77, EPA/540/R-09/02 (USEPA, 2012b).

6.5 PRE-FINAL (95%)/FINAL (100%) REMEDIAL DESIGN

Following receipt of USEPA comments on the Preliminary RD, the Pre-Final RD will be prepared. The Pre-Final RD will be sufficiently developed to represent a potentially approvable remedial design. If USEPA indicates modifications to the Pre-Final RD are necessary, necessary modifications will be incorporated into a Final Design submittal. The Pre-Final RD and Final RD will include the following information and documents:

- A complete set of construction drawings and specifications that are: (1) certified by a registered professional engineer; (2) suitable for procurement; and (3) follow the Construction Specifications Institute's Master Format 2012 (MasterFormat 2012)
- A survey and engineering drawings showing existing Site features, such as elements, property borders, easements, and Site conditions
- Pre-Final versions of the same elements and deliverables as are required for the Preliminary RD
- A specification for photographic documentation of the RA
- A Contingency Plan
- Updates of all supporting deliverables required to accompany the Preliminary (30%) RD, plus the O&M Plan, the O&M Manual, and the Site Wide Monitoring Plan

6.5.1 Final Technical Plans and Specifications

A final set of technical plan and specifications will be completed for this project to detail construction activities. The technical plans will be based on survey-quality base map that shows existing Site features, such as elements, property borders, easements, and Site conditions. The final technical plans and specifications will be completed in MasterFormat 2012, follow the outline provided in the Preliminary RD, and reflect a level of detail suitable for procurement. Technical plans and specifications will be certified by a registered professional engineer following USEPA review and approval.

6.5.2 Pre-Final Versions of Preliminary Remedial Design Support Deliverables

Preliminary Design Support Deliverables, including the FSP, QAPP, CQAP, Offsite Transportation and Disposal Plan, and ICIAP will be updated based on USEPA comments to a level of detail reflective of a Pre-Final RD deliverable.

6.5.3 Specification for Photographic Documentation

The Pre-Final RD will include a specification detailing requirements for photographic documentation of pre-construction site conditions, remedy action construction, and post construction restoration.

6.5.4 Contingency Plan

A Contingency Plan section will be added to the Emergency Response Plan as part of the Pre-Final RD describing procedures to be used in the event of release at the Site. The Contingency Plan will be prepared in accordance with 40 Code of Federal Regulations (CFR) § 300.150 and include the following:

- Name of the person or entity responsible for responding in the event of an emergency incident
- Plan and date(s) for meeting(s) with the local community, including local, State and federal agencies involved in the cleanup, as well as local emergency support and hospitals
- First aid and medical information
- A Spill Prevention, Control, and Countermeasure Plan describing measures to prevent and contingency plans for potential spills and discharges from materials storage, handling, and transportation

6.5.5 Operations & Maintenance Plan and Operations & Maintenance Manual

A long-term O&M Plan with and O&M Manual will be prepared that will describe anticipated O&M activities related to:

- Groundwater monitoring
- Inspection and maintenance of the soil cover
- Maintenance and replacement, if necessary, of the groundwater monitoring wells
- Monitoring and maintenance of the sediment remedy
- Annual review and certification of institutional controls

6.5.6 Site-Wide Monitoring Plan

A Site-Wide Monitoring Plan will be developed to detail the means and methods for completing post RA sample collection to determine whether performance standards, RAOs, and RGs are achieved. The Site-Wide Monitoring Plan will detail post-excavation confirmation sampling efforts and long-term sediment and groundwater monitoring efforts. The Site-Wide Monitoring Plan will reference comparable sections in the FSP and CQAP due to the overlapping scope of these documents.

7 PROJECT TEAM AND CONTRACTING STRATEGY

WPSC has responsibility for all phases of the remedial design and implementation. OBG is WPSC's consultant and will assist WPSC in completion of RD activities including, preparing work plans and design submittals, coordinating sub-consulted services (*i.e.*, laboratories, surveyors etc.), and preparing a detailed set of plans and specifications for implementation of the RA. A description of the project team and preliminary contracting/phasing approach is provided in the following subsections.

7.1 PROJECT TEAM ROLES AND RESPONSIBILITIES

7.1.1 Project Team Organization

A general organizational chart of the primary elements of the project team is provided in Figure 5. There are three main elements which are listed below:

- **USEPA and WDNR –** Regulatory Agency
- **WPSC** – Potentially Responsible Party
- **OBG** – Consultant to Potentially Responsible Party

These elements are organized with the intent of streamlining lines of communication and internal review of design documents prior to submittal to the USEPA and the WDNR for review and comment. Further clarification on the roles and responsibilities is provided below:

- Primary lines of communication with USEPA and WDNR will be maintained directly through WPSC.
- WPSC will provide final review and approval of draft and final submittals to the USEPA and WDNR following review by the Technical Review Committee.

7.1.2 Project Team Personnel

Margaret Gielniewski, USEPA, Remedial Project Manager

Ms. Gielniewski has the responsibility for administration of all actions by USEPA. Ms. Gielniewski or a designated representative will be present or available during Site work. Ms. Gielniewski will provide the major point of contact for WPSC and WDNR and control for matters concerning the project.

Frank Dombrowski, WPSC Project Manager

Mr. Dombrowski has responsibility for administration of all actions by WPSC. Mr. Dombrowski or a designated representative will be present or available during site work and has the authority to commit the resources necessary to meet project objectives and requirements. Mr. Dombrowski will consult with in house and outside legal counsel from time to time for advice on legal, policy, or strategic matters. Mr. Dombrowski is designated as the primary WPSC point of contact and control for matters concerning the project.

Marcus D. Byker, OBG, Project Manager

Marcus D. Byker has over 11 years in engineering including design and field engineering, estimating, construction management, quality control, and project management of solid and hazardous waste projects. Mr. Byker has a B.S. degree in Civil and Environmental Engineering and is a registered professional engineer. Mr. Byker has the responsibility for ensuring the design meets the remedial objectives. Mr. Byker will report directly to the WPSC Project Manager and is responsible for technical and project oversight. The OBG Project Manager responsibilities include:

- Define project objectives and develop detailed work plan schedules
- Establish policy and procedures to address the specific needs of the project as well as the objectives of each task
- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule constraints

- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness
- Review and analyze task performance with respect to planned requirements and authorizations
- Review and approve, or designate the review and approval, of all deliverables before their submission to WPSC Project Manager and regulatory agencies
- Represent the project team, or designate a representative, at meetings, as required

Kyle Bareither, OBG, Design Engineer

Mr. Bareither has over 10 years in engineering including design and field engineering, estimating, construction management, quality control, and project management of remedial and civil construction projects. Mr. Bareither has a B.S. degree in Environmental Engineering. As the Design Engineer, Mr. Bareither has the responsibility for identifying and implementing specific project tasks, and for supervising OBG project personnel, subconsultants, and subcontractors, and implementing the remedial design activities at the Site. The Design Engineer reports directly to the OBG Project Manager. The Design Engineer will:

- Define project objectives and develop work schedules
- Orient all support staff concerning the project's special considerations
- Monitor and direct the design team
- Coordinate and communicate with subcontractors and subconsultants to meet the project objectives
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness
- Review and analyze overall task performance with respect to planned requirements and authorizations
- Ultimately be responsible for the preparation and quality of preliminary, pre-final, and final designs
- Represent the RD project team at meetings, as required

Other technical OBG staff will support the design efforts as required. As approved by WPSC, specialized technical support (*e.g.*, surveying and laboratory analysis) will be utilized to complete the RD.

Tim Olean, OBG, Quality Control Manager

Tim Olean has 27 years of experience in environmental engineering, project and technical management related to soil/groundwater/sediment assessments, remedial design engineering/analysis, construction management, and regulator interface under both CERCLA and state lead projects. Mr. Olean has a B.S. degree in Engineering Management. Mr. Olean will remain independent of direct design involvement and day-to day operations, and has the responsibility for ensuring the design meets remedial objectives. Mr. Olean will directly advise the OBG Project Manager as a technical resource and interface with USEPA and WPSC, as needed.

7.2 CONTRACTING APPROACH

The current contracting approach is a traditional approach, involving design, procurement, and construction. Given that the primary scope of remedial action is heavy civil construction, WPSC will likely contract with a heavy civil firm to serve as a general contractor and the general contractor will engage other supporting subcontractors, as necessary.

As part of the development of the Pre-Final RD, contract bid documents will be prepared for selecting the Remedial Contractor. Activities that will be conducted as part of the finalizing the contracting approach and selection of the Remedial Contractor include the following:

- Finalize the contracting strategy for bidding and contraction the various portions of the RA.
- Complete a pre-screening of potentially qualified contractors to perform the work which will include but not limited to conducing pre-screening interviews, soliciting pre-qualification packages and developing final recommendations to WPSC. Communication with potentially qualified bidders will be initiated early in the process so they can begin an assessment about the project requirements and time frame for contract award.
- Contract documents may be prepared using Environmental Remediation Documents as well as other previously completed contract documents.

Following contractor selection, a description of the contractor's qualifications and key personnel directing the RD will be provided to USEPA.

Following remedial action implementation, post remedy operations and maintenance will include horizontal engineered barrier inspection, groundwater monitoring, and sediment monitoring. WPSC will conduct post remediation operations and maintenance monitoring.

REFERENCES

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Tables

Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE

Chemical-Specific ARARs/TBC

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
		FEDERAL		
Groundwater	Groundwater Quality Standards	40 CFR Part 141 – Safe Drinking Water Act of 1974	Relevant and Appropriate	The National Primary Drinking Water Regulations establish health-based standards for public drinking water systems [maximum contaminant levels (MCLs)]. MCLs are legally enforceable federal drinking water standards and relevant and appropriate to groundwater.
		WISCONSIN		
Soil	Soil Cleanup Standards	Wis. Admin. § NR 720: Soil Cleanup Standards	Applicable	Soil Cleanup Standards are legally applicable to soil, preferred method for determining RCLs outlined based on EPA soil screening values and 10-6 for individual compounds and 10-5 for cumulative risk, alternate RCLs can be developed with input from WDNR.
Groundwater	Groundwater Quality Standards	Wis. Admin. § NR 140.01 and § NR 140.12: Groundwater Quality	Applicable	NR 140 Groundwater Quality Standards are legally applicable to all groundwater, regardless of groundwater use o Generally, NR 140 PALs are the groundwater cleanup goal for all sites, however, flexible closure requirements in NR 726 may be used to set ESs as the primary ROD goal, provided that an adequate source control action is conducted and groundwater monitoring shows a stable or receding plume everywhere groundwater is monitored, including source and NAPL areas.
		Wis. Admin. § NR 726.05(4), §NR 726.05(6), § NR 726.05(7), and § NR 726.05(8), Case Closure	Relevant and Appropriate	NR 726 Case Closure Cleanup requirements are relevant and appropriate
Soil Gas/Indoor Air – Chemical Specific	Indoor Air Quality and Vapor Migration	Wis. Admin. § NR 720 Soil Cleanup Standards	Applicable	NR 720: Soil Cleanup Standards are legally applicable.
		Wis. Admin. § NR 726.05(4), §NR 726.05(6), § NR 726.05(7), and § NR 726.05(8), Case Closure	Relevant and Appropriate	NR 726 Cleanup for Closure is relevant and appropriate o Indoor Air Quality Standards are used to develop Vapor Action Levels for MGP COCs in indoor air and Vapor Risk Screening Levels for MGP COCs in sub slab and soil gas, and in groundwater. o Actions must be taken to ensure soil and groundwater are remediated such that indoor air from vapor intrusion is addressed; the rule also requires vapor mitigation systems for occupied building if needed to address an immediate threat. o Note: Guidance (which would be a TBC) is planned to allow avoiding vapor mitigation systems in vacant buildings with VI issues provided a continuing obligation (CO) is put in place to require the RP to notify WDNR if the building use changes and possibly install a system.
Sediment	Surface Water Quality Standards	Wis. Admin. § NR 105.04 to §NR 105.07, § NR 105.10: Surface Water Quality Criteria and Secondary Values for Toxic Substances	TBC	Surface Water Quality Standards. Refer to: https://dnr.wi.gov/topic/SurfaceWater/standards.html
Surface Water	Surface Water Quality Standards		Applicable	Surface Water Quality Standards for the MGP-related COCs at the site are applicable to monitoring of surface water as part of evaluation of the existing cap.

Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE

Location-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
		FEDERAL		
Reactive Core Mat and Residual Sand Cover	Clean Water Act (CWA) (Section 401 and 404)	40 CFR 121, 230; & 33 CFR 320, 323, 325 and 328	Potentially Applicable if future contingent sediment remedial action is required	Regulates the discharge of dredge and fill materials into waters of the United States. Potentially applicable, if future contingent sediment remedial action is required.
		WISCONSIN		
Boom Landing Zone	Navigable Water Ways Requirements	Wis. Stat § 30.12; Wis. Stat. § 30.195, § 30.20: Navigable Waters, Harbors and Navigation	Potentially Applicable	Should soil excavation or other remedial activities impact the bank of the Menomonee River, Navigable Water Ways Requirements will apply.
		Wis. Stat § 281.15, §281.16 § 281.17, § 281.31,281.33, 281.34: Water and Sewage	Potentially Applicable	
		Wis. Admin. § NR 328.35 and § NR 328.38: Shore Erosion Control Structures in Navigable Waterways	Potentially Applicable	
		Wis. Admin. § NR 341.035; § NR 341.05; § NR 341.06 § NR 341.07§ NR 341.08: Grading on the Bank of Navigable Waterway	Potentially Applicable	

Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE

Soil Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
		FEDERAL		
		NONE IDENTIFIED		
		WISCONSIN		
Wastewater Discharges to POTW	Surface Water Effluent Standards, Criteria, and Limitations	Wis. Stat. § 281.15, § 281.16, § 281.17: Water and Sewage	Applicable	Surface water quality effluent standards, criteria and limitations are Applicable where dewatering during soil excavation may necessitate discharge to the Menomonee River. Discharge to POTW is an offsite action, and any pretreatment requirements would need to be met.
		Wis. Stat § 283: Pollution Discharge Elimination, Subchapter III Standards: Effluent Limitations		
		Wis. Admin. § NR 106.06, § NR 106 Subchapter V, § NR 106 Subchapter VI: Procedures for Calculating Water Quality Based Effluent Limitations for Point Source Discharges to Surface Waters		
		Wis. Admin. § NR 200.22- Application for Discharge Permits and Water Quality Standards Variances		
		Wis. Admin. §NR 207.03 to § NR 207.05: Water Quality Antidegradation		
		Wis. Admin. §NR 218.05 to § NR 218.11: Method and Manner for Sampling		
		Wis. Admin. § NR 219.04: Analytical Test Methods and Procedures		
Site Disturbance	Storm Water Runoff Requirements	Wis. Stat § NR 281.33: Water and Sewage	Applicable	All are Applicable. Storm water runoff requirements apply during excavation activities at sites equal to or greater than one acre that may result in discharge of storm water to the Menomonee River.
		Wis. Admin. § NR 216.46 and § NR 216.47: Storm water Discharge Permits		
		Wis. Admin. § NR 151.015 or § NR 151.01: Runoff Management		
Site Disturbance **In-Situ Treatment of Soil** **Soil that generates vapors**	Air Emissions Requirements, Criteria, Limitations	Wis. Admin. § NR 415.04(1), § NR 415.04(2Xa), § NR 415.04(2) b - Control of Particulate Emissions	Applicable	Air emission requirements will be applicable during soil excavation and blending activities that generate fugitive dust and/or vapors. Air emission requirements will be applicable to in-situ treatment alternatives that involve the generation of vapors.
		Wis. Admin. § NR 419.07 - Control of Organic Compound Emissions		
		Wis. Admin § NR 429.03 - Malodorous Emissions and Open Burning		
		Wis. Admin. §NR 445.07, § NR 445.09- Control of Hazardous Pollutants		

Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE

Groundwater Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
		FEDERAL		
		NONE IDENTIFIED		
		WISCONSIN		
All Groundwater Alternatives	Groundwater Monitor Well Requirements	Wis. Admin. § NR 141.055 to NR 141.31: Groundwater Monitor Well Requirements	Applicable	Groundwater monitoring is required to demonstrate the effectiveness of any groundwater remedy on reducing concentrations of MGP COCs.
		Wis. Stat.§ NR 28527: Air Pollution	Applicable	
In-Situ Chemical or Thermal Treatment	Air Emissions Requirements, Criteria, Limitations	Wis. Admin. § NR 415.04(1), § NR 415.04(2)(a), § NR 415.04(2)(b)- Control of Particulate Emissions	Applicable	Air Emission requirements, criteria and limitations will be applicable during remediation activities that generate vapors during injection, vapor recovery, and/or treatment of pumped groundwater.
		Wis. Admin. § NR 419.05(2); NR 419.07 (2)(a) and NR 419.07 (2)(b) - Control of Organic Compound Emissions	Applicable	
		Wis. Admin. § NR 429.03 - Malodorous Emissions and Open Burning	Applicable	
		Wis. Admin. §NR 431.03- Control of Visible Emissions	Applicable	
		Wis. Admin. §NR 445.07(1), §NR 445.09(1) to §NR	Applicable	
In-Situ Chemical Treatment **In-Situ Enhanced Bioremediation**	Injection Well Requirements	Wis. Stat. § 815.09 and § 815.10: Injection Wells	Applicable	Substantive requirements of the injection well regulation are applicable for in-situ chemical treatment via injection of fluids.
		Wis. Admin. § NR 140 Groundwater Quality, Subchapter III Evaluation and Response Procedures:	Applicable	

All Media Action-Specific ARARs

MEDIA	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	TYPE OF ARAR	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
		FEDERAL		
		NONE IDENTIFIED		
		WISCONSIN		
All Media – Chemical Specific	Laboratory Certification Requirement	Wis. Admin. § NR 149: Laboratory Certification and Registration Wis. Admin. § NR 299.04: Water Quality Certification	Applicable	Applicable. Any sampling during design and implementation must meet these requirements
Remediation Standards, Requirements, and Initiatives	Remedy selection, design, implementation and operation and maintenance requirements	Wis. Admin. §NR 724.13 §NR 724.17; § NR 724.19, Remedial and Interim Action Design, Implementation, Operation, Maintenance and Monitoring Requirements	Applicable	Applicable. The remedial action documents provide standards and requirements for remediation of contamination sites in Wisconsin. NR 722 is very similar to the NCP for remedy evaluation and selection.

Other Non-ARAR Requirements (Full Compliance is Required)

ALTERNATIVE COMPONENT	REQUIREMENT, CRITERIA, STANDARD, LIMIT	CITATION	RELATIONSHIP BETWEEN REQUIREMENT, CRITERIA, STANDARD AND/OR LIMIT AND ALTERNATIVE COMPONENT AND OTHER COMMENTS
FEDERAL			
NONE IDENTIFIED			
WISCONSIN			
Institutional Controls – any media	Notification for Residual Contamination and Continuing Obligation (CO) Requirements	Wis. Admin. § NR 725.05, § NR 725.07, and §NR 726.06 to § NR 726.15	Should WI CO responsibilities be used as additional ICs, then the rule requirements are applicable. To be enforceable, WDNR must issue an approval of a remedial action type plan with enforceable requirements for the continuing obligations. Enforcing COs at properties not controlled by the RP could be an issue.

Table 1 - Applicable or Relevant and Appropriate Requirements, and To Be Considered Guidance/Criteria for USEPA ROD-selected Remedy
WISCONSIN PUBLIC SERVICE CORPORATION - FORMER MARINETTE MANUFACTURED GAS PLANT SITE

To Be Considered Standards, Guidance, and Initiatives

STANDARD, GUIDELINE, INITIATIVE	CITATION	RELATIONSHIP BETWEEN TBC AND ALTERNATIVE COMPONENT
	FEDERAL	
	NONE IDENTIFIED	
	WISCONSIN	
Soil Cleanup Standards	WDNR Guidance Document: "Soil Residual Contaminant Level Determinations Using the U.S. EPA Regional Screening Level Web Calculator" (WDNR PUBL-WR-890, January 23, 2014) WDNR Guidance Document: "RR Program's RCL Spreadsheet Update" (WDNR-RR-052c, December 2015)	These documents provide guidance on applying the U.S. EPA Screening Level Web Calculator to Wisconsin soils to calculate soil cleanup standards.
Air Management Guidelines & Community Involvement	Wisconsin Bureau of Environmental and Occupational Health, Department of Health and Family Services: "Health-based Guidelines for Air Management and Community Involvement During Former Manufactured Gas Plant Clean-ups" (March 23, 2014)	This document provides guidance on developing Air Management Plans to protect human health during remedial activities at MGP sites in Wisconsin.
Soil Cover Guidance	WDNR Guidance Document: "Guidance for Cover Systems as Soil Performance Standard Remedies" (WDNR PUBL-RR-709, October 2013)	This document provides guidance on cover systems and soil performance standard remedies.
Remediation Standards, Requirements, and Initiatives	Wisconsin's Initiative for Sustainable Remediation and Redevelopment in the State of Wisconsin, A Practical Guide to Green and Sustainable Remediation in the State of Wisconsin. (WDNR Pub-RR-911, January 2012)	The Guide to Green and Sustainable Remediation provides guidance on implementing the US. EPA's Superfund Green Remediation Strategy (September 2010) at cleanup sites in Wisconsin.
Sediment Quality Guidelines	WDNR Guidance Document: "Wisconsin Consensus-Based Sediment Quality Guidelines (WDNR PUBL-WT-732, December 2003	This document provides guidelines on developing sediment cleanup levels that are protective of benthic macroinvertebrate species.
Vapor Intrusion Guidance	WDNR Guidance Document: "Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin" (WDNR PUBL-RR-800, December 2010). WDNR Guidance Document: "Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin" (WDNR PUBL-RR-800) Update (July 2012) WDNR Guidance Document: "Sub-slab Vapor Sampling Procedures" (WDNR PUBL-RR-986, July 2014).	These documents provide guidance on the investigation and remediation of the vapor intrusion pathway at contamination sites in Wisconsin and the basis for calculating Indoor Air Vapor Action Levels and Vapor Risk Screening Levels. Also provided is guidance on how vapor intrusion is addressed through continuing obligations applied at case closure at contaminated sites in Wisconsin.
Institutional Controls (Continuing Obligations) Requirements	WDNR Guidance Document: "Guidance on Case Closure and the Requirements for Managing Continuing Obligations" (WDNR PUBL-RR- 606, April 2014): WDNR Guidance Document: "DNR Case Closure Continuing Obligations: Vapor Intrusion" (WDNR PUBL-RR-042, Aug 2015)	These documents provide guidance on which vapor intrusion continuing obligations should be selected when preparing for case closure.

Acronyms

ARARs: Applicable or Relevant and Appropriate Requirements

CO: Continuing Obligation

MGP COCs: Manufactured Gas Plant Compounds of Concern

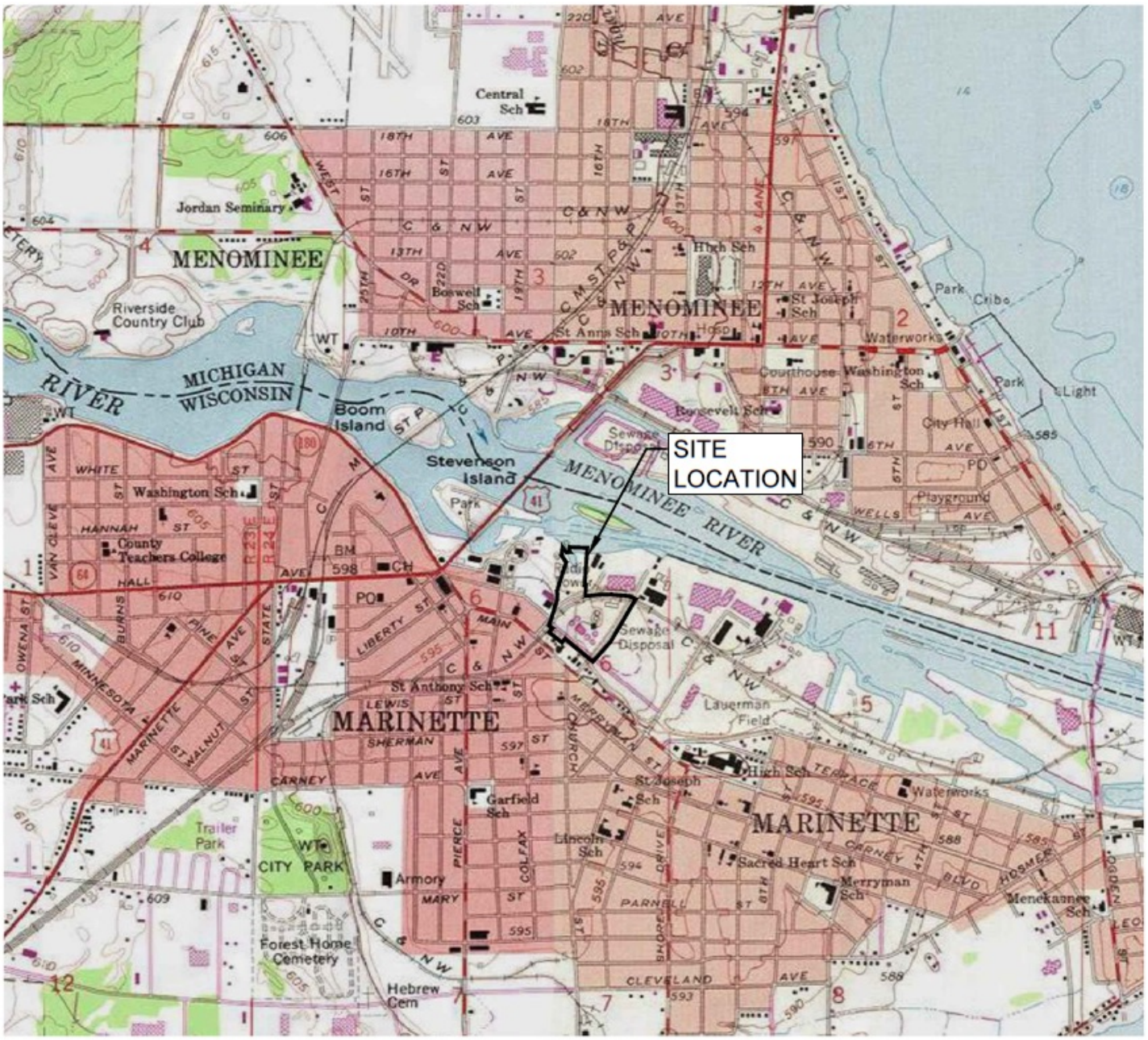
Wis. Stat.: Wisconsin Statute

WDNR: Wisconsin Department of Natural Resources

Wis. Admin: Wisconsin Administrative Code

WPDES: Wisconsin Pollution Discharge Elimination System

Figures



SOURCE NOTES:

1. NATIONAL GEOGRAPHIC TOPO. 1:24,000-SCALE MAPS FOR THE UNITED STATES. THE TOPO! MAPS ARE SEAMLESS, SCANNED IMAGES OF UNITED STATES GEOLOGICAL SURVEY (USGS) PAPER TOPOGRAPHIC MAPS. FOR MORE INFORMATION ON THIS MAP, VISIT US ONLINE AT HTTP://GOTO.ARCGISONLINE.COM/MAPS/USA_TOPO_MAPS COPYRIGHT:© 2011 NATIONAL GEOGRAPHIC SOCIETY, I-CUBED
2. COORDINATE SYSTEM IS WISCONSIN COUNTY COORDINATE SYSTEM, MARINETTE COUNTY, US FOOT.

QUADRANGLE LOCATION

N

0 1000 2000

SCALE IN FEET

CONTOUR INTERVAL 10 FEET

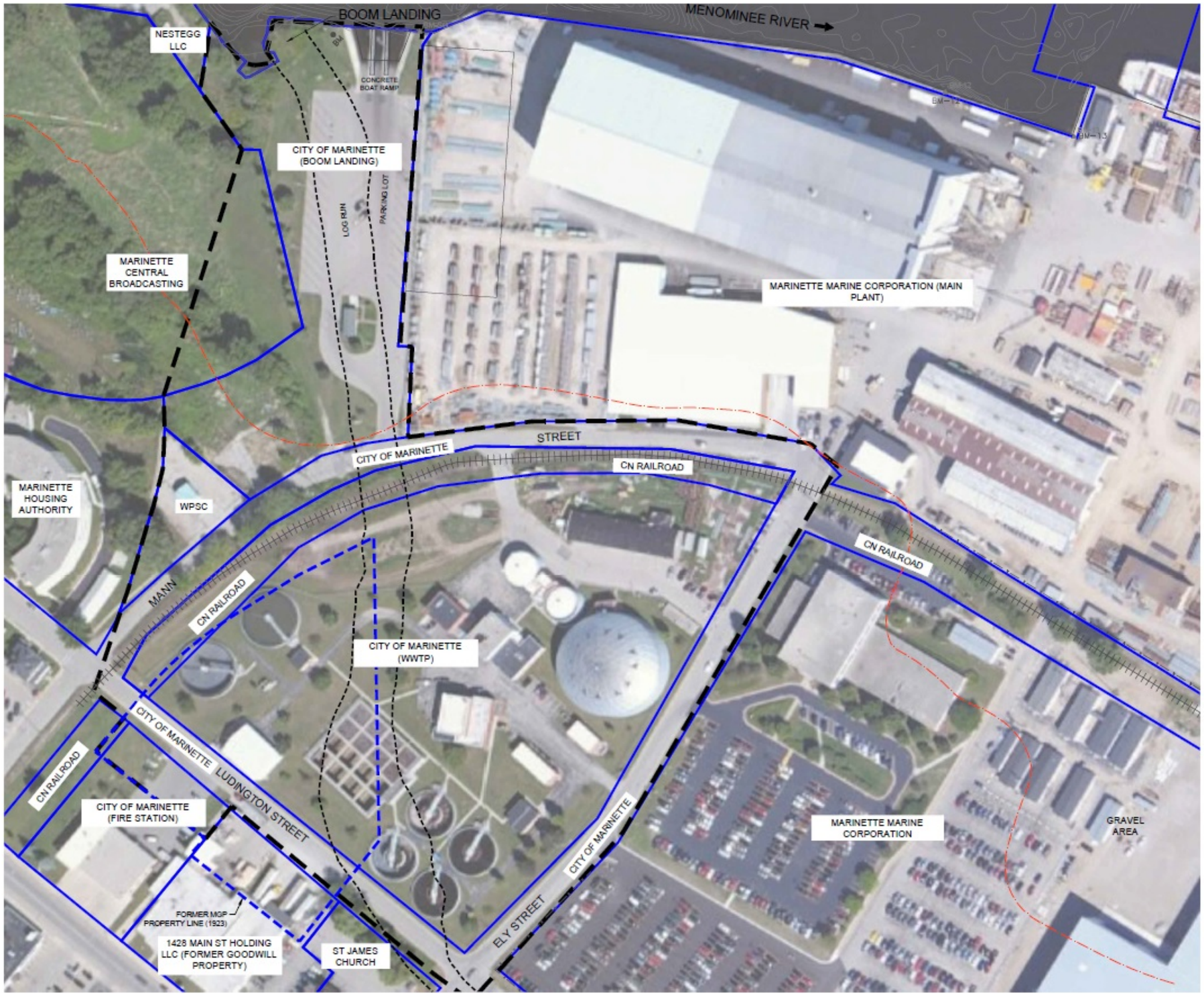
DRAWN BY/DATE:
KJB 4/19/18
REVIEWED BY/DATE:
MDB 4/19/18
APPROVED BY/DATE:
MDB 4/20/18

SITE LOCATION MAP

REMEDIAL DESIGN WORK PLAN
WPSC MARINETTE FORMER MGP SITE
MARINETTE, WI

PROJECT NO: 67979

FIGURE NO: 1



PROPERTY BOUNDARIES
FORMER MGP PROPERTY BOUNDARY (1923)
APPROXIMATE EXTENT OF UPLAND SITE
100 YEAR FLOOD BOUNDARY
FORMER SLOUGH/ LOG RUN
RAILROAD

N

0 75 150
SCALE IN FEET

SOURCE NOTES:

1. THIS DRAWING WAS DEVELOPED FROM A MAP BY THE CITY OF MARINETTE.
2. COORDINATE SYSTEM IS WISCONSIN COUNTY SYSTEMS: MARINETTE COUNTY, US FOOT.
3. VERTICAL CONTROL IS NAVD 88 DATUM
4. BUILDING LOCATIONS NORTH OF RAILROAD TRACKS WERE SUPPLIED BY MARINETTE MARINE CORPORATION.
5. PORTIONS OF THIS DRAWING ARE FROM HYDRO-SEARCH DRAWING.
6. EXISTING STRUCTURES AND UTILITIES FROM FOTH & VAN DYKE ENGINEERS/ARCHITECTS, GRADING PLAN, DIGITAL FILE 7m755c06.DWG, RECORD DRAWING REVISIONS 2/22/90, AND FROM SMET CONSTRUCTION SERVICES PDF DRAWING SET "MARINETTE MARINE BLDG 32 OUTFITTING", SHEET C1.1, DATED APRIL 24, 2012.
7. 100 YR FLOOD PLAIN FROM US DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT MAP, FLOOD INSURANCE RATE MAP, EFFECTIVE MARCH 1978.

DRAWN BY/DATE:
KJB 4/19/18
REVIEWED BY/DATE:
MDB 4/19/18
APPROVED BY/DATE:
MDB 4/20/18

SITE LAYOUT AND EXISTING STRUCTURES

REMEDIAL DESIGN WORK PLAN
WPSC MARINETTE FORMER MGP SITE
MARINETTE, WI

PROJECT NO: 67979

FIGURE NO: 2

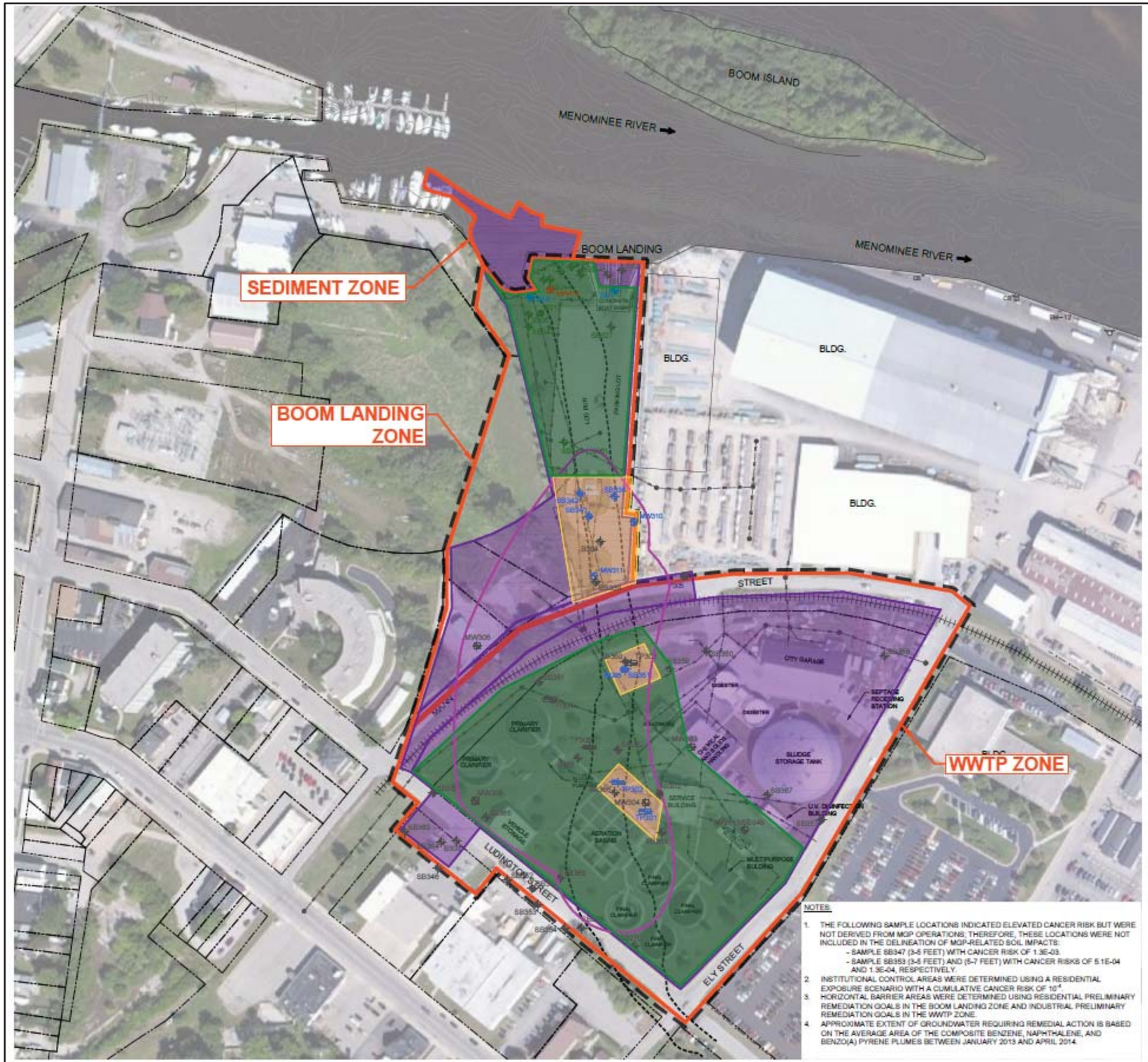
DRAWN BY/DATE: KJB 4/19/18
REVIEWED BY/DATE: MDB 4/19/18
APPROVED BY/DATE: MDB 4/20/18

CURRENT SITE LAYOUT AND ZONING

REMEDIAL DESIGN WORK PLAN
WPSC MARINETTE FORMER MGP SITE
MARINETTE, WI

PROJECT NO:

67979 FIGURE NO: 3



NOTES:

1. THE FOLLOWING SAMPLE LOCATIONS INDICATED ELEVATED CANCER RISK BUT WERE NOT DERIVED FROM MGP OPERATIONS; THEREFORE, THESE LOCATIONS WERE NOT INCLUDED IN THE DELINEATION OF MGP-RELATED SOIL IMPACTS:
   - SAMPLE SB347 (3-5 FEET) WITH CANCER RISK OF 1.3E-03.
   - SAMPLE SB353 (3-5 FEET) AND (5-7 FEET) WITH CANCER RISKS OF 5.1E-04 AND 1.3E-04, RESPECTIVELY.
2. INSTITUTIONAL CONTROL AREAS WERE DETERMINED USING A RESIDENTIAL EXPOSURE SCENARIO WITH A CUMULATIVE CANCER RISK OF 10^{-4}.
3. HORIZONTAL BARRIER AREAS WERE DETERMINED USING RESIDENTIAL PRELIMINARY REMEDIATION GOALS IN THE BOOM LANDING ZONE AND INDUSTRIAL PRELIMINARY REMEDIATION GOALS IN THE WWTP ZONE.
4. APPROXIMATE EXTENT OF GROUNDWATER REQUIRING REMEDIAL ACTION IS BASED ON THE AVERAGE AREA OF THE COMPOSITE BENZENE, NAPHTHALENE, AND BENZO(A) PYRENE PLUMES BETWEEN JANUARY 2013 AND APRIL 2014.

MW310 LOCATIONS WITH OBSERVATIONS OF MGP RESIDUALS

MW306 LOCATIONS WITH NO OBSERVATIONS OF MGP RESIDUALS

MW410 PROPOSED MONITORING WELL

APPROXIMATE EXTENT OF UPLAND SITE

APPROXIMATE EXTENT OF GROUNDWATER REQUIRING REMEDIAL ACTION

PROPERTY BOUNDARY

FORMER SLOUGH/ LOG RUN

RAILROAD

REMEDIATION ZONE

SOURCE REMOVAL AREA

INSTITUTIONAL CONTROL AREA

HORIZONTAL BARRIER AREA

GAS

SANITARY SEWER

STORM SEWER

OVERHEAD ELECTRIC

UNDERGROUND ELECTRIC

WATER

SUMMARY OF ALTERNATIVE 4			
SOIL	GROUNDWATER	SOIL GAS	SEDIMENT
Institutional Controls	Institutional Controls	Institutional Controls	Institutional Controls[2]
Excavation and Offsite Disposal - Boom Landing Source Material	In-situ Treatment[1]		Monitoring[3]
Excavation and Offsite Disposal - Accessible WWTP Source Material	Monitored Natural Attenuation		
Horizontal Engineered Surface Barrier - Shallow Soil with Direct Contact			

1. - Assumes application of an in-situ reagent (oxidant or bio-stimulant) on the soil excavation bottom
2. - Assumes use of Wisconsin GIS Registry to restrict removal of reactive core mat or overlying protective rip-rap
3. - Assumes monitoring of residual sand cover and reactive core mat

N

0 100 200

SCALE IN FEET

SOURCE NOTES:

1. THIS DRAWING WAS DEVELOPED FROM A MAP BY THE CITY OF MARINETTE.
2. VERTICAL CONTROL IS NAVD 88 DATUM
3. BUILDING LOCATIONS NORTH OF RAILROAD TRACKS WERE SUPPLIED BY MARINETTE MARINE CORPORATION.
4. PORTIONS OF THIS DRAWING ARE FROM HYDRO-SEARCH DRAWING.
5. EXISTING STRUCTURES AND UTILITIES FROM FOTH & VAN DYKE ENGINEERS/ARCHITECTS, GRADING PLAN, DIGITAL FILE 7m755c06.DWG, RECORD DRAWING REVISIONS 2/22/90, AND FROM SMET CONSTRUCTION SERVICES PDF DRAWING SET "MARINETTE MARINE BLDG 32 OUTFITTING", SHEET C1.1, DATED APRIL 24, 2012.

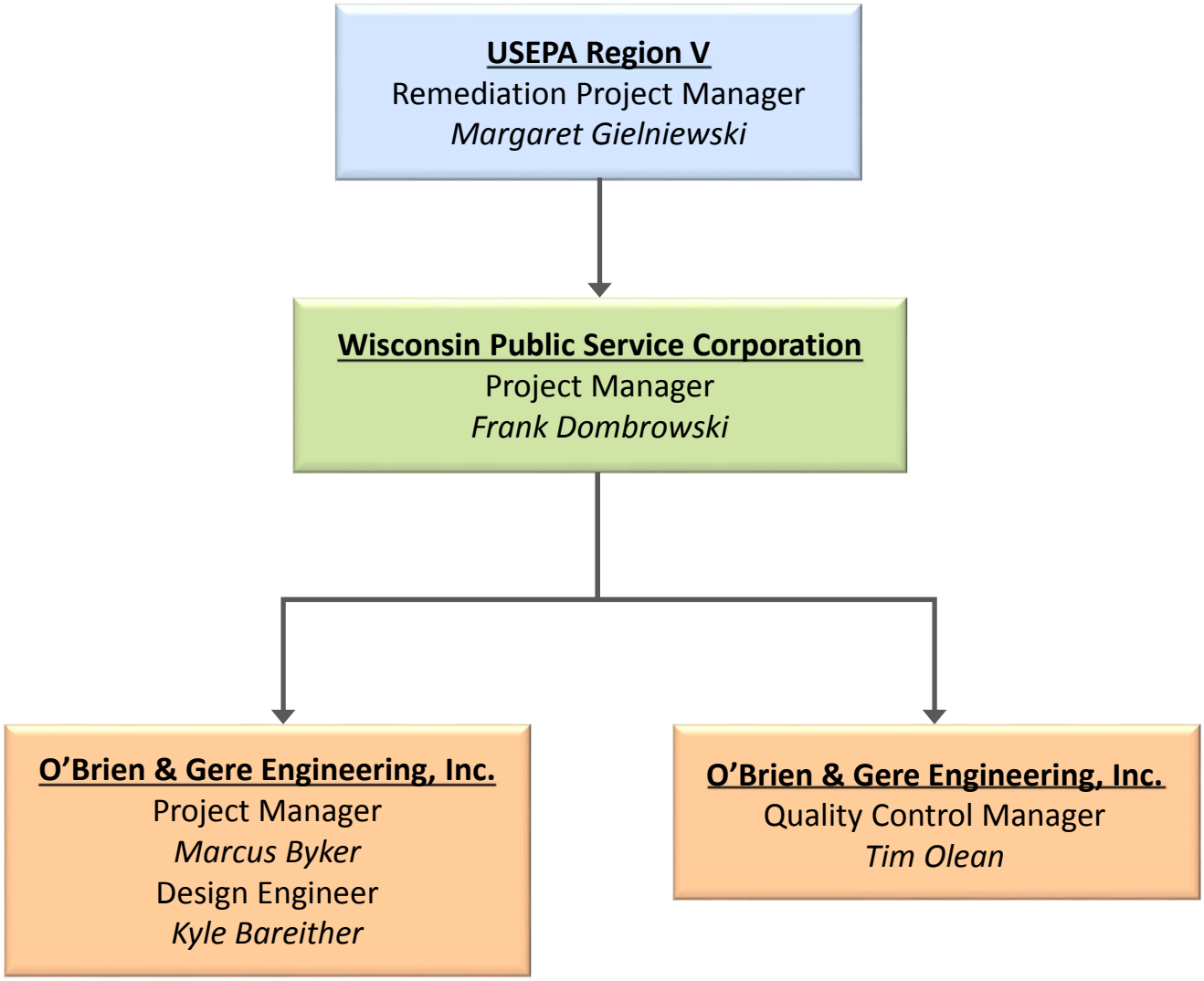
DRAWN BY/DATE: KJB 4/19/18
REVIEWED BY/DATE: MDB 4/19/18
APPROVED BY/DATE: MDB 4/20/18

FS-LEVEL SUMMARY OF USEPA-SELECTED REMEDY

REMEDIAL DESIGN WORK PLAN
WPSC MARINETTE FORMER MGP SITE
MARINETTE, WI

PROJECT NO:

67979 FIGURE NO: 4



DRAWN BY/DATE:
KJB 4/19/18
REVIEWED BY/DATE:
MDB 4/19/18
APPROVED BY/DATE:
MDB 4/20/18

PROJECT TEAM ORGANIZATION

REMEDIAL DESIGN WORK PLAN
WPSC MARINETTE FORMER MGP SITE
MARINETTE, WI

PROJECT NO: 67979

FIGURE NO: 5

Appendix A

Draft Health and Safety Plan

MULTI-SITE HEALTH AND SAFETY PLAN

FORMER MANUFACTURED GAS PLANT SITES

Prepared for:

Integrys
130 East Randolph Drive
Chicago, Illinois 60601

Prepared For Use By:

The Consultant/Contractor

Revision 2
August 2, 2007

MULTI-SITE HEALTH AND SAFETY PLAN SUMMARY

Prior to initiating site-specific field activities, the following information will be provided to USEPA and to each field staff member within the Site-Specific Work Plan. A copy of this Health and Safety Plan (HASP) will be maintained on site during field activities and updated as determined necessary by the Project Manger. Furthermore, any modifications to this HASP will be included within the Site-Specific Work Plan.

Site Address:

Major Cross Roads:

Hospital Address:

Direction to Hospital from Site (see map below):

Activity(s) and Dates of Work:

Description of Site (See map below):

Health/Safety Hazards on Site:

Chemical	Media	Maximum Concentration	Routes of Exposure
Volatile Organic Compounds	Water & Soil		Inhalation, ingestion, skin or eye contact
Semi-Volatile Organic Compounds	Water & Soil		Inhalation, ingestion, skin or eye contact
Metals	Water & Soil		Inhalation, ingestion, skin or eye contact
Cyanide	Water & Soil		Inhalation, ingestion, skin or eye contact
Others based on Site-Specific conditions			

The safety coordinator/emergency coordinator will be the consultant's/contractor's staff personnel supervising the field investigation/work.

Protective Equipment/Instruments:

In general, personal protective equipment (PPE) will be used as specified on Table 1 for the anticipated project tasks. The project manager may require additional PPE based on field conditions or additional data collection. A list of the PPE required for the various site activities is listed on Table 1.

Air Monitoring:

In general, a PID (and possibly a CGM) will be used to monitor air quality in the work zone and breathing zone during site investigation activities. Tasks requiring use of either the PID or CGM are listed in Table 1. Use of the PID will be continuous during test pit excavation and sampling, and sporadically during soil boring sampling.

Actions levels for the PID are listed below and discussed in more detail in Section 7.3. The VOC action levels, unless modified in the Work Plan, include the following:

- Occurs when a reading of 50 parts per million (ppm) is sustained on PID it is held at a constant height either in the excavation or the breathing zone. (Sustained readings last more than 30 seconds and the meter either continues to climb or remains relatively stable. Wildly fluctuating readings require a calibration check).

- Sustained readings of 50 ppm require use of either full-face or half-face respirators utilizing Organic Vapor cartridge filters.

- Air quality monitoring continues to ensure that PID readings do not exceed sustained readings of 500 ppm.

- If the 500-ppm action level is achieved, all activities on the site will immediately stop. The consultant/contractor PM will be contacted prior to taking any further action on the site.

Safety Equipment:
Fire extinguisher and first aid kit in consultant's/contractor's field vehicles

EMERGENCY CONTACT LIST

Emergency contact phone numbers will be provided in the Site-Specific Work Plan. The emergency numbers will be confirmed prior to initiating field activities.

Client Contact:	See Work Plan(s)	See Work Plan(s)
Fire Dept:		
Police:		
Sheriff:		
Local Utility		
Local Water Co.		
Consultant/Contractor:		
Ambulance or Emergency. Medical Services	.	
Subcontractor(s):		
Hospital:		
Field Staff Emergency Contact		

Route to Hospital: A copy of the map with the route to the hospital will be provided in the Site-Specific Work Plan. The route will be confirmed prior to initiating field activities.

Table 1. Summary of PPE by Sampling Activities

PPE Required	Site Reconnaissance/Field Mobilization	Drilling (monitoring wells/bore holes)	Monitoring Well Development and Conductivity Testing	Groundwater Levels and Sampling	Soil Sampling (heavy equipment or drill rig)	Soil Sampling (hand augers or shovels)	Test Pit Excavation/Trenching	Surface Water Sampling (from land or shallow wading)	Surface Water Sampling (water craft)	Sediment Sampling (shallow wading)	Sediment Sampling (water craft)	Subsurface structure inspection (from surface)
Steel-Toed Boots (Rubber)		Av	Av	Av	Av	Av	Av	Av	Av	Av	Av	Av
Steel-Toed Boots (Leather)	X	X	X	X	X	X	X	X	X	Av	X	X
Hard Hat		X			X		X				X	X
Safety Glasses/Goggles	X	X	X	X	X	X	X	X	X	X	X	X
Gloves-Inner (Nitrile)	Av	X	X	X	X	X	X	X	X	X	X	Av
Gloves-Outer (Nitrile)		X	X	X	X	X	X	X	X	X	X	
Orange Vest	X	X	X	X	X	X	X	X	X	X	X	X
Life Vest								X	X	X	X	
Tyvek Coverall		Av			Av	Av	Av			Av	Av	
Half-Face Respirator					Av	Av	Av					
Respirator Cartridge (Hepa or Org. Vapor)					X	X	X					
Photoionization Detector (PID)		Av			Av	Av	Av					X
Combustible Gas Meter (CGM)												X
Other												

Key: X = PPE Required
Av = Have available at work site
Glove types may be altered based on field conditions to include Vinyl, Neoprene, and/or Latex
"Other" required or to be available PPE will be identified for each task in the Site-Specific Work Plan.

FIELD HEALTH & SAFETY BRIEFING

Project # _____ Task # _____

I HEREBY CERTIFY THAT I HAVE READ AND UNDERSTOOD ALL HEALTH AND SAFETY PROCEDURES AS STATED HEREIN:

Name and Affiliation (printed)	**Signature**	**Date**

HASP was received from subcontracting company.

☐ YES ☐ NO ☐ Not Applicable

HASP training documentation was received from subcontracting company

☐ YES ☐ NO ☐ Not Applicable

This page should be copied after it has been signed and put into the project file.

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APPENDICES

1 INTRODUCTION

1.1 Purpose and Scope

This document describes the health and safety procedures and requirements for the installation of borings/wells, test pit excavations, sampling of soil (surface and subsurface), groundwater, surface water and sediment and subsurface structure inspection (from ground surface). This document is intended to serve as a Multi-Site Health and Safety Plan (HASP) to ensure that the field work performed by the consultant/contractor is done in compliance with applicable federal occupational safety and health regulations. Any modifications will be included in the Work Plan. All subcontractors shall be made aware of the requirements of this plan; however, subcontractors are required to have their own plan for the health and safety of their own employees and for following all applicable federal, state, and local regulations.

In compliance with HAZWOPER, a comprehensive work plan will be developed for each site to evaluate the logistics and resources needed to reach work objectives for site operations. The work plan will identify cleanup activities, methods for accomplishing the objectives (sampling plans), and normal operating procedures. Comprehensive site specific work plans will be available on location at each site along with a Multi-Site Field Sampling Quality Assurance Project Plan (QAPP) and Site-Specific Work Plan.

1.2 Health and Safety Plan Modification Procedures

Due to varying site conditions or the finding of unanticipated hazards, it may be necessary to revise the HASP. Necessary plan changes that call for more stringent procedures or a higher level of personal protective equipment (PPE) may be made at any time by the Project Manager (PM) or Task Leader in cooperation with the Project Health and Safety Officer (PHSO). The PM should be notified at the soonest available opportunity. HASP revisions will be included as part of each site specific Work Plan.

Plan changes that would make safety procedures or PPE requirements less stringent may be made only upon approval of the PM after consultation with the Corporate Health and Safety (CHS). Plan changes must always be put in writing and communicated to all field personnel.

2 KEY PERSONNEL/IDENTIFICATION OF H&S PERSONNEL

2.1 Key Personnel

Responsibilities for health and safety compliance issues associated with hazardous waste operations are primarily vested in the project organization, with support from appropriate health and safety professionals on consultant's/contractor's technical and administrative staffs.

2.2 Site-Specific Health and Safety Personnel and Organizational Responsibility

2.2.1 Corporate Health and Safety

The CHS acts as a technical resource to all consultant/contractor offices on health and safety matters. This person is responsible for ensuring that all consultant/contractor health and safety programs comply with applicable federal, state, and local statutes for safety and health protection; executive orders; operating orders; permits and regulations; and company policies and procedures. The CHS is also responsible for review and approval of all site-specific HASPs, serves in a consultation capacity to the technical staff on health and safety-related issues, and has the authority to conduct health and safety audits.

2.2.2 Project Manager

The PM is accountable for health and safety compliance on his or her projects. The PM is responsible for the technical and financial execution of the project, and has the authority to commit resources, adopt program policies and procedures, and approve expenditures and subcontracts. The PM will ensure that adequate resources are budgeted and available to implement a sound health and safety program and that appropriate technical resources are brought in to support the health and safety needs of the project. The PM will ensure that health and safety is a high priority in planning fieldwork and or lab studies, and that

adequate resources are available to develop and implement an appropriate project-specific health and safety plan.

2.2.3 Project Health and Safety Officer

The Project Health and Safety Officer (PHSO) is responsible for developing and implementing the project- or site-specific Health and Safety Plan. In the event a PHSO has not been identified for a specific project, the PM will assume those responsibilities. The PM is ultimately responsible for health and safety for the project. It is the responsibility of the PM to report any unsafe conditions reported by the project staff to the CHS and to work cooperatively to mitigate unsafe conditions. The PHSO will also ensure compliance with health and safety requirements presented in this Plan. The PM will serve as the PHSO unless site-specific hazards are identified warranting assignment of a PHSO to the project. To meet these responsibilities, the PM/PHSO may:

- Act as a health and safety consultant to the project field staff;
- Provide site-specific training to all staff assigned to work at the site;
- Review and confirm any changes in personal protective clothing or respiratory protection requirements;
- Require the specific health and safety precautions be taken before personnel enter a site;
- Restrict access to the site or a portion thereof;
- Perform necessary personnel monitoring;
- Stop work when the health or safety of project personnel are jeopardized and order the immediate evacuation of personnel from any area of the site;
- Require personnel to obtain immediate medical attention if warranted;
- Provide health and safety briefings to all site visitors; and
- Enforce the requirements stated in the Corporate Health and Safety Manual and the project- or site-specific Health and Safety Plan.

2.2.4 Field Team Members

All consultant/contractor personnel must know, understand and comply with the requirements of this Plan developed for their projects. Field personnel will:

- Read and understand all applicable health and safety plans;
- Perform their work safely;
- Be aware of and alert for signs and symptoms of work-related injuries and illnesses; and
- Promptly report any unsafe conditions that may occur on site to the PHSO, PM, and/or CHS.

2.2.5 Subcontractors

Subcontractors have primary responsibility for the health and safety of their own employees. However, consultant/contractor is required by OSHA standards (e.g., 29 CFR 1910.120) to provide information to its subcontractors on known or potential workplace hazards, as well as the methods proposed to manage the identified hazards.

It is currently OSHA policy to issue citations to prime contractors in the event that their subcontractor is found to be out of compliance with regulatory requirements. The consultant/contractor may incur civil penalties as a result of non-compliance with regulatory requirements by its subcontractors and/or injuries or illnesses incurred by the subcontractor's staff. Personal injury suits have been successfully brought against prime contractors in instances where a subcontractor's employee has demonstrated that the lack of health and safety oversight on the part of a prime contractor played a role in his or her sustaining an injury or illness.

The consultant/contractor intends to manage its subcontractors to protect the health and well being of consultant's/contractor's staff. The consultant's/contractor's objective is to manage subcontractors in a way that limits the consultant's/contractors and the client's liabilities related to subcontractor performance, including management of health and safety issues. To achieve this objective, a minimum level of subcontractor surveillance, with respect to health and safety issues is required.

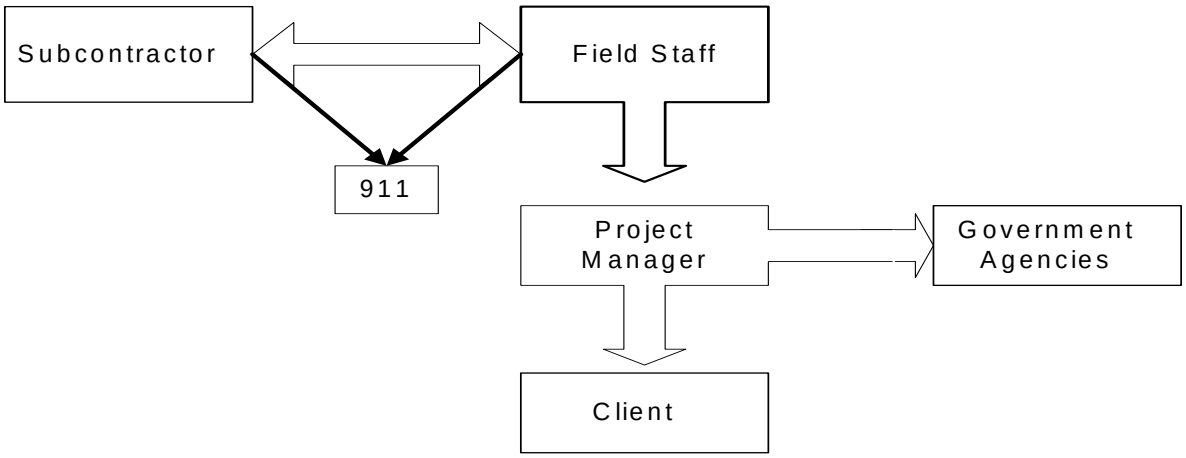
When required by the consultant/contractor, the subcontractor must review project-specific health and safety information and hazards, and develop and implement a health and safety plan. This plan must

comply with all applicable health and safety regulations and any project-specific requirements that the consultant/contractor has specified. The subcontractor must provide the consultant/contractor with a copy of this plan before the start of work. The consultant's/contractor's acceptance of the subcontractor's plan does not mean that the consultant/contractor concurs with the adequacy of the plan for protection of the health and safety of the subcontractor's employees. That responsibility rests solely with the subcontractor. The consultant's/contractor's review of subcontractor health and safety plans will be for the purposes of: 1) assessing potential health and safety impacts to the consultant's/contractor's personnel and 2) meeting the consultant's/contractors legal responsibilities as a prime contractor. Any deficiencies in the subcontractor's plan or inconsistencies in proposed work practices between the consultant/contractor and its subcontractor should be identified. If appropriate, these deficiencies or differences should be resolved before the work begins.

2.3 Communication

Field staff and subcontractors are both permitted to call 911 in an emergency situation. Emergency numbers will be provided in the Site-Specific HASP Summary to be included as an appendix to the Site-Specific Work Plan. As part of preparing the Site-Specific HASP Summary, 911 services will be verified for each site location. Assuming the PM is not on-site, the field staff should contact the PM as soon as possible regarding the on-site situation. It is then up to the discretion of the PM to contact the Client or Government Agencies if the on-site situation requires. The following flow chart is a depiction of a typical on-site communication procedure (assuming the PM is not on-site).

Communication Procedure



3 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS

3.1 Historical Overview of Site

A historical overview of the site along with details of the project description is provided in the project Work Plan. Further, the QAPP presents the organization, objectives, planned activities, and specific Quality Assurance/Quality Control (QA/QC) procedures.

Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses to be performed are described in the consultant's/contractor's Standard Operating Procedures (SOPs) included in the Multi-Site QAPP. All QA/QC procedures are structured in accordance with applicable technical standards, U.S. EPA's requirements, regulations, guidance, and technical standards.

3.2 Risk Analysis-General

All personnel in the vicinity of the drilling, excavation, and sampling operations are not only subject to the hazards of direct exposure, but also to dangers posed by machinery operation. In addition, stresses due to working in protective clothing will be encountered. Physical, chemical, and biological hazards are present at most job sites.

3.2.1 Heat/Cold Stress

Temperature extremes, wet working conditions, and PPE can all combine to cause injury and illness to field workers. In general, high temperatures and/or impermeable PPE can induce heat stress. Cold stress can be induced by low temperatures and/or wet skin or clothing.

PRECAUTIONS

Heat Stress: Wear thin cotton clothing under Tyvek™ suits; have thirst liquids available; and, stop work if heat exhaustion occurs (i.e. light headedness, profuse sweating).

Cold Stress: Dress in layers and regulate clothing to activity levels; wear plenty of layer clothing (so layers can be added or removed); cover exposed skin when windy; glove liners can keep hands warm but reduce dexterity; use face masks and helmet liners to keep head warm and, stop work if conditions get too cold.

SYMPTOMS

Heat Stress: Profuse sweating, weakness, rapid pulse, dizziness, nausea, and headache. If heat stroke occurs, the skin will be hot, dry and flushed.

Cold Stress: Involuntary shivering, speech difficulty, loss of manual dexterity, and memory lapse. The most severe localized form of cold stress, frostbite, causes the skin to become numb, pale, hard, and cold.

FIRST AID MEASURES

Heat Stress: Move the person to a shaded, cool area. Have them drink large quantities of fluids. In the case of heat stroke, seek medical attention immediately.

Cold Stress: Move the person to a heated, sheltered area. Immerse exposed body parts in warm (104-130 ^{o}F) water. If exposed skin is numb, do not rub it. If frostbite is suspected, seek medical attention as soon as possible.

3.2.2 Slips, Trips, and Falls

The most common hazards that will be encountered will be slips, trips, and falls. Common sense will be used to avoid these hazards. When working on slippery surfaces, tasks will be planned to decrease the risk of slipping. Slippery surfaces will be avoided, work and travel will not be hurried, and good housekeeping will be maintained. All personnel must vigilantly observe where they are working and walking to avoid slips, trips, and falls.

3.2.3 Vehicular Traffic

Another common hazard that will be encountered at many sites will be vehicle traffic, including cars, trucks, drilling rigs and heavy machinery. When it is necessary to move a vehicle, all site drivers must be

mindful that pedestrians are present on site. If appropriate, site personnel on foot may guide site drivers while moving vehicles to alert and protect non-site personnel. Site personnel on foot must avoid standing in blind spots or in high traffic areas, be aware of vehicle locations, and make eye contact with site drivers if crossing the path of vehicles is necessary. All site personnel on foot must vigilantly observe where they are working and walking to avoid being struck by vehicles which, for one reason or another, are moving. Finally, when working in high traffic areas (i.e., on the edge or in the middle of city streets or heavily used parking areas) site personnel are required to set up traffic cones and wear orange traffic safety vests to alert drivers to their presence.

Work performed in rail yards or along railroad tracks poses an additional hazard. Numerous incidents have occurred when working between or alongside rail lines and have resulted in serious injury or death. Therefore, the following rules must be followed when working near rail lines:

- Never walk or step on a railroad track. The tracks can be slick and injury due to slipping off a track is possible.
- Never run over tracks - Always Walk. Tripping injuries can occur when running over the tracks which can result in serious head injuries.
- Never stand between the tracks. When necessary, walk across the railroad tracks and stand to one side or the other of a rail line.
- Always wear a hard hat, eye protection, steel-toed boots and an orange reflective vest for personal protection.

In addition to these rules, whenever work is done near railroad tracks or in a railroad right-of-way, the railroad company must be contacted and a flagman requested to monitor work activities. No work will be done without a railroad flagman being present unless the railroad company expressly permits it.

3.2.4 Hunting Season

It is possible field activities will be conducted during hunting seasons and may pose a risk to site workers. The hunting season dates for the location of the project (if they exist) will be reviewed prior to conducting field activities in non-urban areas.

Site workers will wear a minimum of at least 50% of the outer clothing above the waist in 100% blaze orange (faded blaze orange is not acceptable) to alert potential hunters to their presence. If site work is

performed in densely vegetated locations, site personnel may post signs along access locations to indicate their presence.

3.2.5 Exposure to Excessive Noise

Overexposure to noise can result in hearing loss. If it is difficult to hear normal speech when the speaker is 3 to 4 feet from the listener, and that condition is present for more than four hours a day, it will be assumed that the noise level exceeds 85 dBA and appropriate hearing protection will be used. The disposable "ear plug" type hearing protectors are recommended.

3.2.6 Chemical Hazards

PPE requirements are stated in Personnel Protection Section 5 of this Plan. Material Safety Data Sheets (MSDSs) for suspected contaminants are contained in Appendix A.

3.2.7 Biological Hazards

During warm weather months, potential biological hazards include venomous insects, snakebites, and poisonous plants. Appropriate safety measures, such as the use of insect repellent and probing of possible nesting areas, will be taken to prevent exposure to biological hazards. Long sleeves and pants will provide protection from contact with poisonous plants.

3.2.8 Thunderstorms and Rain

Drilling/excavation and sampling activities during electrical storms poses a hazard of electrocution by lightning strike, and adverse working conditions, as well as high winds tipping the drill rig. All drilling/excavation and sampling activities will stop and the drilling rig mast will be lowered at the approach of a thunderstorm. Drilling activities during rainstorms can cause not only slippery conditions but also excess friction on cathead pulleys. This can cause dangerous conditions during drive sampling operations. Therefore all drive sampling operations will cease and, depending on the PHSO's assessment, drilling may be halted.

3.3 Risk Analysis-Task-by-Task

Table 1. Anticipated Task Hazards

	Hazards													
					Physical									
	Chemical	Biological	Explosive	General Safety	Heat	Cold	Traffic	Noise	Slip, Trips, Falls	Heavy Equipment	Underground utilities	Overhead Power	Lines	Trench/Excavation
Site reconnaissance/field mobilization		X	X	X	X	X	X	X	X	X	X		X	
Well and bore hole drilling	X	X	X	X	X	X	X	X	X	X	X		X	
Monitoring well development	X	X		X	X	X	X		X					
Groundwater level measurements	X	X		X	X	X	X		X					
Groundwater and soil sampling	X	X		X	X	X	X		X					X
Test pits and excavation	X	X	X	X	X	X	X	X	X	X	X		X	X
Surface water sampling	X	X		X	X	X	X	X	X	X			X	
Sampling through ice	X	X		X		X	X	X	X	X			X	

3.3.1 Well and Bore Hole Drilling

In addition to the possibility of contact with the above listed chemicals, physical hazards associated with well and bore hole drilling include:

- Snapping cables;
- Brush and equipment fires;
- Being hit by equipment;
- Being caught in rotating tools;
- Falling objects;
- Exposure to excessive noise; and

- Contact with energized electrical lines.

3.3.2 Air Rotary Drilling

This type of drilling, in addition to the above listed hazards, may also expose field personnel to blowing dust and high-pressure airlines.

3.3.3 Groundwater, Seep, Soil, and Pipe Sampling

Collection of these samples presents the hazard of inhalation exposure to and skin contact with the substances listed in Appendix A.

3.3.4 Drilling/Excavation near Overhead Electrical Lines

Drilling or excavation activities near overhead electrical lines present a serious electrocution hazard. Safe work distance must be maintained. This distance is a function of the humidity and the voltage present. Should work in the proximity of overhead lines be required, the minimum clearance will be determined based on OSHA standards.

3.3.5 Drilling/Excavation near Underground Electrical/Utility Lines

Buried electrical/utility lines present a hidden danger while drilling/excavating. The subcontractor will be responsible for contacting the local underground utility locator service (i.e. Diggers Hotline in Chicago and Wisconsin and JULIE in Illinois outside of Chicago); however, it is the responsibility of the consultant's/contractor's PM or PHSO to ensure that the subcontractor has contacted the appropriate locator service to ensure that site activities can be completed in accordance with the schedule. The locator service will mark all underground lines to ensure safe working conditions. Drilling/excavation will not occur within three feet of any marked underground line.

3.3.6 Test Pits and Excavation

Test pits and excavations pose a serious threat of injury resulting from falls or excavation wall collapses. During excavation or digging activities an exclusion work zone will be established around excavating

machinery. All bystanders and on-lookers will be prohibited from entering this work zone while the excavating machinery is in operation. The work zone will be large enough so that the excavating machinery (i.e. trackhoe, etc.) can rotate 360^{o} without extending out of the work zone. After the excavation is completed it should either be backfilled immediately or the entire excavation will be encircled with a physical barrier (i.e. barricades, orange excavation fencing, etc.) which will limit access to the excavation and decrease the likelihood of injury resulting from falls. Any excavation greater than four feet deep will NOT be entered unless the walls of the excavation have been reinforced to prevent wall collapse. Entry into any excavation greater than four feet deep will constitute a confined space entry procedure. Therefore, no excavation entrance is allowed.

A PID will be used to monitor air quality in the breathing zone of the work area for VOC vapor levels and in an excavation (See Section 7 of this plan). Prior to Contractor Personnel entering any excavations to install piping or any other equipment, the PID will be lowered into the excavation to determine air quality in the excavation. Confined spaces will not be entered.

3.3.7 Operations on Surface Waters

The procedures specified in this subsection are designed to protect the consultant's/contractor's staff when conducting work activities involving water craft vessels on surface waters. Governmental laws and regulations regarding onshore waters are under the jurisdiction of the Unites States Coast Guard (USCG-Great Lakes) and the State and City the work is being conducted in. Always Work In Pairs – Never Conduct Work Activities Alone.

Due to the location and manner in which work activities are conducted, the threat of falling into the water is very high. Carry retrieval equipment including:

- 50 foot of line at least 3/8 inch diameter, and
- Two - six (6) foot long wooden 2" x 4"s, if necessary.

3.3.7.1 Scope and Applicability

The procedures specified in this subsection apply to all work activities involving surface waters (including sediment sampling). The highest ranking consultant/contractor staff member (i.e. PM, Field

Task Leader) at the work site is responsible for implementing this plan. The work activities will not be initiated prior to receiving approval from the PM.

- Work activities can be conducted in "open water" or "ice" conditions; and
- Each staff person at the site is responsible for following these procedures.

3.3.7.2 Water Craft

The following procedures will be observed when consultant/contractor staff conducts work activities in "open water" conditions in a water craft vessels (including drill rigs mounted on barges):

- Work will not be initiated prior to meeting approval from the PM;
- All work activities conducted on surface waters will be conducted in accordance with the requirements of the USCG and other appropriate state agency;
- Personal Flotation Devices (PFD) that are USCG approved must be worn at all times when on surface waters. One adult size PFD (wearable style) for every person on the water craft is required;
- A minimum of two (2) PFDs must be on board on the water craft at all times on waters;
- Have on board a "throwable" flotation device w/attached line;
- Distribute weight evenly across the beam of the watercraft;
- Only allow one person to stand at a time in a small watercraft vessel;
- Do not exceed manufacture's capacity plate load limits;
- Attach a lanyard or safety line which can be tied to the sampling personnel when water surface conditions are rough. This will enable easier retrieval of the person should he/she fall over the side of the water craft;
- Check running condition of the outboard motor prior to launching (i.e. ample supply of fuel/oil mix, fuel line in good condition, integrity of the propeller, EXTRA SHEER PINS);
- Equipment to have on board include oars, anchor w/line (100 foot minimum line on inland waters) and mooring lines of adequate length;
- Wear work gloves when using equipment that could injure hands;

- Wear hard hat if overhead hazards exist (e.g. A-Frame, use of long coring devices);
- Secure overboard equipment to vessel; and
- Use proper lifting techniques when retrieving heavy equipment.

3.3.7.3 Shallow Water

The Site-Specific Work Plan and the site reconnaissance will evaluate the best approach to sampling in shallow water. If wading is necessary, work activities in shallow water along the shore line shall consider the following hazards:

- Use waders to minimize exposure to water, sediment contaminant exposure and heat loss;
- Proceed carefully – water currents and falling can cause the waders to fill creating a very serious condition. In addition to wearing a PFD, a safety line should be tethered to the person walking in water currents; and
- Fatigue can occur more rapidly from walking through the water.

3.3.7.4 Sampling Through Ice

Collection of samples through frozen rivers/lakes presents the difficulties of working on ice. All precautions for slips, trips and falls will be observed. Ice thickness will be at a minimum of 9 inches thick before work activities will commence.

The following procedures will be observed when consultant/contractor staff conducts work activities on "ice" conditions:

- Work activities will not be initiated prior to meeting approval from the PHSO;
- Know the ice (i.e. thickness) and proceed with extreme caution. Ice thickness at a minimum should be 18 to 24 inches (when conducting drilling operations) and inspected for integrity. Check ice thickness regularly when traversing across ice to assure adequate support exists. Be especially cautious when approaching pressure cracks, areas of open water or areas of rivers where water velocity may be higher;
- Wear PFDs at all times;
- Warm weather causes ice thinning and potential for slipping (drilling holes on thinning ice can cause flooding of ice surface and can accelerate ice thinning and breakage);

- Equipment may be required to be hauled between work stations (use sleds); and
- Fatigue can occur from walking and drilling holes.

Based on water currents, water temperature and the amount of clothing worn by consultant/contractor staff, the threat of being swept downstream or drowning is possible. Extreme caution must be used when conducting these type of work activities. If a consultant/contractor staff employee should fall into the water, the employee will be retrieved and all warranted precautions shall be taken to ensure the safety and well being of that individual. All work activities will be immediately suspended and the person brought to shore. All wet clothing shall be removed and the person shall be dried and dressed in a set of dry clothes. If the possibility of hypothermia exists, seek medical attention immediately.

Persons sampling contaminated or potentially contaminated materials should wear the same PPE as listed for monitoring well sampling. The required PPE will be carried along on the sediment sampling water craft. PPE can add to heat stress during warm conditions and can cause decreased mobility dexterity.

3.3.7.5 Subcontractors

It is the responsibility of the PM to require any and all subcontractors assisting in the work activities, to adhere to state and federal governmental laws and regulations related to onshore and inland waters. Any refusal on behalf of the subcontractor will mandate shutdown of the project.

4 PERSONNEL TRAINING REQUIREMENTS

4.1 General

All consultant/contractor and subcontractor employees performing field work on this project are required to have appropriate safety training as specified in the OSHA Standards, particularly the HAZWOPER Standard 29CFR1910.120. Consultant/contractor personnel performing fieldwork on this project meet the necessary general training requirements. Subcontractors are responsible for supplying consultant's/contractor's PM with written statements certifying that all of their project personnel meet the necessary general training requirements.

4.2 Site-Specific

Site-specific hazard and hazard control information is contained in this HASP. All consultant/contractor personnel will be provided with a copy of this plan prior to the beginning of fieldwork. Each person will be required to "sign off" that they have read, understood, and will follow the procedures set forth in the plan.

4.3 Informational Briefings

It is the responsibility of each consultant/contractor staff member directing field operations to keep their crew members appraised of site conditions relative to health and safety, and of any approved modifications to the plan. This will be accomplished through ongoing "tailgate" meetings. All personnel are required to report injuries, illnesses and unsafe conditions to their immediate supervisor. The supervisor is required to report in writing any such accidents to the PM and PHSO within 24 hours of occurrence.

5 PERSONAL PROTECTIVE EQUIPMENT

Listed in the health and safety plan summary at the very beginning of this plan are hazardous substances that have been found or are suspected to be present at the site. Hazardous substances are most likely found in soil and groundwater. Routes of exposure include: inhalation, ingestion, and absorption. Proper PPE should be worn when applicable.

5.1 Drilling/Excavation/Installation of Wells

Persons handling contaminated or potentially contaminated equipment, soils, sediment or water must wear the following PPE:

- Long sleeve coveralls (light or heavy weights subject to ambient temperature);
- Bib style rain pants where wet operations exist;
- Nitrile gloves;
- Vinyl gloves for sample handling;
- Safety glasses with side-shields; (REQUIRED AT ALL TIMES)
- Hard hat; (REQUIRED AT ALL TIMES)
- Steel-toed boots; (REQUIRED AT ALL TIMES)
- Reflective orange vest; (worn as the situation warrants) and
- Hearing protection (as required – see note below).

NOTE: Guidance on the requirements of ear protection is as follows: if you must raise your voice to converse with persons three feet away from you, you are probably being overexposed to noise. In these instances, the wearing of hearing protection is required. The muff or "EAR" type disposable earplugs will suffice.

5.2 Ground/Surface Water and Soil/Sediment Sampling

Persons sampling contaminated or potentially contaminated materials, soil, sediment, or water must wear the following PPE:

- Long sleeve coveralls (light or heavy weights subject to ambient temperature);
- Bib style rain pants where wet operations exist;
- Nitrile gloves;
- Vinyl gloves for sample handling;
- Safety glasses with side-shields;
- Steel-toed boots; and
- Hearing protection (as required).

Persons whose skin or inner clothing comes in contact with contaminated soils or liquids should remove such clothing, shower or clean as appropriate, then re-suit for continued work activities.

NOTE: Outer gloves should be changed between samples if contact to the sample occurs. This will preserve sample integrity.

6 MEDICAL SURVEILLANCE REQUIREMENTS

6.1 Medical Surveillance

The hazardous substances known or suspected to be present at the site are not known to produce injury or illness that would not be detected by the medical examination specified in the consultant's/contractor's medical monitoring program. The medical monitoring program established complies with all OSHA guidelines regarding and necessitating medical monitoring in the work place.

7 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING

7.1 Site Air Monitoring

A photoionization detector (PID) and possibly a combustible gas indicator (CGI) will be used to measure air contaminant concentrations in the breathing and work zones. Readings are to be recorded on the logs and in the project logbook. The PID will be calibrated per the air monitoring action plan below. If a CGI is also used to detect combustible conditions at the work site, the monitoring will also follow the plan below.

7.2 Sampling Air Monitoring

A PID may be used to measure air contaminant concentrations at the well head or soil sample location during sampling. If measurements are collected, they should be recorded in the project logbook. The PID will be calibrated at the start of each day of use. Air monitoring should follow the action plan below.

7.3 Air Monitoring Action Plan

A PhotoVac MicroTip 3000 PID (or equivalent) will be calibrated and checked on a minimum basis at least three times per day: 1) before work activities begin; 2) during lunch break or approximately half way through the working day; and 3) following work activities at the end of the day. These calibration checks will be used to ensure accuracy of VOC readings. Calibration procedures will follow those outlined in the PID manual and consultant's/contractor's SOPs.

The PID will be used to monitor air quality in the breathing zone of the work area for the presence of VOC vapor levels. Prior to personnel entering any excavations to install piping or any other equipment, the PID will be lowered into the excavation to determine air quality in the excavation. Confined spaces will not be entered. Besides using the PID to monitor VOC vapors in the breathing zone, an oxygen meter may also be used. The oxygen meter may be used to measure percent oxygen in any excavation. Calibration of the combustible gas meter is required based on use to insure accuracy.

The VOCs "action level" is considered when a reading of 50 ppm is sustained on the PID when the PID is held at a constant height, whether in the excavation or the breathing zone. Reaching the VOC action level will require use of either full-face or half-face respirators utilizing Organic Vapor cartridge filters. Additionally, further air quality monitoring will be required to ensure that the PID readings do not exceed a sustained reading of 500 ppm. This will be done under the direction of the consultant/contractor PHSO who will determine specific modifications to work practices and PPE requirements.

If the 500-ppm action level is achieved, all activities on the site will immediately stop. The consultant/contractor PM will be contacted prior to taking any further action on the site, unless a situation exists which requires immediate action. Options such as nitrogen purging will be considered based on the most current information available.

8 SITE CONTROL MEASURES

8.1 Buddy System

Each worker will maintain visual contact with another worker at all times. The buddy system will ensure against an employee becoming stressed with a co-worker being aware of his or her condition. Workers should watch out for each other while working close to potential chemical and physical hazards. For example, all work in the exclusion zone should be scheduled so that no employee works alone in this zone at any time.

8.2 Safe Work Practices

To prevent accidental ingestion of chemical contaminants, the following rules must be compiled with when working within the exclusion/contamination reduction zones, and when taking or handling samples. Further, the consultant's/contractor's SOPs for groundwater and soil sampling, and drilling/excavation/well installation will be included in the Multi-Site QAPP and Field Sampling Plan (FSP).

- No eating, drinking, or smoking is allowed at work locations.
- No fires are allowed at work locations unless approved by the Project Health and Safety Officer on a site-specific, task-specific basis. If fires or propane torches are used, fires will be maintained away from potential ignition sources and site personnel will not leave the fire unattended and a fire extinguisher will be immediately available.
- All personnel must wash their hands, arms, face, and neck immediately after leaving the exclusion/contamination reduction zones. This must also be done after taking samples and prior to eating, drinking, smoking, or using the restroom.

8.3 Work Zone Definition

All work crews, whether drilling, excavating or performing other activities, must prevent the uncontrolled movement of contaminated or potentially contaminated soil and water. All soil and water removed from its natural setting should be considered contaminated unless proven otherwise by chemical analysis or

specifically known to be clean material in which verification sampling is occurring. Work crews will prevent migration of removed materials by establishing work zones and decontamination procedures. Work zones will be delineated. Only persons certified as having the necessary training and medical qualifications will be allowed in the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ). The following describes the zones to be established during drilling or excavation:

- Exclusion Zone – An EZ will be established surrounding the drilling or excavation site, if necessary. The EZ will comprise an area of at least as large as a circle having a diameter equaling one half the mast height of the drilling equipment or arm of excavating equipment. The size and shape of the EZ will be determined by the PHSO. No personnel will be permitted in the EZ unless they are in full compliance with the site health and safety plan.

- Contamination Reduction Zone - A CRZ is to provide a controlled area for performing decontamination. If a CRZ is necessary for the job, the size and the shape of the CRZ will be determined by the PHSO.

8.4 Daily Start-up and Shutdown Procedures

The following protocols will be followed daily prior to the start of work activities:

- The PHSO will review site conditions to determine if modifications of the work and safety plans are needed;

- Personnel will be briefed and updated on any new safety procedures based on the previous day's findings and the planned work activity for that day;

- All safety equipment will be checked for proper function;

- The PHSO will ensure that the first aid equipment is readily available; and

- The PHSO will initiate appropriate monitoring.

The following protocol will be followed at the end of daily operations and before breaks:

- All personnel will proceed through appropriate decontamination procedures and facilities;

- The work site will be left clean. Drums will be properly labeled and staged; and

- All PPE must be removed prior to eating, drinking, smoking, or using the restroom.

8.5 Equipment

Drilling rigs and heavy equipment should be inspected at the start of each day to detect equipment problems. Particular attention should be paid to cables and hydraulic lines. Examine them for evidence of stretching, fraying and cracking. The fuel system should be in good repair (free from leaks) to avoid the potential for fire or explosion. The drill rig and heavy equipment should be equipped with or have stationed in the area two 20-lb. type BC fire extinguishers.

8.6 Drilling/Excavation Area

The drilling/excavation area should be located away from overhead electrical lines. The location of buried water, electrical, telephone, and gas utility lines must be determined and staked. Slope of terrain, stability of embankments, soil load bearing ability, etc. should be evaluated in selection of the drilling/excavation locations.

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9 DECONTAMINATION PLAN

9.1 Decontamination Procedures

Personal decontamination will be accomplished by using good personal hygiene. Personal contamination should not occur if the protection methods specified in this plan are used. However, the following procedures must be complied with to ensure that contamination does not remain on equipment, sample containers, or in contact with personnel.

- While in the EZ clean gross contamination off equipment by scraping or brushing. Collect all contaminated soil with the drill cuttings and transport the cuttings in an appropriate manner to the staging area on site (i.e. placed in DOT approved 55-gallon drums).
- If steam cleaning of equipment is required it will occur at the designated area on site. If capture of decontamination water is required, it will be placed in DOT approved 55-gallon drums.

After equipment and sample container decontamination is accomplished, drilling crewmembers must remove PPE before leaving the CRZ. PPE must be removed in a step-wise fashion to prevent contamination of work clothing, as follows:

- Remove all contaminated soil from work boots and remove protective clothing for decontamination or disposal. If disposable PPE is required, it should be placed in an open top drum designated for that purpose. A lid should be placed on the drum after usage. All drummed material will be labeled identifying contents and the date filled.
- Remove and wash outer gloves and hard hat. Place disposable gloves in a collection bag.
- The use of respiratory protection is not anticipated. If a respirator must be used or otherwise removed from its containers, wash it down and take it with you as you exit the CRZ.
- Final daily decontamination will be reviewed by the PHSO to ensure that no contaminated articles are left which may be accessible to the public. Therefore, all disposable PPE and other miscellaneous garbage will be stored in a drum with a secured lid.

After leaving the CRZ, and before eating, drinking, smoking, or using the restroom, all personnel must wash their hands, arms, face, and neck. In addition, all personnel should take a full-body shower at the end of the workday. A full-body shower includes the use of a wash cloth to scrub the skin.

9.2 Waste Storage and Disposal

Since all soil and water removed from its natural setting is considered potentially contaminated, these materials will be stored and disposed of according to the guidelines established in the Work Plan for the site. If no guidelines have been established in the Work Plan for storage and disposal of these investigative wastes, the applicable federal, state and/or local regulations and guidance pertaining to investigation derived waste will be followed. in storing and disposing of the wastes.

Waste container contents and identification will be made in the field log for future reference. All containers will be distinctly labeled using a paint pen or marker.

10 EMERGENCY ACTION PLAN

10.1 Medical Emergencies

In the event of a medical emergency, the following procedures should be used.

1. If serious injury or life-threatening condition exists, call 911. Clearly describe the location, injury and conditions to the dispatcher. Designate a person to direct emergency responders to the injured person(s).

2. Call the PM.

3. Implement steps to prevent the reoccurrence of the accident.

10.2 Chemical Emergencies

1. If serious injury or life-threatening condition exists, call 911. Clearly describe the location, injury and conditions to the dispatcher.

2. Evacuate other on-site personnel to a safe place in an upwind direction until it is safe for work to resume.

3. Call the PM.

4. If necessary contact clean-up contractor.

5. If release requires contacting government agencies the PM makes the appropriate calls (PM also contacts Client).

10.3 General Emergencies

In the case of fire (other than a managed pre-approved fire, discussed in Section 8.2), flood, explosion, spills, severe weather, tank or pipe punctures, or other hazard, work shall be halted and if applicable, 911 called. All on-site personnel will immediately be evacuated to a safe place.

10.4 Accident Reports and Follow up

All accidents, including those that do not result in injury or illness, are to be reported to the PHSO or the PM within 24 hours of their occurrence. The report form to be used can be seen on the following page. Other reporting procedures and forms, if necessary, will be included in the Work Plan for the specific site. Notifications regarding work related accidents and near misses will follow requirements set forth in OSHA.

Accident/Injury Report Form **Project No.**

Date: _____ Time: _____

Location of Incident: _____

Was Anyone Injured _____ Name of Injured: _____

Describe Company First Aid (If Applicable): _____

Physician's Treatment (If Applicable): _____

Description of Incident: _____

Corrective Action: _____

Additional Comments: _____

Reported By: _____

Distribution:
Corporate Health and Safety _____
Project Manager: _____ Other: _____

11 CONFINED SPACE ENTRY PROCEDURES

Confined space entry procedures will be addressed in the site specific Work Plan, if necessary.

12 SPILL CONTAINMENT PROGRAM

If there is an accidental release of potentially hazardous materials or waste (i.e. spilled purge water or soil cuttings or ruptured hydraulic line), site personnel will:

- Contact the Project Health and Safety Officer and PM;
- Contain the spill, if it is possible and it can be done safely; and
- Initiate cleanup.

FIGURES

TO BE PROVIDED IN SITE SPECIFIC WORK PLANS

APPENDIX

Appendix A
Material Safety Data Sheets

- Benzene
- Ethylbenzene
- Toluene
- Xylenes (M, O, & P)
- PAHs (Technical Sheet)
- Naphtha (Coal Tar)
- Cyanide
- PCBs

(To be modified by adding and/or deleting chemicals as appropriate in the Work Plan).

BENZENE

BNZ

CAUTIONARY RESPONSE INFORMATION

Common Synonyms
Benzol
Benzole

Watery liquid Colorless Gasoline-like odor

Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.

Restrict access.
Avoid contact with liquid and vapor.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to ``knock down'' vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Skim
Chemical and Physical Treatment: Burn
Salvage waterfowl

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon
2.2 Formula: C_6H_6
2.3 IMO/UN Designation: 3.2/1114
2.4 DOT ID No.: 1114
2.5 CAS Registry No.: 71-43-2
2.6 NAERG Guide No.: 130
2.7 Standard Industrial Trade Classification: 51122

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Self contained positive pressure breathing apparatus; protective gloves and clothing.
3.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, nausea, and vomiting. Coma and possible death.
3.3 Treatment of Exposure: SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.
3.4 TLV-TWA: 0.5 ppm
3.5 TLV-STEL: 2.5 ppm
3.6 TLV-Ceiling: Not listed
3.7 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Leukemia.
3.10 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 4.68 ppm
3.13 IDLH Value: 500 ppm
3.14 OSHA PEL-TWA: 1 ppm.
3.15 OSHA PEL-STEL: 5 ppm
3.16 OSHA PEL-Ceiling: Not listed
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 12°F C.C.
4.2 Flammable Limits in Air: 1.3%-7.9%
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide.
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
4.5 Special Hazards of Combustion Products: Not pertinent.
4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
4.7 Auto Ignition Temperature: 1097°F
4.8 Electrical Hazards: Class I, Group D
4.9 Burning Rate: 6.0 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 35.7 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction.
5.2 Reactivity with Common Materials: No reaction.
5.3 Stability During Transport: Stable.
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
5.5 Polymerization: Not pertinent.
5.6 Inhibitor of Polymerization: Not pertinent.

6. WATER POLLUTION

6.1 Aquatic Toxicity: 5 ppm/6 hr/minnow/lethal/distilled water
20 ppm/24 hr/sunfish/TL_m/tap water
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days
6.4 Food Chain Concentration Potential: None.
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 2
Human Oral hazard: 1
Human Contact hazard: II
Reduction of amenities: XXX

7. SHIPPING INFORMATION

7.1 Grades of Purity: Industrial pure – 99+%; Thiophene-free – 99+%; Nitration – 99+%; Industrial – 90% - 85+%; Reagent – 99+%
7.2 Storage Temperature: Ambient.
7.3 Inert Atmosphere: No requirement.
7.4 Venting: Pressure-vacuum.
7.5 IMO Pollution Category: C
7.6 Ship Type: 3
7.7 Barge Hull Type: 3

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: II
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 10 pounds
8.7 EPA Pollution Category: A
8.8 RCRA Waste Number: U019
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 78.11
9.3 Boiling Point at 1 atm: 176°F = 80.1°C = 353.3°K
9.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K
9.5 Critical Temperature: 552.0°F = 288.9°C = 562.1°K
9.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m^2
9.7 Specific Gravity: 0.879 at 20°C (liquid)
9.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C
9.10 Vapor (Gas) Specific Gravity: 2.8
9.11 Ratio of Specific Heats of Vapor (Gas): 1.061
9.12 Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 X 10^5 J/kg
9.13 Heat of Combustion: –17,460 Btu/lb = –9698 cal/g = –406.0 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent.
9.15 Heat of Solution: Not pertinent.
9.16 Heat of Polymerization: Not pertinent.
9.17 Heat of Fusion: 30.45 cal/g
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 3.22 psia

NOTES

BENZENE

BNZ

9.20 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
55	55.330
60	55.140
65	54.960
70	54.770
75	54.580
80	54.400
85	54.210
90	54.030
95	53.840
100	53.660
105	53.470
110	53.290
115	53.100
120	52.920
125	52.730
130	52.540
135	52.360
140	52.170
145	51.990
150	51.800
155	51.620
160	51.430
165	51.250
170	51.060
175	50.870

9.21 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
45	0.394
50	0.396
55	0.398
60	0.400
65	0.403
70	0.405
75	0.407
80	0.409
85	0.411
90	0.414
95	0.416
100	0.418

9.22 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit inch per hour-square foot-F
75	0.988
80	0.981
85	0.975
90	0.969
95	0.962
100	0.956
105	0.950
110	0.944
115	0.937
120	0.931
125	0.925
130	0.919
135	0.912
140	0.906
145	0.900
150	0.893
155	0.887
160	0.881
165	0.875
170	0.868

9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
55	0.724
60	0.693
65	0.665
70	0.638
75	0.612
80	0.588
85	0.566
90	0.544
95	0.524
100	0.505
105	0.487
110	0.470
115	0.453
120	0.438

9.24 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
77	0.180

9.25 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
50	0.881
60	1.171
70	1.535
80	1.989
90	2.547
100	3.227
110	4.049
120	5.033
130	6.201
140	7.577
150	9.187
160	11.060
170	13.220
180	15.700
190	18.520
200	21.740
210	25.360

9.26 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
50	0.01258
60	0.01639
70	0.02109
80	0.02681
90	0.03371
100	0.04196
110	0.05172
120	0.06317
130	0.07652
140	0.09194
150	0.10960
160	0.12980
170	0.15270
180	0.17850
190	0.20750
200	0.23970
210	0.27560

9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	0.204
25	0.219
50	0.234
75	0.248
100	0.261
125	0.275
150	0.288
175	0.301
200	0.313
225	0.325
250	0.337
275	0.349
300	0.360
325	0.371
350	0.381
375	0.392
400	0.402
425	0.412
450	0.421
475	0.431
500	0.440
525	0.449
550	0.457
575	0.465
600	0.474

BENZENE

Also known as: Benzol, Mineral Naphtha, Phenyl Hydride, Annulene
Chemical reference number (CAS): 71-43-2

WHAT IS BENZENE?

Benzene is a widely used industrial chemical. Benzene is found in crude oil and is a major part of gasoline. It's used to make plastics, resins, synthetic fibers, rubber lubricants, dyes, detergents, drugs and pesticides. Benzene is produced naturally by volcanoes and forest fires.

In homes, benzene may be found in glues, adhesives, cleaning products, paint strippers, tobacco smoke and gasoline. Most benzene in the environment comes from our use of petroleum products.

Benzene quickly evaporates from water or soil. If benzene leaks from buried storage tanks or landfills, it can contaminate nearby drinking water wells. Benzene can move long distances in groundwater.

HOW ARE PEOPLE EXPOSED TO BENZENE?

Breathing: The most common way people are exposed to benzene is when they fill their car with gasoline. People are also exposed to benzene when they use household products that contain benzene.

Benzene evaporates quickly from contaminated water. People can be exposed to benzene if they use contaminated water to bathe, shower, wash dishes or do laundry.

Benzene vapors are present in exhaust from many industries and automobiles. People who live near highways or industries can be exposed to benzene.

Drinking/Eating: People whose drinking water wells are located within half a mile of leaking underground storage tank, may be exposed by drinking contaminated water.

Touching: Benzene can pass through the skin. Benzene exposure through skin contact with gasoline or other solvents is possible. People can also absorb benzene as they bathe or shower in contaminated water.

DO STANDARDS EXIST FOR REGULATING BENZENE?

Water: The state and federal drinking water standards for benzene are both set at 5 parts per billion (ppb). We suggest you stop drinking water that contains more than 5 ppb of benzene. If the level of benzene in your water is higher than 100 ppb, you may also need to avoid washing, bathing or using the water for other purposes. Contact your local public health agency for more information specific to your situation.

Air: No standards exist for the amount of benzene allowed in the air of homes. We recommend that people with any detectable levels of benzene in the air of their homes eliminate the source of the contamination (gasoline in cans, contaminated drinking water, etc.) Most people can smell benzene at levels above 5 parts per million (ppm) in air.

WILL EXPOSURE TO BENZENE RESULT IN HARMFUL HEALTH EFFECTS?

Drowsiness, headaches, and dizziness have been reported when people breathed air with benzene levels of more than 10 ppm for a short time.

The following health effects can occur after several years of exposure to benzene:

Cancer: Long-term exposure to benzene can increase the risk of developing leukemia.

Reproductive Effects: Animal studies show that inhaling benzene vapors can damage reproductive organs and cause infertility. Exposure to benzene in workplaces has caused menstrual variations.

Organ Systems: Exposure to benzene can cause anemia and weaken the immune system.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person.

A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It is also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

CAN A MEDICAL TEST DETERMINE EXPOSURE TO BENZENE?

Benzene breaks down in the body to several other compounds. Those compounds can be found in the blood or urine of people who have been exposed to high levels of benzene within the past two days. Tests will prove an exposure to benzene occurred but will not predict the kind of illness that could result. We do not know what level of benzene break-down products are common in most people, since most people are regularly exposed to some amount of benzene.

People who think they have been exposed to benzene over a long period of time should contact their doctor. Physicians can use blood chemistry, liver function and kidney function tests.

Seek medical advice if you have any symptoms that you think may be related to chemical exposure.

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: www.dhfs.state.wi.us/eh/index.htm

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(POH 4341 *Revised* 12/2000)

ETHYLBENZENE

ETB

CAUTIONARY RESPONSE INFORMATION

Common Synonyms			
EB Phenylethane	Liquid	Colorless	Sweet, gasoline-like odor

Floats on water. Flammable, irritating vapor is produced.

Keep people away. Avoid contact with liquid and vapor.
Avoid inhalation.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stay upwind and use water spray to ``knock down'' vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Skim
Clean shore line
Salvage waterfowl

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon
2.2 Formula: $C_6H_5CH_2CH_3$
2.3 IMO/UN Designation: 3.3/1175
2.4 DOT ID No.: 1175
2.5 CAS Registry No.: 100-41-4
2.6 NAERG Guide No.: 129
2.7 Standard Industrial Trade Classification: 51126

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Self-contained breathing apparatus; safety goggles.
3.2 Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.
3.3 Treatment of Exposure: INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.
3.4 TLV-TWA: 100 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: 125 ppm
3.7 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Currently not available
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
3.12 Odor Threshold: 140 ppm
3.13 IDLH Value: 800 ppm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 80°F O.C. 59°F C.C.
4.2 Flammable Limits in Air: 1.0%-6.7%
4.3 Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical.
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated.
4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.
4.7 Auto Ignition Temperature: 860°F
4.8 Electrical Hazards: Not pertinent
4.9 Burning Rate: 5.8 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 50.0 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): N_2 diluent: 9.0%

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: 29 ppm/96 hr/bluegill/TL_m/fresh water
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 5 days
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 3
Human Oral hazard: 1
Human Contact hazard: I
Reduction of amenities: XX

7. SHIPPING INFORMATION

7.1 Grades of Purity: Research grade: 99.98%; pure grade: 99.5%; technical grade: 99.0%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Open (flame arrester) or pressure-vacuum
7.5 IMO Pollution Category: B
7.6 Ship Type: 3
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: II
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 1000 pounds
8.7 EPA Pollution Category: C
8.8 RCRA Waste Number: Not listed
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 106.17
9.3 Boiling Point at 1 atm: 277.2°F = 136.2°C = 409.4°K
9.4 Freezing Point: –139°F = –95°C = 178°K
9.5 Critical Temperature: 651.0°F = 343.9°C = 617.1°K
9.6 Critical Pressure: 523 psia = 35.6 atm = 3.61 MN/m^2
9.7 Specific Gravity: 0.867 at 20°C (liquid)
9.8 Liquid Surface Tension: 29.2 dynes/cm = 0.0292 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 35.48 dynes/cm = 0.03548 N/m at 20°C
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): 1.071
9.12 Latent Heat of Vaporization: 144 Btu/lb = 80.1 cal/g = 3.35 X 10^5 J/kg
9.13 Heat of Combustion: –17,780 Btu/lb = –9877 cal/g = –413.5 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 0.4 psia

NOTES

ETHYLBENZENE

ETB

9.20 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
40	54.990
50	54.680
60	54.370
70	54.060
80	53.750
90	53.430
100	53.120
110	52.810
120	52.500
130	52.190
140	51.870
150	51.560
160	51.250
170	50.940
180	50.620
190	50.310
200	50.000
210	49.690

9.21 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
40	0.402
50	0.404
60	0.407
70	0.409
80	0.412
90	0.414
100	0.417
110	0.419
120	0.421
130	0.424
140	0.426
150	0.429
160	0.431
170	0.434
180	0.436
190	0.439
200	0.441
210	0.443

9.22 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit inch per hour-square foot-F
-90	1.065
-80	1.056
-70	1.047
-60	1.037
-50	1.028
-40	1.018
-30	1.009
-20	1.000
-10	0.990
0	0.981
10	0.971
20	0.962
30	0.953
40	0.943
50	0.934
60	0.924
70	0.915
80	0.906
90	0.896
100	0.887
110	0.877
120	0.868
130	0.859
140	0.849
150	0.840
160	0.830

9.23 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
40	0.835
50	0.774
60	0.719
70	0.670
80	0.626
90	0.586
100	0.550
110	0.518
120	0.488
130	0.461
140	0.436
150	0.414
160	0.393
170	0.374
180	0.356
190	0.340
200	0.325
210	0.311

9.24 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
68	0.020

9.25 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
80	0.202
100	0.370
120	0.644
140	1.071
160	1.713
180	2.643
200	3.953
220	5.747
240	8.147
260	11.290
280	15.320
300	20.410
320	26.730
340	34.460
360	43.800
380	54.950

9.26 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
80	0.00370
100	0.00654
120	0.01099
140	0.01767
160	0.02734
180	0.04087
200	0.05926
220	0.08363
240	0.11520
260	0.15510
280	0.20490
300	0.26570
320	0.33910
340	0.42620
360	0.52850
380	0.64720

9.27 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
-400	-0.007
-350	0.026
-300	0.060
-250	0.093
-200	0.125
-150	0.157
-100	0.187
-50	0.217
0	0.246
50	0.274
100	0.301
150	0.327
200	0.353
250	0.377
300	0.401
350	0.424
400	0.446
450	0.467
500	0.487
550	0.507
600	0.525

TOLUENE

TOL

CAUTIONARY RESPONSE INFORMATION

Common Synonyms Methylbenzene Methylbenzol Toluol	Watery liquid Colorless Pleasant odor Floats on water. Flammable, irritating vapor is produced.

Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to ``knock down'' vapor.
Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Skim
Chemical and Physical Treatment: Burn
Clean shore line
Salvage waterfowl

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon
2.2 Formula: $C_6H_5CH_3$
2.3 IMO/UN Designation: 3.2/1294
2.4 DOT ID No.: 1294
2.5 CAS Registry No.: 108-88-3
2.6 NAERG Guide No.: 130
2.7 Standard Industrial Trade Classification: 51123

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves.
3.2 Symptoms Following Exposure: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.
3.3 Treatment of Exposure: INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
3.4 TLV-TWA: 50 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Kidney and liver damage may follow ingestion.
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 0.17 ppm
3.13 IDLH Value: 500 ppm
3.14 OSHA PEL-TWA: 200 ppm
3.15 OSHA PEL-STEL: 500 ppm, 10 minute peak once in 8 hour shift
3.16 OSHA PEL-Ceiling: 300 ppm
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 55°F O.C. 40°F C.C.
4.2 Flammable Limits in Air: 1.27%-7%
4.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective
4.5 Special Hazards of Combustion Products: Not pertinent
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
4.7 Auto Ignition Temperature: 896°F
4.8 Electrical Hazards: Class I, Group D
4.9 Burning Rate: 5.7 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 42.8 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 11.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): N_2 diluent: 9.5%

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: 1180 mg/l/96 hr/sunfish/TL_m/fresh water
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): 0%, 5 days; 38% (theor), 8 days
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 2
Human Oral hazard: 1
Human Contact hazard: II
Reduction of amenities: XXX

7. SHIPPING INFORMATION

7.1 Grades of Purity: Research, reagent, nitration-all 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Open (flame arrester) or pressure-vacuum
7.5 IMO Pollution Category: C
7.6 Ship Type: 3
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: II
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 1000 pounds
8.7 EPA Pollution Category: C
8.8 RCRA Waste Number: U220
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 92.14
9.3 Boiling Point at 1 atm: 231.1°F = 110.6°C = 383.8°K
9.4 Freezing Point: –139°F = –95.0°C = 178.2°K
9.5 Critical Temperature: 605.5°F = 318.6°C = 591.8°K
9.6 Critical Pressure: 596.1 psia = 40.55 atm = 4.108 MN/m^2
9.7 Specific Gravity: 0.867 at 20°C (liquid)
9.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): 1.089
9.12 Latent Heat of Vaporization: 155 Btu/lb = 86.1 cal/g = 3.61 X 10^5 J/kg
9.13 Heat of Combustion: –17,430 Btu/lb = –9686 cal/g = –405.5 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: 17.17 cal/g
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 1.1 psia

NOTES

TOLUENE

TOL

9.20 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
-30	57.180
-20	56.870
-10	56.550
0	56.240
10	55.930
20	55.620
30	55.310
40	54.990
50	54.680
60	54.370
70	54.060
80	53.750
90	53.430
100	53.120
110	52.810
120	52.500

9.21 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	0.396
5	0.397
10	0.399
15	0.400
20	0.402
25	0.403
30	0.404
35	0.406
40	0.407
45	0.409
50	0.410
55	0.411
60	0.413
65	0.414
70	0.415
75	0.417
80	0.418
85	0.420
90	0.421
95	0.422
100	0.424
105	0.425
110	0.427
115	0.428
120	0.429
125	0.431

9.22 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit inch per hour-square foot-F
0	1.026
10	1.015
20	1.005
30	0.994
40	0.983
50	0.972
60	0.962
70	0.951
80	0.940
90	0.929
100	0.919
110	0.908
120	0.897
130	0.886
140	0.876
150	0.865
160	0.854
170	0.843
180	0.833
190	0.822
200	0.811
210	0.800

9.23 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
0	1.024
5	0.978
10	0.935
15	0.894
20	0.857
25	0.821
30	0.788
35	0.757
40	0.727
45	0.700
50	0.673
55	0.649
60	0.625
65	0.603
70	0.582
75	0.562
80	0.544
85	0.526
90	0.509
95	0.493
100	0.477

9.24 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
68	0.050

9.25 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
0	0.038
10	0.057
20	0.084
30	0.121
40	0.172
50	0.241
60	0.331
70	0.449
80	0.600
90	0.792
100	1.033
110	1.332
120	1.700
130	2.148
140	2.690
150	3.338
160	4.109
170	5.018
180	6.083
190	7.323
200	8.758
210	10.410

9.26 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
0	0.00070
10	0.00103
20	0.00150
30	0.00212
40	0.00296
50	0.00405
60	0.00547
70	0.00727
80	0.00954
90	0.01237
100	0.01584
110	0.02007
120	0.02518
130	0.03127
140	0.03850
150	0.04700
160	0.05691
170	0.06840
180	0.08162
190	0.09675
200	0.11400
210	0.13340

9.27 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	0.228
25	0.241
50	0.255
75	0.268
100	0.281
125	0.294
150	0.306
175	0.319
200	0.331
225	0.343
250	0.355
275	0.367
300	0.378
325	0.389
350	0.400
375	0.411
400	0.422
425	0.432
450	0.443
475	0.453
500	0.462
525	0.472
550	0.482
575	0.491
600	0.500

TOLUENE

Also known as: Toluol, Methylbenzene, Phenylmethane
Chemical reference number (CAS): 108-88-3

WHAT IS TOLUENE?

Toluene is a common ingredient in degreasers. It's a colorless liquid with a sweet smell and taste. It evaporates quickly. Toluene is found naturally in crude oil. It's used in oil refining and the manufacturing of paints, lacquers, explosives (TNT) and glues. In homes, toluene may be found in paint thinners, paint brush cleaners, nail polish, glues, inks and stain removers. Toluene is also found in car exhaust and the smoke from cigarettes.

When toluene is spilled on the ground or improperly disposed, it can seep into soil and contaminate nearby wells and streams. Toluene can remain unchanged for a long time in soil or water that is not in contact with air.

HOW ARE PEOPLE EXPOSED TO TOLUENE?

Breathing: People are often exposed to high levels of toluene when they breathe vapors from paints, paint thinners, or glues. Breathing gasoline or car exhaust will also result in some exposure to toluene. People who live near industries using toluene may be exposed to the chemical in the air. If home water supplies are contaminated, people may inhale the chemical while washing, bathing or using water for other household purposes.

Some people intentionally inhale toluene to get "high." These people can be exposed to hazardous levels of the chemical.

Drinking/Eating: People may be exposed by drinking contaminated water, handling contaminated soils or touching their mouths or eating with dirty hands.

Touching: Although the chemical may irritate the skin, it passes through the skin slowly. People can be exposed to toluene when they touch the chemical, touch contaminated soil, or bathe in contaminated water.

DO STANDARDS EXIST FOR REGULATING TOLUENE?

Water: The Wisconsin drinking water standard is 343 parts per billion (ppb) of toluene. We suggest you stop drinking water that contains higher levels. If levels of toluene are very high in your water, you should avoid washing, bathing, or using the water for other purposes. Contact your local public health agency for more information specific to your situation.

Air: No standards exist for the amount of toluene allowed in the air of homes. We use a formula to convert work place limits to suggested home limits. Based on the formula, we recommend levels be no higher than 4 parts per million (ppm) of toluene in air. Most people can't smell toluene until levels reach 0.16 - 37 ppm. If you can smell the chemical, the level may be too high to be safe.

The Wisconsin Department of Natural Resources regulates the amount of toluene that can be released by industries.

WILL EXPOSURE TO TOLUENE RESULT IN HARMFUL HEALTH EFFECTS?

The following symptoms may occur immediately or shortly after exposure to levels over 100 ppm of toluene in air;

- Tiredness, dizziness, headache, loss of coordination or hearing, euphoria, insomnia
- Nausea
- Eye and nose irritation
- Rapid delay of reaction time, unconsciousness, and death at levels of 4,000 ppm

The worst effects of exposure to toluene have occurred in deliberate abusers of toluene. Most studies of workers exposed to moderate levels of toluene show no harmful health effects.

The following health effects can occur after several years of exposure to toluene:

Cancer: Research shows that toluene is unlikely to cause cancer.

Reproductive Effects: There are no indications toluene causes damage to reproductive organs. Toluene may affect the development of unborn babies.

Organ Systems: Damage to the brain, liver, bone marrow and kidneys can occur.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person. A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It's also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

CAN A MEDICAL TEST DETERMINE EXPOSURE TO TOLUENE?

The breakdown products of toluene, hipparic acid and cresol, can be measured in urine within 12 hours of a high level exposure. These measurements may not predict possible future health effects. Other medical tests may be helpful in determining damage to the nervous system, kidneys or liver.

Seek medical advice if you have any symptoms that you think may be related to chemical exposure.

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: www.dhfs.state.wi.us/eh/index.htm

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(POH 4351 *Revised* 12/2000)

M-XYLENE

XLM

CAUTIONARY RESPONSE INFORMATION

Common Synonyms
1,3-Dimethylbenzene
Xylol

Watery liquid Colorless Sweet odor

Floats on water. Flammable, irritating vapor is produced.

Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear self-contained breathing apparatus.
Extinguish with foam, dry chemical, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose, and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Skim
Chemical and Physical Treatment: Burn
Clean shore line
Salvage waterfowl

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon
2.2 Formula: m-$C_6H_4(CH_3)_2$
2.3 IMO/UN Designation: 3.2/1307
2.4 DOT ID No.: 1307
2.5 CAS Registry No.: 108-38-3
2.6 NAERG Guide No.: 130
2.7 Standard Industrial Trade Classification: 51124

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
3.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.
3.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
3.4 TLV-TWA: 100 ppm
3.5 TLV-STEL: 150 ppm
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 g/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Kidney and liver damage.
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 0.05 ppm
3.13 IDLH Value: 900 ppm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 81°F C.C.
4.2 Flammable Limits in Air: 1.1%-7.0%
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
4.5 Special Hazards of Combustion Products: Not pertinent
4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
4.7 Auto Ignition Temperature: 982°F
4.8 Electrical Hazards: Class I, Group D
4.9 Burning Rate: 5.8 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 50.0 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL_m/fresh water
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 8 days
6.4 Food Chain Concentration Potential: Currently not available
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 3
Human Oral hazard: 1
Human Contact hazard: II
Reduction of amenities: XX

7. SHIPPING INFORMATION

7.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.2%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Open (flame arrester) or pressure-vacuum
7.5 IMO Pollution Category: C
7.6 Ship Type: 3
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: III
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 1000 pounds
8.7 EPA Pollution Category: C
8.8 RCRA Waste Number: U239
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 106.16
9.3 Boiling Point at 1 atm: 282°F = 138.9°C = 412.1°K
9.4 Freezing Point: –54.2°F = –47.9°C = 225.3°K
9.5 Critical Temperature: 650.8°F = 343.8°C = 617°K
9.6 Critical Pressure: 513.8 atm = 34.95 psia = 3.540 MN/m^2
9.7 Specific Gravity: 0.864 at 20°C (liquid)
9.8 Liquid Surface Tension: 28.6 dynes/cm = 0.0286 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 36.4 dynes/cm = 0.0364 N/m at 30°C
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): 1.071
9.12 Latent Heat of Vaporization: 147 Btu/lb = 81.9 cal/g = 3.43 X 10^5 J/kg
9.13 Heat of Combustion: –17,554 Btu/lb = –9752.4 cal/g = –408.31 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: 26.01 cal/g
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 0.34 psia

NOTES

M-XYLENE

XLM

9.20 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
15	55.400
20	55.260
25	55.130
30	54.990
35	54.850
40	54.710
45	54.570
50	54.430
55	54.290
60	54.160
65	54.020
70	53.880
75	53.740
80	53.600
85	53.460
90	53.320
95	53.180
100	53.050

9.21 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
40	0.387
50	0.393
60	0.398
70	0.404
80	0.410
90	0.415
100	0.421
110	0.426
120	0.432
130	0.437
140	0.443
150	0.448
160	0.454
170	0.460
180	0.465
190	0.471
200	0.476
210	0.482

9.22 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit inch per hour-square foot-F
35	0.962
40	0.953
45	0.944
50	0.935
55	0.926
60	0.917
65	0.908
70	0.899
75	0.890
80	0.881
85	0.873
90	0.864
95	0.855
100	0.846

9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
15	0.938
20	0.898
25	0.862
30	0.827
35	0.794
40	0.764
45	0.735
50	0.708
55	0.682
60	0.658
65	0.635
70	0.613
75	0.592
80	0.572
85	0.554

9.24 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
	I
	N
	S
	O
	L
	U
	B
	L
	E

9.25 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
60	0.090
70	0.127
80	0.177
90	0.242
100	0.326
110	0.434
120	0.571
130	0.743
140	0.956
150	1.219
160	1.538
170	1.924
180	2.388
190	2.939
200	3.590
210	4.355
220	5.247
230	6.282
240	7.476
250	8.846
260	10.410

9.26 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
60	0.00172
70	0.00238
80	0.00324
90	0.00435
100	0.00577
110	0.00754
120	0.00975
130	0.01247
140	0.01577
150	0.01977
160	0.02455
170	0.03023
180	0.03691
190	0.04473
200	0.05382
210	0.06431
220	0.07635
230	0.09009
240	0.10570
250	0.12330
260	0.14310

9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	0.247
25	0.260
50	0.273
75	0.286
100	0.299
125	0.311
150	0.324
175	0.336
200	0.348
225	0.360
250	0.371
275	0.383
300	0.394
325	0.406
350	0.417
375	0.427
400	0.438
425	0.449
450	0.459
475	0.469
500	0.479
525	0.489
550	0.499
575	0.508
600	0.517

O-XYLENE

XLO

CAUTIONARY RESPONSE INFORMATION

Common Synonyms
1,2-Dimethylbenzene
Xylol

Watery liquid Colorless Sweet odor

Floats on water. Flammable, irritating vapor is produced.

Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear self-contained breathing apparatus.
Extinguish with foam, dry chemical, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Skim
Chemical and Physical Treatment: Burn
Clean shore line
Salvage waterfowl

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon
2.2 Formula: o-$C_6H_4(CH_3)_2$
2.3 IMO/UN Designation: 3.2/1307
2.4 DOT ID No.: 1307
2.5 CAS Registry No.: 95-47-6
2.6 NAERG Guide No.: 130
2.7 Standard Industrial Trade Classification: 51124

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
3.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.
3.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
3.4 TLV-TWA: 100 ppm
3.5 TLV-STEL: 150 ppm
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Kidney and liver damage.
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 0.05 ppm
3.13 IDLH Value: 900 ppm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 90°F C.C.
4.2 Flammable Limits in Air: 0.9 - 6.7%
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
4.5 Special Hazards of Combustion Products: Not pertinent
4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
4.7 Auto Ignition Temperature: 869°F
4.8 Electrical Hazards: Class I, Group D
4.9 Burning Rate: 5.8 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 50.0 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: >100 mg/l/96 hr/D. magna/TL_m/fresh water
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): 0 lb/lb. 5 days; 2.5% (theor.), 8 days
6.4 Food Chain Concentration Potential: Currently not available
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 3
Human Oral hazard: 1
Human Contact hazard: I
Reduction of amenities: X

7. SHIPPING INFORMATION

7.1 Grades of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No reaction
7.4 Venting: Open (flame arrester) or pressure-vacuum
7.5 IMO Pollution Category: C
7.6 Ship Type: 3
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: II
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 1000 pounds
8.7 EPA Pollution Category: C
8.8 RCRA Waste Number: U239
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 106.16
9.3 Boiling Point at 1 atm: 291.9°F = 144.4°C = 417.6°K
9.4 Freezing Point: –13.3°F = –25.2°C = 248.0°K
9.5 Critical Temperature: 674.8°F = 357.1°C = 630.3°K
9.6 Critical Pressure: 541.5 atm = 36.84 psia = 3.732 MN/m^2
9.7 Specific Gravity: 0.880 at 20°C (liquid)
9.8 Liquid Surface Tension: 30.53 dynes/cm = 0.03053 N/m at 15.5°C
9.9 Liquid Water Interfacial Tension: 36.06 dynes/cm = 0.03606 N/m at 20°C
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): 1.068
9.12 Latent Heat of Vaporization: 149 Btu/lb = 82.9 cal/g = 3.47 X 10^5 J/kg
9.13 Heat of Combustion: –17,558 Btu/lb = –9754.7 cal/g = –408.41 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: 30.64 cal/g
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 0.28 psia

NOTES

O-XYLENE

XLO

9.20 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
15	56.460
20	56.330
25	56.190
30	56.050
35	55.910
40	55.770
45	55.630
50	55.490
55	55.360
60	55.220
65	55.080
70	54.940
75	54.800
80	54.660
85	54.520
90	54.380
95	54.250
100	54.110

9.21 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
35	0.389
40	0.391
45	0.394
50	0.396
55	0.398
60	0.400
65	0.402
70	0.404
75	0.406
80	0.408
85	0.411
90	0.413
95	0.415
100	0.417

9.22 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit inch per hour-square foot-F
35	1.043
40	1.035
45	1.027
50	1.018
55	1.010
60	1.002
65	0.993
70	0.985
75	0.977
80	0.969
85	0.960
90	0.952
95	0.944
100	0.935

9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
15	1.328
20	1.263
25	1.202
30	1.145
35	1.092
40	1.042
45	0.995
50	0.952
55	0.911
60	0.873
65	0.836
70	0.802
75	0.770
80	0.740
85	0.712

9.24 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
	I
	N
	S
	O
	L
	U
	B
	L
	E

9.25 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
60	0.071
70	0.101
80	0.141
90	0.194
100	0.263
110	0.352
120	0.465
130	0.609
140	0.787
150	1.007
160	1.277
170	1.605
180	1.999
190	2.469
200	3.028
210	3.686
220	4.456
230	5.352
240	6.389
250	7.581
260	8.947

9.26 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
60	0.00135
70	0.00188
80	0.00258
90	0.00349
100	0.00464
110	0.00611
120	0.00794
130	0.01021
140	0.01298
150	0.01634
160	0.02038
170	0.02520
180	0.03090
190	0.03759
200	0.04539
210	0.05443
220	0.06484
230	0.07674
240	0.09030
250	0.10560
260	0.12290

9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	0.261
25	0.274
50	0.287
75	0.299
100	0.311
125	0.323
150	0.335
175	0.347
200	0.358
225	0.370
250	0.381
275	0.392
300	0.403
325	0.414
350	0.424
375	0.435
400	0.445
425	0.455
450	0.465
475	0.475
500	0.485
525	0.494
550	0.504
575	0.513
600	0.522

P-XYLENE

XLP

CAUTIONARY RESPONSE INFORMATION

Common Synonyms
1,4-Dimethylbenzene
Xylol

Watery liquid Colorless Sweet odor

Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.

Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear self-contained breathing apparatus.
Extinguish with foam, dry chemical, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Skim
Chemical and Physical Treatment: Burn
Clean shore line
Salvage waterfowl

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon
2.2 Formula: p-$C_6H_4(CH_3)_2$
2.3 IMO/UN Designation: 3.2/1307
2.4 DOT ID No.: 1307
2.5 CAS Registry No.: 106-42-3
2.6 NAERG Guide No.: 130
2.7 Standard Industrial Trade Classification: 51124

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
3.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.
3.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
3.4 TLV-TWA: 100 ppm
3.5 TLV-STEL: 150 ppm
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Kidney and liver damage.
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
3.12 Odor Threshold: 0.05 ppm
3.13 IDLH Value: 900 pmm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 81°F C.C.
4.2 Flammable Limits in Air: 1.1%-7.0%
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
4.5 Special Hazards of Combustion Products: Not pertinent
4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
4.7 Auto Ignition Temperature: 984°F
4.8 Electrical Hazards: Class I, Group D
4.9 Burning Rate: 5.8 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 50.0 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL_m/fresh water
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days
6.4 Food Chain Concentration Potential: Currently not available
6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 3
Human Oral hazard: 1
Human Contact hazard: I
Reduction of amenities: X

7. SHIPPING INFORMATION

7.1 Grades of Purity: Research: 99.99%; Pure: 99.8%; Technical: 99.0%
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Open (flame arrester) or pressure-vacuum
7.5 IMO Pollution Category: C
7.6 Ship Type: 3
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: III
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 100 pounds
8.7 EPA Pollution Category: B
8.8 RCRA Waste Number: U239
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 106.16
9.3 Boiling Point at 1 atm: 280.9°F = 138.3°C = 411.5°K
9.4 Freezing Point: 55.9°F = 13.3°C = 286.5°K
9.5 Critical Temperature: 649.4°F = 343.0°C = 616.2°K
9.6 Critical Pressure: 509.4 atm = 34.65 psia = 3.510 MN/m^2
9.7 Specific Gravity: 0.861 at 20°C (liquid)
9.8 Liquid Surface Tension: 28.3 dynes/cm = 0.0283 N/m at 20°C
9.9 Liquid Water Interfacial Tension: 37.8 dynes/cm = 0.0378 N/m at 20°C
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): 1.071
9.12 Latent Heat of Vaporization: 150 Btu/lb = 81 cal/g = 3.4 X 10^5 J/kg
9.13 Heat of Combustion: –17,559 Btu/lb = –9754.7 cal/g = –408.41 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: 37.83 cal/g
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 0.34 psia

NOTES

P-XYLENE

XLP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	53.970	60	0.412	60	0.935	60	0.678
65	53.830	70	0.418	65	0.928	65	0.654
70	53.690	80	0.424	70	0.921	70	0.631
75	53.550	90	0.429	75	0.914	75	0.610
80	53.410	100	0.435	80	0.907	80	0.590
85	53.270	110	0.440	85	0.900	85	0.571
90	53.140	120	0.446	90	0.892	90	0.552
95	53.000	130	0.451	95	0.885	95	0.535
100	52.860	140	0.457	100	0.878	100	0.519
105	52.720	150	0.462			105	0.503
110	52.580	160	0.468			110	0.488
115	52.440	170	0.474			115	0.474
120	52.300	180	0.479			120	0.460
		190	0.485				
		200	0.490				
		210	0.496				
		220	0.501				
		230	0.507				
		240	0.512				
		250	0.518				
		260	0.524				
		270	0.529				
		280	0.535				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.096	60	0.00183	0	0.246
	N	70	0.135	70	0.00252	25	0.259
	S	80	0.187	80	0.00343	50	0.272
	O	90	0.255	90	0.00459	75	0.285
	L	100	0.343	100	0.00607	100	0.297
	U	110	0.456	110	0.00792	125	0.309
	B	120	0.599	120	0.01022	150	0.321
	L	130	0.777	130	0.01303	175	0.333
	E	140	0.998	140	0.01646	200	0.345
		150	1.270	150	0.02059	225	0.357
		160	1.600	160	0.02553	250	0.368
		170	1.998	170	0.03138	275	0.380
		180	2.475	180	0.03826	300	0.391
		190	3.041	190	0.04629	325	0.402
		200	3.710	200	0.05561	350	0.413
		210	4.493	210	0.06636	375	0.424
		220	5.407	220	0.07867	400	0.435
		230	6.465	230	0.09270	425	0.445
		240	7.683	240	0.10860	450	0.456
		250	9.080	250	0.12650	475	0.466
		260	10.670	260	0.14670	500	0.476
						525	0.486
						550	0.496
						575	0.505
						600	0.515

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Also known as: Polynuclear Aromatic Hydrocarbons, PNA, Polyaromatic Hydrocarbons
Examples: Benzo(a)pyrene, Benzanthracene, Benzo(b)fluoranthene, Fluoranthene, Naphthalene

WHAT ARE PAHs?

PAHs are a group of approximately 10,000 compounds, a few of which are listed above. Most PAHs in the environment are from incomplete burning of carbon-containing materials like oil, wood, garbage or coal. Many useful products such as mothballs, blacktop, and creosote wood preservatives contain PAHs. They are also found at low concentrations in some special-purpose skin creams and anti-dandruff shampoos that contain coal tars.

Automobile exhaust, industrial emissions and smoke from burning wood, charcoal and tobacco contain high levels of PAHs. In general, more PAHs form when materials burn at low temperatures, such as in wood fires or cigarettes. High-temperature furnaces produce fewer PAHs.

Fires can form fine PAH particles. They bind to ash particles and can move long distances through the air. Some PAHs can dissolve in water. PAHs can enter groundwater from ash, tar, or creosote that is improperly disposed in landfills.

HOW ARE PEOPLE EXPOSED TO PAHs?

Breathing: Most people are exposed to PAHs when they breathe smoke, auto emissions or industrial exhausts. Most exhausts contain many different PAH compounds. People with the highest exposures are smokers, people who live or work with smokers, roofers, road builders and people who live near major highways or industrial sources.

Drinking/Eating: Charcoal-broiled foods, especially meats, are a source of some PAH exposure. Shellfish living in contaminated water may be another major source of exposure. PAHs may be in groundwater near disposal sites where construction wastes or ash are buried; people may be exposed by drinking this water. Vegetables do not take up significant amounts of PAHs that are in soil.

Touching: PAH can be absorbed through skin. Exposure can come from handling contaminated soil or bathing in contaminated water. Low levels of these chemicals may be absorbed when a person uses medicated skin cream or shampoo containing PAHs.

DO STANDARDS EXIST FOR REGULATING PAHs?

Water: Wisconsin has established drinking water standards for five PAHs: Anthracene - 3,000 parts per billion (ppb), Benzo(a)pyrene - 0.2 ppb, Benzo(b)fluoranthene - 0.2 ppb, Fluoranthene - 400 ppb and Fluorene - 400 ppb. We suggest you stop drinking water containing more than these amounts. If other PAHs are found in your drinking water, contact your local public health agency for advice.

Air: No standards exist for the amount of PAHs allowed in the air of homes. We use a formula to convert workplace limits to suggested home limits. Based on the formula, we recommend levels of PAHs in air be no higher than 0.004 parts per million (ppm).

The Wisconsin Department of Natural Resources regulates the amount of several PAHs that can be released by industries.

WILL EXPOSURE TO PAHs RESULT IN HARMFUL HEALTH EFFECTS?

The effects of breathing high concentrations of PAHs have not been studied. However, PAHs may be attached to dust or ash causing lung irritation. Skin contact with PAHs may cause redness, blistering, and peeling.

The following health effects can occur after several years of exposure to PAHs:

Cancer: Benzo(a)pyrene, a common PAH, is shown to cause lung and skin cancer in laboratory animals. Other PAHs are not known to have this effect. Extracts of various types of smoke containing PAHs caused lung tumors in laboratory animals. Cigarette smoke will cause lung cancer.

Reproductive Effects: Reproductive problems and problems in unborn babies' development have occurred in laboratory animals that were exposed to benzo(a)pyrene. Other PAHs have not been studied enough to determine whether they cause reproductive problems.

Organ Systems: A person's lungs, liver, skin, and kidneys can be damaged by exposure.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person.

A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It's also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

CAN A MEDICAL TEST DETERMINE EXPOSURE TO PAHs?

Many PAHs can be detected in blood or urine soon after exposure. Tests for these compounds are not routine and can only be performed using special equipment not usually found in doctor's offices. People who think they may have been exposed to PAHs for a long time should contact their physician. Blood tests of liver and kidney function are available. People exposed to PAHs in air may want to ask their doctor to consider having lung function tests done.

Seek medical advice if you have any symptoms that you think may be related to chemical exposure.

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: www.dhfs.state.wi.us/eh/index.htm

Prepared by the
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Agency for Toxic Substances and Disease Registry,
Public Health Service,
U.S. Department of Health and Human Services.

(POH 4606 *Revised* 12/2000)

NAPHTHA: COAL TAR

NCT

CAUTIONARY RESPONSE INFORMATION

Common Synonyms			
Mixture of benzene, toluene, xylenes	Watery liquid	Colorless to pale yellow	Gasoline-like odor
	Floats on water. Irritating vapor is produced.		

Keep people away.
Avoid inhalation.
Shut off ignition sources and call fire department.
Avoid contact with liquid and vapor.
Stay upwind and use water spray to ``knock down'' vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

Combustible.
Extinguish with foam, dry chemical or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Skim
Chemical and Physical Treatment: Burn
Clean shore line
Salvage waterfowl

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 33; Miscellaneous Hydrocarbon Mixtures
2.2 Formula: Currently not available
2.3 IMO/UN Designation: 3.2/2553
2.4 DOT ID No.: 1268
2.5 CAS Registry No.: MX8030-31-7
2.6 NAERG Guide No.: 128
2.7 Standard Industrial Trade Classification: 33429

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Hydrocarbon vapor canister or air pack; plastic gloves; goggles or face shield.
3.2 Symptoms Following Exposure: Primarily a narcotic, causing unconsciousness in high concentrations. The symptoms of acute benzene poisoning are not likely, since the compound has components other than benzene.
3.3 Treatment of Exposure: Remove from exposure. Support respiration. Call physician.
3.4 TLV-TWA: 400 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Leukemia
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause a smarting and reddening of the skin.
3.12 Odor Threshold: 4.68 ppm
3.13 IDLH Value: 1,000 ppm
3.14 OSHA PEL-TWA: 100 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: 107°F C.C.
4.2 Flammable Limits in Air: Currently not available
4.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Not pertinent
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: 900–950°F
4.8 Electrical Hazards: Class I, Group D
4.9 Burning Rate: 4 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: Not pertinent.
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): Currently not available
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile: Not listed

7. SHIPPING INFORMATION

7.1 Grades of Purity: Purity varies with coal used and distillation range taken.
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Open (flame arrester)
7.5 IMO Pollution Category: B
7.6 Ship Type: 3
7.7 Barge Hull Type: 3

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: I
8.4 Marine Pollutant: Yes
8.5 NFPA Hazard Classification: Not listed
8.6 EPA Reportable Quantity: Not listed.
8.7 EPA Pollution Category: Not listed.
8.8 RCRA Waste Number: Not listed
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: Not pertinent
9.3 Boiling Point at 1 atm: 200–500°F = 93–260°C = 366-533°K
9.4 Freezing Point: Not pertinent
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 0.86–0.88 at 20°C (liquid)
9.8 Liquid Surface Tension: (est.) 20 dynes/cm = 0.020 N/m at 20°C
9.9 Liquid Water Interfacial Tension: (est.) 45 dynes/cm = 0.045 N/m at 20°C
9.10 Vapor (Gas) Specific Gravity: Currently not available
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.030
9.12 Latent Heat of Vaporization: (est.) 101 Btu/lb = 56.2 cal/g = 2.35 X 10^5 J/kg
9.13 Heat of Combustion: (est.) –18,200 Btu/lb = –10,100 cal/g = –424 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 0.13 psia

NOTES

NAPHTHA: COAL TAR

NCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	53.680	50	0.478	50	1.040	50	9.343
52	53.680	52	0.478	52	1.040	52	8.841
54	53.680	54	0.478	54	1.040	54	8.370
56	53.680	56	0.478	56	1.040	56	7.927
58	53.680	58	0.478	58	1.040	58	7.511
60	53.680	60	0.478	60	1.040	60	7.119
62	53.680	62	0.478	62	1.040	62	6.751
64	53.680	64	0.478	64	1.040	64	6.404
66	53.680	66	0.478	66	1.040	66	6.078
68	53.680	68	0.478	68	1.040	68	5.770
70	53.680	70	0.478	70	1.040	70	5.481
72	53.680	72	0.478	72	1.040	72	5.207
74	53.680	74	0.478	74	1.040	74	4.950
76	53.680	76	0.478	76	1.040	76	4.707
78	53.680	78	0.478	78	1.040	78	4.477
80	53.680	80	0.478	80	1.040	80	4.260
82	53.680	82	0.478	82	1.040	82	4.056
84	53.680	84	0.478	84	1.040	84	3.862
86	53.680	86	0.478	86	1.040	86	3.679
88	53.680	88	0.478	88	1.040	88	3.506
90	53.680	90	0.478	90	1.040	90	3.342
92	53.680	92	0.478	92	1.040	92	3.187
94	53.680	94	0.478	94	1.040	94	3.040
96	53.680	96	0.478	96	1.040	96	2.901
98	53.680	98	0.478	98	1.040	98	2.770
100	53.680	100	0.478	100	1.040	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340	0.094 0.124 0.163 0.211 0.272 0.347 0.440 0.553 0.691 0.856 1.054 1.290 1.569 1.897 2.281 2.728 3.247 3.846 4.535 5.323 6.221 7.241 8.394 9.695 11.160 12.790		N O T P E R T I N E N T		C U R R E N T L Y N O T A V A I L A B L E

CYANIDE

Chemical reference numbers (CAS) of common forms: Cyanide 57-12-5, Zinc Cyanide 557-21-1, Sodium Cyanide 143-33-9, Potassium Cyanide 151-50-8, Hydrogen Cyanide 74-90-8

WHAT IS CYANIDE?

Cyanide is very poisonous. Cyanide can exist as a gas, liquid or white crystal powder. Cyanide is used in the electroplating industry, in metal cleaning operations, and as an industrial bug killer. Breathing the gas, eating the liquid or solid forms can make people suddenly lose consciousness or cause death.

There are no common uses of cyanide in the home. Most cyanide in the environment results from industrial processes and from improper waste disposal.

HOW ARE PEOPLE EXPOSED TO CYANIDE?

Breathing: Cyanide gas can be found in industrial emissions and car exhaust, cigarette smoke and certain papers and plastics as they burn. It is also possible to breathe or eat cyanide dust when working with cyanide powder. If people use a contaminated water supply, they can breathe cyanide when they cook or shower with the water.

Drinking/Eating: Cyanide is sometimes found in contaminated drinking water. People can be exposed when they drink contaminated water. People who handle contaminated soil may be exposed when they eat or touch their mouths with dirty hands.

Touching: Cyanide can enter the body through skin when people handle the chemical, contaminated soil or contaminated water. People can be exposed to cyanide if they wash or bathe with contaminated water.

DO STANDARDS EXIST FOR REGULATING CYANIDE?

Water: The federal drinking water standard for cyanide is set at 200 parts per billion (ppb). We suggest you stop drinking water containing more than 200 ppb of cyanide.

Air: No standards exist for the amount of cyanide allowed in the air of homes. We use a formula to convert workplace limits to suggested home limits. Based on the formula, we recommend cyanide levels be no higher than 90 ppb. Most people can't smell cyanide until levels reach 600 ppb. Cyanide compounds smell like bitter almonds to some people, while others cannot smell them at all. If you can smell the chemical, the level is too high to be safe.

The Wisconsin Department of Natural Resources regulates the amount of cyanide that can be released by industries.

WILL EXPOSURE TO CYANIDE RESULT IN HARMFUL HEALTH EFFECTS?

The following health effects are described in cases of suicide or accidental exposure to high levels of cyanide compounds. These effects are not expected following low-dose exposures:

- Irritation of skin and mucous membranes (causing redness or flushing of skin)
- Headaches, dizziness and loss of coordination
- Nausea and vomiting
- Rapid, deep breathing or gasping
- Rapid pulse rate and increased blood pressure
- Muscle spasms and convulsions
- Loss of consciousness and death.

The following health effects can occur after several years of exposure to low levels of cyanide:

Cancer: No studies show a relationship between exposure to cyanide and the development of cancer.

Reproductive Effects: Studies of laboratory animals show exposure to cyanide resulted in birth defects.

Organ Systems: Cyanide can cause nerve damage affecting hearing, vision, and muscle coordination. Damage to the thyroid gland is also possible, resulting in changes of metabolism in adults and slowing growth or development in children.

In general, chemicals affect the same organ systems in all people who are exposed. A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It's also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

CAN A MEDICAL TEST DETERMINE EXPOSURE TO CYANIDE?

Doctors can test urine for "thiocyanate" shortly after exposure to cyanide. Blood levels of cyanide can indicate recent exposure. Cigarette smokers generally have higher levels of cyanide-related compounds in their bodies than non-smokers.

Seek medical advice if you have any symptoms that you think may be related to chemical exposure.

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: www.dhfs.state.wi.us/eh/index.htm

Prepared by the
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Agency for Toxic Substances and Disease Registry,
Public Health Service,
U.S. Department of Health and Human Services.

(POH 4594 *Revised* 12/2000)

POLYCHLORINATED BIPHENYL

PCB

CAUTIONARY RESPONSE INFORMATION

Common Synonyms			
Arochlor Chlorinated biphenyl Halogenated waxes PCB Polychloropolyphenyls	Oily liquid to solid powder Sinks in water.	Light yellow liquid, or white powder	Weak odor

Notify local health and pollution control agencies.
Protect water intakes.
Keep people away.
Avoid contact with liquid and solid.
Call fire department.

Fire	Combustible. Extinguish with water, foam, dry chemical, or carbon dioxide.
Exposure	CALL FOR MEDICAL AID. LIQUID OR SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Contain
Collection Systems: Pump; Dredge
Clean shore line

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.
2.2 Formula: $(C_{12}H_{10-x})Cl_x$
2.3 IMO/UN Designation: Not listed
2.4 DOT ID No.: 2315
2.5 CAS Registry No.: 1336-36-3
2.6 NAERG Guide No.: 171
2.7 Standard Industrial Trade Classification: 51139

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Gloves and protective garments.
3.2 Symptoms Following Exposure: Acne from skin contact.
3.3 Treatment of Exposure: SKIN: wash with soap and water.
3.4 TLV-TWA: Not listed.
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 2; oral rat LD_{50} = 3980 mg/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Causes chromosomal abnormalities in rats, birth defects in birds
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations.
3.11 Liquid or Solid Characteristics: Contact with skin may cause irritation.
3.12 Odor Threshold: Currently not available
3.13 IDLH Value: Not listed.
3.14 OSHA PEL-TWA: Not listed.
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: >286°F
4.2 Flammable Limits in Air: Currently not available
4.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Irritating gases are generated in fires.
4.6 Behavior in Fire: Not pertinent
4.7 Auto Ignition Temperature: Currently not available
4.8 Electrical Hazards: Not pertinent
4.9 Burning Rate: Currently not available
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: Not pertinent.
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity:
0.278 ppm/96 hr/bluegill/TL_m/fresh water
0.005 ppm/336-1080 hr/pinfish/TL_m/salt water
6.2 Waterfowl Toxicity: LD_{50} 2000 ppm (mallard duck)
6.3 Biological Oxygen Demand (BOD): Very low
6.4 Food Chain Concentration Potential: High
6.5 GESAMP Hazard Profile:
Bioaccumulation: +
Damage to living resources: 4
Human Oral hazard: 1
Human Contact hazard: II
Reduction of amenities: XX

7. SHIPPING INFORMATION

7.1 Grades of Purity: 11 grades (some liquid, some solids) which differ primarily in their chlorine content (20%-68% by weight)
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: No requirement
7.4 Venting: Open
7.5 IMO Pollution Category: Currently not available
7.6 Ship Type: Currently not available
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Class 9
8.2 49 CFR Class: 9
8.3 49 CFR Package Group: II
8.4 Marine Pollutant: Yes
8.5 NFPA Hazard Classification: Not listed
8.6 EPA Reportable Quantity: 1 pound
8.7 EPA Pollution Category: X
8.8 RCRA Waste Number: Not listed
8.9 EPA FWPCA List: Yes

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid
9.2 Molecular Weight: Not pertinent
9.3 Boiling Point at 1 atm: Very high
9.4 Freezing Point: Not pertinent
9.5 Critical Temperature: Not pertinent
9.6 Critical Pressure: Not pertinent
9.7 Specific Gravity: 1.3–1.8 at 20°C (liquid)
9.8 Liquid Surface Tension: Not pertinent
9.9 Liquid Water Interfacial Tension: Not pertinent
9.10 Vapor (Gas) Specific Gravity: Not pertinent
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
9.12 Latent Heat of Vaporization: Not pertinent
9.13 Heat of Combustion: Not pertinent
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: Currently not available
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: Currently not available

NOTES

POLYCHLORINATED BIPHENYL

PCB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	81.150		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT
69	81.150						
70	81.150						
71	81.150						
72	81.150						
73	81.150						
74	81.150						
75	81.150						
76	81.150						
77	81.150						
78	81.150						
79	81.150						
80	81.150						
81	81.150						
82	81.150						
83	81.150						
84	81.150						
85	81.150						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	INSOLUBLE		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

POLYCHLORINATED BIPHENYLS (PCBs)

Also known as: Aroclor, Chlorinated Biphenyls, Kaneclor
Chemical reference number (CAS): 1336-36-3

WHAT ARE PCBs?

PCBs are a group of 209 different compounds. PCBs are man-made and have no smell. They are yellow, oily liquids that don't easily burn. There are no natural sources of PCBs.

Companies in the United States first made PCBs in 1929. They've been used as coolants in electrical equipment, metal-cutting oils, microscope lens oils, and in inks, dyes, and carbonless copy paper.

In 1977, the U.S. Environmental Protection Agency (EPA) banned the use of PCBs. The EPA was concerned about the harmful effects of PCBs. For example, PCBs can accumulate in the environment. PCBs may be present in old fluorescent light fixtures and parts of appliances made before 1978.

PCBs break down very slowly and can be carried long distances in the air, in rivers, lakes and oceans. PCBs can build up over time in the fat of people and animals. Recent studies found that most people have traces of PCBs in their body fat. PCBs can build-up in the food chain. For example, fish can have PCB levels in their fatty tissues that are much higher than the surrounding water.

HOW ARE PEOPLE EXPOSED TO PCBs

Drinking/Eating: For most people, eating fish or other seafood caught from polluted water is the main way in which they are exposed to PCBs.

Women who are pregnant or plan to have children should be especially cautious about eating contaminated fish. When people eat contaminated food over many years, PCBs can build up in their body fat. When people lose weight or breastfeed, their bodies use stored fat and put stored PCBs back into their blood. Babies may be exposed to PCBs in breast milk from mothers who often eat PCB contaminated fish.

Researchers have found high levels of PCBs in several types of fish, shellfish, marine mammals and waterfowl. In general, older animals living in polluted areas have the highest levels. State advisories are available for people who eat sport-caught fish and waterfowl. For more information, contact your regional Wisconsin Department of Natural Resources (DNR) office or call (608) 266-1877.

Touching: People can be exposed to PCBs in places where these chemicals were used, spilled, or thrown away. PCBs can be absorbed through skin during handling of the chemicals, contaminated soil or other contaminated items.

Breathing: Inhalation of PCB vapors or air is a minor source of contamination.

DO STANDARDS EXIST FOR REGULATING PCBs?

Food: The U.S. Food and Drug Administration (FDA) suggests not eating fish containing more than 2 parts per million of PCBs. This guidance assumes that a person eats two 8-ounce servings of fish per month, for every month of the year.

Water: The state and federal drinking water standard for PCBs are both set at 0.5 parts per billion (ppb). The Wisconsin groundwater standard is 0.03 ppb. Wisconsin's standard is to protect people against the possible cancer-causing effects of PCBs and the effects PCBs have on infants. We suggest you stop drinking water containing more than 0.03 ppb of PCBs.

WILL EXPOSURE TO PCBs RESULT IN HARMFUL HEALTH EFFECTS?

Researchers have found PCBs cause a number of harmful health effects. Exposure to high levels of PCBs, as might occur as a result of a chemical spill, can cause changes in the immune system and in liver function. The following health effects can occur after several years of exposure to PCBs:

Cancer: PCBs cause liver cancer in laboratory animals and may cause cancer in humans.

Reproductive Effects: Some limited animal and human studies suggest PCBs can effect reproduction and the development of unborn babies. Researchers have noted learning and memory problems in some children who were exposed to PCBs before birth.

Immunity: Animal studies show the immune system can be affected by PCBs.

Organ Systems: PCB exposure can cause liver damage.

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person.

Each person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals including medicines, and personal habits such as smoking or drinking.

It is also important to consider the length of exposure to the chemical; the amount of chemical exposure; and whether the chemical was inhaled, touched, or eaten.

CAN A MEDICAL TEST DETERMINE EXPOSURE TO PCBs?

Doctors can use blood tests to evaluate exposure to PCBs. This type of blood test is expensive and not always locally available. Testing can also detect PCBs in human fat or breast milk. Most testing of this type has been done for research purposes. Liver function tests may be helpful in determining damage from exposure.

Seek medical advice if you have any symptoms that you think may be related to exposure.

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

FOR MORE INFORMATION

- Poison Control Center, 800-815-8855
- Your local public health agency
- Division of Public Health, BEH, 1 West Wilson Street, Rm. 150, Madison, WI 53701-2659, (608) 266-1120 or Internet: www.dhfs.state.wi.us/eh/index.htm

Prepared by the
Wisconsin Department of Health and Family Services
Division of Public Health, with funds from the
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(POH 4607 *Revised* 12/2000)

Appendix B

Draft Emergency Response Plan

TABLE OF CONTENTS

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

ERC	Emergency Response Coordinator
CRP	Cardio-Pulmonary Resuscitation
OBG	O'Brien and Gere Engineers, Inc.
ROD	Record of Decision
SDS	Safety Data Sheets
SSHO	Site Safety and Health Officer
USEPA	United States Environmental Protection Agency
WPSC	Wisconsin Public Service Corporation

1 INTRODUCTION

O'Brien and Gere Engineers, Inc. (OBG) prepared this Emergency Response Plan on behalf of Wisconsin Public Service Corporation (WPSC) for the use by WPSC site personnel, WPSC contractors, and other authorized parties in the event of an emergency when implementing the remedy selected by the U.S. Environmental Protection Agency (USEPA) in the September 2017 Record of Decision (ROD) for the WPSC Marinette Former Manufactured Gas Plant Superfund Alternative Site, Marinette County, Wisconsin. The purpose of this plan is to:

- Establish an organizational structure and procedures in the event of an emergency situation.
- Minimize hazards to human health and the environment from emergency events.
- Familiarize response personnel with equipment and procedures.

Since the scope of the remedy does not involve long term operations of a treatment plant, this Emergency Response Plan focuses on potential emergencies that may arise when implementing the excavation and monitoring activities specified in the ROD. Once the Final Design is approved and a construction schedule is established, WPSC will meet with local police, fire, and city staff who may be involved in responding to potential emergencies at the site during remedial action implementation. A Spill Prevention, Control and Countermeasure Plan, in accordance with 40 CFR Part 112, may be developed as site conditions warrant based on the Final Remedial Design.

OBG and/or WPSC will review this Emergency Response Plan with Site personnel covered by the plan including:

- When the Emergency Response Plan is initially developed or the Site personnel is assigned to the job.
- When the Site personnel's responsibilities under the Emergency Response Plan change.
- When the Emergency Response Plan is changed.

2 PRE-EMERGENCY PLANNING

In order to handle emergencies properly and effectively, planning and training is essential. Pre-emergency planning procedures must be in place to facilitate effective immediate response to emergency situations. Site personnel must be knowledgeable of their roles and responsibilities and act within their abilities and training. WPSC will prohibit employees from responding to emergency situations that would require them to be exposed to hazards beyond their level of training. Prior to Site activities, and as necessary throughout project execution, the Site Safety and Health Officer (SSHO), or other designee, will communicate with outside response agencies (e.g., fire, police, ambulance, and medical) to coordinate emergency response efforts. Contacts with each response agency will be informed of any changing site conditions that may affect emergency response. A complete list of emergency contacts can be found in Appendix A.

3 ROLES AND RESPONSIBILITIES

The SSHO will be the primary Emergency Response Coordinator (ERC). The SSHO or designated alternate will contact the appropriate personnel or authorities as determined by the type and nature of the incident. The personnel identified for these roles will be clarified as the remedial design progresses. The emergency contact list included in Appendix A will serve as documentation of the site-specific chain-of-command.

This chain-of-command is established to minimize confusion and to outline decision-making authority in the event of an emergency situation.

3.1 EMERGENCY RESPONSE COORDINATOR/INCIDENT COMMANDER ROLE

The ERC's responsibilities during emergency situations include:

- Evaluate emergency situation and special needs;
- Direct emergency efforts, including evacuation of personnel;
- Notify emergency response agencies;
- Oversee medical and decontamination procedures; and
- Serve as the point of contact for local fire department(s), hazardous material team(s) and other emergency response agencies.

The ERC's responsibilities after the emergency response activities have been completed include:

- Supervise cleanup efforts; ensure proper recovery, disposal and accounting of hazardous material/waste;
- Ensure all emergency equipment and supplies are inspected, cleaned, and made available for future use; and
- Document incident, advise management, and initiate debriefing.

The ERC will delegate, as necessary, specific roles and duties outlined above.

3.2 ALTERNATE EMERGENCY RESPONSE COORDINATOR ROLE

A Field Technician/Engineer will be designated as the primary backup to the ERC. Additional personnel may be trained as alternate ERCs based upon site complexity and/or size.

3.3 PROGRAM HEALTH AND SAFETY MANAGER ROLE

The Program Health and Safety Manager will provide technical assistance and lead post-event investigations. In addition, the Program Health and Safety Manager will receive and review reports from the Emergency Response Coordinator, provide information to appropriate management, track reports, be a liaison for worker's compensation, and be focal point for medical return to work considerations.

3.4 EMERGENCY RESPONSE TEAMS

Based upon the size and complexity of the Site and/or task activities, Emergency Response Teams will either be jointly comprised of all personnel on-site [cross-trained for necessary actions (e.g., spills, high-angle rescue)], specific individuals and local response agencies, or a combination thereof.

4 EMERGENCY RECOGNITION, PREVENTION, AND TRAINING

All Site personnel will be instructed daily to be constantly alert for potentially hazardous situations or conditions. Immediate recognition with necessary corrective actions of potential hazardous conditions can avert an emergency. Emergency response discussions will be incorporated into daily tailgate safety meetings and will include such topics as:

- Tasks to be performed
- Hazards that may be encountered, along with their effects and how to recognize symptoms
- Emergency procedures

Given the nature of remedial action of the project, training will be consistent with standards for Hazardous Waste Operations (29 CFR 1920.120). As such, all Site personnel shall have a minimum of the following safety training:

- 40-hour Hazardous Waste Operations
- 8-hour Annual Refresher Course
- Site-Specific Training

In addition:

- At least (1) member of the team shall have First Aid/Cardio-Pulmonary Resuscitation (CPR) training
- At least (1) member shall have 8-hour Site Health and Safety Coordinator Training
- The ERC shall have Hazardous Waste Operations incident commander 8-hour refresher

5 COMMUNICATION

Daily health and safety tailgate briefings will be used to remind personnel of their roles, responsibilities, and emergency procedures. A record of the safety briefings will be completed and maintained on-site.

Emergency communications will be by voice, audible horn/alarm, and/or cell phone. Site-specific emergency communication requirements are presented in Appendix B. Telephone or cell phone capability will be a requirement for the Site and Site personnel. Emergency telephone numbers will be kept in Site vehicles and/or Site office. Personnel will be instructed to immediately contact the SSHO or Site Manager if an emergency situation arises. A backup emergency notification system will also be used during all Site activities (e.g., vehicle horn located at each work location).

In the case of an emergency, the signal for personnel to evacuate the area will be a series of long blasts. Five short blasts of the air horn will signal "all clear" once the emergency has been mitigated as determined by the ERC; workers may return to their designated work areas.

Each type of communication will be tested to insure that Site personnel can identify the signals above background noise, as well as to check for system efficacy and accuracy.

In the event of an emergency requiring outside assistance, the ERC or designated alternate will contact outside help using the nearest telephone or other pre-established means.

6 SUPPORT AREAS, EVACUATION PROCUDURES, AND PERSONNEL ACCOUNTING

The primary evacuation assembly areas for the Site will be determined before commencement of work. Evacuation routes and assembly areas will be determined in pre-job briefings. Means of accounting for site personnel and visitors will be based upon site size and complexity (typical methods include sign-in logs). In the event of an evacuation, these logs will be brought to the assembly area(s) in order to verify safe evacuation by all. After a head count has been taken at the assembly area(s), further evacuation may be required based on wind direction and other weather conditions.

Alternate routes and assembly areas will be determined and utilized based upon wind speed and direction as well as emergency requirements. A Site Plan and Hospital Evacuation Route are included in the Health and Safety Plan.

7 EMERGENCY PROCEDURES

7.1 GENERAL

During an emergency, the following actions will be taken, with some actions conducted concurrently. No one will attempt an emergency response/rescue until the situation has been assessed and the appropriate response outlined.

It will be determined prior to work initiation, whether any tasks on-site are critical operations requiring one or more persons to shut down sensitive equipment in a time-critical manner. If it is determined that critical operations are evident, specific procedures will be outlined in an addendum to this report.

7.2 SECURITY ISSUES

Both routine and emergency response actions dictate the need for prevention of unauthorized access and for the protection of vital records and equipment. Evaluation of the Site size, location, political or social environment, and equipment needs are necessary to evaluate whether security personnel (private or public) is needed. As the remedial design progresses, WPSC will coordinate site security procedures with the City of Marinette.

In the event of unauthorized access, Site personnel should avoid confrontation (verbal or physical). Attempts must be made to explain Site hazards, and corporate and client expectations for a safe worksite. Continued presence by unauthorized persons will require a team member to notify the local police. Site activities may need to be halted in the event unauthorized persons create an adverse risk to themselves, to Site personnel or to subcontractor personnel.

7.3 SEVERE WEATHER/NATURAL DISASTERS

In the event of adverse weather conditions occurring at or near the Site such as lightning, high winds, tornado, hurricane or extreme heat, the SSHO will instruct the workers to discontinue or modify field operations. These natural phenomena complicate work activities and add or increase risk to all Site personnel. The following actions should be evaluated or taken in the event of severe weather:

- Stop work.
- Secure all loose materials, toolboxes, plywood, trash cans. etc.
- Bring all workers to safe areas indoors or in vehicles when lightning or severe weather is in the immediate area.
- Verify that all buildings and trailer doors are secured and windows closed.
- Shut down and disconnect all non-critical electrical equipment to protect the equipment from electrical surges and abrupt power loss.
- Notify Program Health and Safety Manager and WPSC Project Manager.

7.4 INJURY OR ILLNESS

In the event of injury or illness, Site personnel will take the following action:

- Evaluate the scene for safe entry.
- Notify SSHO and Site Manager.
- Assess the type and extent of injury or illness.
- Provide initial First Aid to the injured person.
- If the injury or illness is not potentially life-threatening, transport to local medical facility.
- If injury or illness is potentially life-threatening, notify emergency medical services.

- Notify Program Health and Safety Manager and WPSC Project Manager.

7.5 EXTRICATION

In the event a person becomes trapped and requires extrication, site personnel will take the following action:

- Notify SSHO and Site Manager.
- Evaluate the scene for safe entry.
- Contact the local Fire Department or Rescue Service.
- Provide initial First Aid, as necessary.
- Notify Program Health and Safety Manager and WPSC Project Manager.

7.6 CHEMICAL EXPOSURE

In the event of chemical exposure, Site personnel will take the following action:

- Evaluate the scene for safe entry.
- Notify SSHO and Site Manager.
- Provide assistance with emergency shower, eyewash, or other initial First Aid, as required [see Safety Data Sheets (SDS) for chemical information, if known].
- Decontaminate exposed personnel.
- Notify emergency medical services of need for transportation as necessary.
- Notify Program Health and Safety Manager and WPSC Project Manager.

7.7 SMALL FIRE

A small fire is defined as a fire that can be extinguished with a 4A:20BC type fire extinguisher or incipient stage fires, which can safely be extinguished with material readily at hand. The location of the fire extinguisher is provided in Appendix B. In the event of a small fire, Site personnel will take the following actions:

- Evacuate all unnecessary personal from the area, if possible, to an upwind location.
- Notify SSHO and Site Manager.
- If properly trained and authorized, attempt to extinguish fire using portable fire extinguishers or by smothering from an upwind location.
- Request emergency response assistance as appropriate.
- Notify Program Health and Safety Manager and WPSC Project Manager.

7.8 LARGE FIRE

In the event of a large fire, or a small fire that cannot be extinguished, the following actions will be taken:

- Sound alarm.
- Evacuate all unnecessary personnel from the area, if possible, to an upwind location.
- Notify local fire department; request other emergency response services (police, ambulance, and hospital), as needed.
- Notify Program Health and Safety Manager and WPSC Project Manager.

7.9 SPILLS

The Wisconsin spill law, Chapter 292.11(2) Wis. Stats., requires that a person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance shall notify the WDNR immediately

of the discharge that is not exempted. Spill reporting requirements are contained in NR706 Wis. Admin. Code. The spill Hotline telephone number is (800-943-0003). Information on spill reporting requirements is available in the Immediate Reporting Required for Hazardous Substance Spills PUB-RR-560 fact sheet. Additional information related to spill response is provided below.

7.9.1 Small Spill

In the event of a small spill, appropriate actions will be taken to prevent the spill from reaching groundwater, surface water or drains. Actions Include:

- Verification and assessment of spilled material, volume, and hazards [see Safety Data Sheets (SDS)].
- Determine appropriate response procedures including personal protection equipment.
- Determine the level of response to contain and clean it up using the appropriate materials and methods.
- Confine or contain spill with booms, pads, or berm.
- Neutralize spill with appropriate agents (if safe/possible).
- Notify Program Health and Safety Manager and WPSC Project Manager.
- Collect spilled material including absorbent material and place in appropriate containers. All hazardous materials shall be disposed of in accordance with all applicable hazardous waste regulations and WPSC requirements.

7.9.2 Large Spill

A volume equal to or greater than state or federal reportable quantity and/or those beyond the capabilities and resources of on-site personnel defines large spills. Appropriate remedial actions will be conducted according to state and federal regulations. General Procedures as follows:

- Verification and assessment of spilled material, volume, and hazards.
- As safe to do so, confine the spill to the smallest area possible using booms, pads, berms or any other effective material.
- Assess type and extent of damages and injuries to personnel; take appropriate First Aid steps if necessary.
- Notify Program Health and Safety Manager and WPSC Project Manager.
- In the event the additional emergency clean-up assistance is needed, WPSC will request assistance from emergency response contractors.
- Collect hazardous waste including contaminated booms and absorbent material. All hazardous clean-up residues shall be disposed of as hazardous waste in accordance with all applicable hazardous waste regulations.
- All emergency equipment will be decontaminated prior to being put back into service. Expendable or damaged supplies will be isolated and replaced.

7.10 CRITIQUES AND CORRECTIVE ACTIONS

Post emergency response activities include documentation, investigation and appropriate corrective actions to avoid future problems. The Program Health Safety Manager will lead the post-incident critique to assure worker knowledge of actions taken and proposals for changes as necessary. The SSHO is responsible for documenting incident reports and providing communication to management. The Program Health Safety Manager is responsible for providing direction and assistance. Corrective actions necessary based upon appropriate review and investigation of the incident are required prior to assumption of work. In the event corrective action(s) cannot be made on an immediate basis, documented plans and schedules will be formulated.

APPENDIX A – EMERGENCY CONTACTS

Emergency Contact	Phone Number
General Emergency	911
Ambulance	911
Hospital	TBD
Wisconsin Department of Health Services (WDHS)	(608) 258-0099
Marinette County Health and Human Services Department	TBD
Wisconsin Department of Natural Resources (WDNR)	(715) 355-2752
Wisconsin Hazardous Material Spill Hotline	(800) 943-0003
WDNR North East Regional Spill Coordinator	920-424-7077
Wisconsin Poison Control Center	(800) 222-1212
USEPA Region 5	(312) 353-2318
USEPA Emergency Response Center	(800) 424-8805
Wisconsin State Police	(715) 845-1143
Site Manager: TBD	TBD
Site Specific Health and Safety Office: TBD	TBD
Program Health and Safety Manager: TBD	TBD
WPSC Project Manager: Frank Dombrowski	(414) 221-2156, or (414) 587-4467
National Response Center	800-424-8802
WEC EIRT	414-430-3478
Site Office	TBD

APPENDIX B – EMERGENCY RESPONSE EQUIPMENT

The following emergency response equipment will be maintained on-site in the event of an emergency. Unless otherwise noted below, emergency equipment will be stored in the site vehicle or site office.

- **Communications Equipment and Alarms:** Cell phone.
- **Fire Control Equipment:** Fire extinguishers will be located in the field vehicles and in construction trailer.
- **Spill Control Equipment:** Slip kits will be stored in the site office for use in addressing small spills. The local fire department will be contacted to address large spills
- **Personal Floatation Devices:** Required for work near or on water
- **Personal Protective Equipment:** Level D PPE, or as required based on HASP.
- **First Aid Equipment:** A First Aid kit will be located in the Site office
- **Rescue Equipment:** When work near or over water, at least one skiff or power boat shall be required for Life-Saving operations.
- **Equipment Testing:** It is the responsibility of the ERC to periodically test communications and fire control equipment, and to ensure that all spill response/control, PPE, First Aid supplies, and rescue equipment is available and usable.
- **Maintenance of Equipment:** Fire extinguishers are to be inspected monthly with annual testing by an outside firm. First Aid supplies are to be inspected weekly. The wearer will inspect PPE when donning.

OBG

THERE'S A WAY