



SYMBIONT
ENGINEERS • SCIENTISTS • CONSTRUCTORS

Prepared for:

**City of South Bend Brownfields Coalition
227 West Jefferson Boulevard, 13th Floor
South Bend, Indiana 46601**

Sampling and Analysis Plan for Phase II Environmental Site Assessment

**Former Gasoline Service Station
Property
204 Roosevelt Road
Walkerton, Indiana 46574**

**Symbiont Project No. W150460
March 17, 2016**

Prepared for:

City of South Bend Brownfields Coalition
227 West Jefferson Boulevard, 13th Floor
South Bend, Indiana 46601

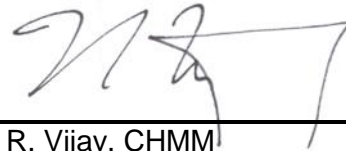
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Former Gasoline Service Station Property
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Symbiont Project No. W150460
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LIST OF ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
DOT	Department of Transportation
ESA	Environmental Site Assessment
FD	Field Duplicate
GPR	Ground Penetrating Radar
GPS	Geographic Positioning System
HASP	Health and Safety Plan
IDEM	Indiana Department of Environmental Management
MS/MSD	Matrix Spike / Matrix Spike Duplicate
PAH	Polycyclic Aromatic Hydrocarbon
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
REC	Recognized Environmental Condition
SAP	Sampling and Analysis Plan
SIN	Sample Identification Number
TW	Temporary Well
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

Section 1.0 INTRODUCTION

1.1 GENERAL

This Sampling and Analysis Plan (SAP) has been prepared on behalf of the City of South Bend Brownfields Coalition (Coalition) by Symbiont, Science, Engineering and Construction, Inc. (Symbiont) and Heartland Environmental Associates, Inc. (Heartland) for a field investigation to be performed as part of a Phase II Environmental Site Assessment (ESA) at 204 Roosevelt Road, Walkerton, Indiana (referred to as the “Site” or the “property”) (Figure 1). The Coalitions United States Environmental Protection Agency (USEPA) Community-Wide Brownfield Assessment Grant funds will be used to conduct assessment activities at the Site.

The purpose of this SAP is to document and report proposed sampling activities and rationale, outline data quality objectives, data generation methodologies and quality assurance measures associated with this Phase II ESA. All sampling procedures and analytical methods will be conducted in accordance with the grant-wide Quality Assurance Project Plan (QAPP) (Heartland 2015).

1.2 SITE DESCRIPTION/BACKGROUND

The site is located on approximately 1.1-acres situated on two parcels (Parcel #s 010-1032-0603 & 010-1032-0607). The Site was originally developed for residential use by at least 1922. The Site operated as a gasoline service station from at least the early 1960s through the mid to late 1980s. The site was vacant from this time through the early 2000s, when the site building was razed.

The property currently consists of vacant grounds with gravel parking and landscaped areas, and is currently owned by Mr. Lawrence E. Hiler. A Site location map is provided as Figure 1. A property location map depicting parcel boundaries is provided as Figure 2.

1.3 RECOGNIZED ENVIRONMENTAL CONDITIONS

A Phase I ESA conducted in February 2016 (Heartland, 2016), identified the following Recognized Environmental Condition (REC) and potential environmental concerns at the Site.

Historical Property Use and Historical Presence of UST

- The Site historically operated as a gasoline service station from at least the early 1960s through the mid to late 1980s.

During its operation as a gasoline service station, the site likely operated underground storage tanks (USTs). Historic reports reviewed indicate the Site potentially operated three (3) gasoline USTs and one (1) waste oil UST; however, documentation pertaining to the



registration and the removal and/or closure of any site USTs was not uncovered as part of the Phase I ESA. Historic subsurface investigations conducted at the Site have indicated the presence of elevated total petroleum hydrocarbon (TPH) impacts to soil as well as potential free product petroleum. To date only limited environmental subsurface investigation has been conducted at the Site.

A Phase II ESA will be conducted to confirm that the USTs have been removed from the Site and determine if there are petroleum impacts to soil and/or groundwater. This SAP has been prepared to outline the scope of work for the Phase II ESA.

Section 2.0

PROBLEM STATEMENT AND SCOPE OF WORK

2.1 PROBLEM STATEMENT

The REC at the Site have not yet been fully assessed. The objective of this Phase II ESA is to evaluate RECs identified in the Phase I ESA (Heartland, 2016). Specifically, the purpose of the assessment is to determine if USTs are present at the Site and to confirm the presence of petroleum products at the Site in conditions that constitute disposal or release, or provide sufficient information to render a professional opinion that there is no reasonable basis to suspect the presence of petroleum products at the Site. If present and applicable, the extent and magnitude of impact(s) will be evaluated to assess appropriate additional investigations and potential remedial actions.

2.2 SCOPE OF WORK

A geophysical survey will be conducted using ground penetrating radar (GPR) to confirm that historic USTs have been removed from the Site.

Up to 14 soil borings will be installed across the Site. Soil borings will be installed using direct push drilling techniques. Soil samples for laboratory analysis will be collected from each of the soil borings. The 14 soil borings will be completed as 1-inch diameter polyvinyl chloride (PVC) temporary groundwater piezometer. Groundwater samples will be collected from each of the temporary groundwater monitoring wells.

Soil and groundwater samples will be submitted to Pace Analytical Service, Indianapolis, Indiana (Pace Analytical) and analyzed for lead, volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbon compounds (PAHs).

The following sections provide detailed field investigation methods and procedures to be conducted as part of the Phase II ESA.

Section 3.0 GEOPHYSICAL SURVEY

3.1 GENERAL

A geophysical survey of the Site, using GPR survey techniques, will be completed based on the findings of the Phase I ESA (Heartland, 2016). A site-specific health and safety plan (HASP) has been developed for use during implementation of the geophysical survey is provided in Appendix A.

3.2 OBJECTIVES

A GPR survey of the entire Site will be in the estimated vicinity of the USTs to confirm that the historic UST have been removed from the Site. Geophysical surveying will also be utilized to identify other underground utilities such as water and electrical lines to assist with the utility clearance around soil boring locations.

3.3 GEOPHYSICAL SURVEY METHODOLOGY

A GPR survey will be conducted at the site to locate any suspected USTs or former UST excavation pits. Ground penetrating radar is a geophysical technique that uses electromagnetic waves for willow subsurface reconnaissance and exploration. An electromagnetic impulse in the form of ultra-high frequency radio waves are emitted into the ground by a transmitting antenna, and the resulting reflection of transfer of waves from buried objects and/or excavation boundary layers are detected by a receiving antenna. The presence of buried objects or significant changes in conductivity of the layers will cause the electromagnetic wave to be reflected. Together these images provide direct information concerning subsurface conditions. These images will then be transposed onto a final map, documenting the locations of any anomalies, including USTs, in the final Phase II ESA report.

Section 4.0 SOIL ASSESSMENT

4.1 GENERAL

The sampling and analytical approach for soil is based on the findings of a Phase I ESA (Heartland, 2016). A site-specific HASP has been developed for use during implementation soil assessment work and is provided in Appendix A.

4.2 OBJECTIVES

Heartland will conduct Phase II ESA field activities to address identified RECs and other environmental concerns identified in the Phase I ESA (Heartland, 2016). Site investigation activities will include the collection of subsurface soil samples to assess soil quality to identify potential historical leaks and/or spills. All sampling procedures and analytical methods will be conducted in accordance with the approved, grant-wide QAPP (Heartland, 2016).

4.3 SOIL BORING AND SUBSURFACE INVESTIGATION

Soil boring locations will be cleared for underground utilities by conducting an underground utility survey using GPR, notifying applicable utility companies, and reviewing any records available from the City or elsewhere regarding utility locations.

Soil sampling equipment such as drilling tools will be decontaminated prior to arrival onsite. To prevent cross contamination, all drilling and downhole equipment will be decontaminated in between use at the site utilizing a high-pressure spray washer, an Alconox solution wash, followed by a distilled water rinse.

The soil investigation will consist of up to 14 soil borings advanced using direct push drilling methods. Soil borings will be advanced throughout the site, with 7 borings advanced in the northern portion of the site in the area of the former USTs and former fuel dispenser islands, 4 borings advanced along the northwestern, northcentral, and northeastern boundaries of the Site in the area of the former gasoline service station and 3 borings advanced in the southern portion of the Site in landscaped areas north of the adjacent school building. Locations of the proposed soil borings are depicted on Figure 3.

Soil samples will be collected continuously at 2 foot intervals to the anticipated total boring depth. Soil samples will be visually and physically examined by Heartland field staff, and observations will be made of the general soil type, any visible layering, evidence of non-native fill materials if any, indications of chemical or other staining, odors, and any other distinctive features. Pertinent observations noted during advancement of the soil borings will be documented on the soil boring logs.

Additionally, each soil sample will be field-screened for the presence of organic vapors using a photoionization detector (PID). The PID will be calibrated daily in the field in accordance with the manufacturer's specification. The calibration of the PID will be checked periodically during the sampling day. PID readings will be recorded on the soil boring logs.

One soil sample for laboratory analysis will be collected from each soil boring. The soil sample interval where the highest PID reading is detected will be submitted to the laboratory for chemical analysis. If organic vapors are not detected in a boring, a soil sample for laboratory analysis will be collected from immediately above the water table.

Soil samples will be collected and analyzed for VOCs using U.S. Environmental Protection Agency (EPA) SW-846 method 8260B, PAHs using EPA SW-846 method 8270SIM, and lead using EPA SW-846 method 6020B. All samples will be placed in laboratory-supplied containers, preserved as appropriate, stored on ice, sealed with signed and dated custody seals, and submitted under chain-of-custody procedures to Pace Analytical for analysis.

Soil samples will be identified using a Sample Identification Number (SIN) with the following format:

Sample Type	Sample Location	Sample Interval (feet bgs)	Sample Name
Soil Boring	SB-01	-(1-2)	SB-01-1-2
Methanol Blank	TB	--	TB-01

bgs = below ground surface

4.3.1 Special Handling Considerations

Soil samples for laboratory analysis will be collected and preserved in accordance with applicable laboratory and EPA method requirements. The laboratory will supply the appropriate sample collection containers.

Methanol trip blanks will be analyzed for VOCs to verify that sample handling procedures have not affected the integrity of the field samples. Methanol trip blanks will be provided by the laboratory and will be subject to the same handling and transportation procedures as the samples. Trip blanks will be required at the rate of one per shipping container per day.

If non-disposable sampling equipment is used, equipment blanks will be prepared by filling the decontaminated sampling device with laboratory supplied reagent water, transferring the sample to bottles, and submitting the sample to the laboratory for analysis. If contaminants are found in the equipment or trip blanks, the source of the contamination will, if possible, be identified and corrective action, such as modifying the procedure and/or re-sampling if appropriate, will be initiated.

Field Duplicate (FD) samples will be collected and analyzed to assess the quality of the data resulting from the field sampling and analytical programs. The estimated number of FDs are based on the total number of samples collected. One (1) FD will be collected for every 20 samples submitted for analysis.

4.3.2 Chain-of-Custody

The chain-of-custody will allow for the tracking of possession and handling of individual samples from the time of field collection through laboratory submittal. The chain-of-custody will include sample identifiers, date collected, sample collection time, number of containers, analysis requested, sample preservation and special handling information, requested turnaround time and name(s) and signature(s) of sample collector(s). Additional chain-of-custody information includes; Heartland project manager, project name, and number, name of laboratory and the laboratory project manager contact information.

4.3.3 Field Log Book

An up-to-date field log book will be kept and maintained during all field investigation activities. The log book will include a general list of tasks performed, additional data, or observations not listed on field data sheets, and document communication with onsite personnel or visitors as it applies to the project.

4.3.4 Management of Investigative Waste

Investigative wastes generated during the soil boring and subsurface investigation will be properly managed and maintained. Waste soil cuttings will be collected in Department of Transportation (DOT)-approved 55 gallon drums or other appropriate container, sealed, labeled, and stored onsite pending the completion of laboratory analysis and determination of disposal restrictions, if any. As appropriate, waste soil cuttings will be handled, transported, and disposed of by a licensed waste handler per federal and state requirements. The generator of the waste will be the property owner at the time of the investigation.

4.3.5 Horizontal and Vertical Survey of Boring Locations

The horizontal and vertical location of the top of the ground surface at each soil boring will be surveyed using a sub-centimeter global positioning system (GPS). Horizontal accuracies within the capabilities of a sub-meter GPS unit (approximately 1.5 feet of error) are acceptable. Vertical accuracy of at least 0.01 feet is required.

Section 5.0 GROUNDWATER ASSESSMENT

5.1 GENERAL

The sampling and analytical approach for soil is based on the findings of a Phase I ESA (Heartland, 2016). A site-specific HASP has been developed for use during implementation soil assessment work and is provided in Appendix A.

5.2 OBJECTIVES

Heartland will conduct groundwater sampling activities to characterize groundwater at the Site to address identified RECs in the Phase I ESA (Heartland, 2016). All sampling procedures and analytical methods will be conducted in accordance with the approved, grant-wide QAPP (Heartland, 2016).

5.3 PIEZOMETER WELL INSTALLATION AND SAMPLING

All 14 of the soil borings will be converted into one-inch diameter temporary groundwater piezometers. Each temporary groundwater piezometer will be installed to the extent of the first encountered groundwater saturated zone, anticipated to be approximately 15 feet bgs. Each soil boring will be advanced approximately 5 feet below the water table. Each temporary groundwater piezometer will be constructed using approximately 5 feet of polyvinyl chloride well screen and blank well casing.

The temporary groundwater piezometers will be allowed to stabilize and will be sampled at within at least 24-hours following well installation. Groundwater samples will be collected from each piezometer utilizing Indian Department of Environmental Management (IDEM) approved low flow sampling methodology. Low-flow sampling methodology will include a flow through sampling cell for measuring groundwater quality parameters (temperature, pH, conductivity, dissolved oxygen, oxygen reduction potential and turbidity). Prior to sampling, each of the soil borings will be surveyed and located with global positioning system (GPS) coordinates.

Depth to groundwater data will be collected from each temporary piezometer to properly evaluate groundwater flow direction at the site. Groundwater monitoring wells will be additionally gauged utilizing a Solinst Oil/Water Interface Probe to evaluate for the presence of free product.

Groundwater samples will be submitted for analysis of VOCs using USEPA SW-846 Method 8260, PAHs using USEPA SW-846 Method 8270SIM and lead using USEPA SW-846 Method 6010B. Groundwater samples will be analyzed by Pace Analytical.

After collection of the groundwater samples, the temporary piezometers will be properly abandoned in accordance with Indiana Administrative Code 312 IAC 13-10-2 and the boreholes will be finished to grade.



Groundwater samples will be identified using a SIN with the following format:

Sample Type	Sample Location	Indicate Groundwater Matrix	Sample Name
Temporary Well	SB-01	-GW	SB-01-GW
Trip Blank	TB	-01	TB-01

5.3.1 Special Handling Considerations

Collection of groundwater samples for analysis for VOCs will be performed in accordance with the QAPP. Headspace should not be present in the sample container, thus minimizing the volatilization of organics from the sample. The laboratory will supply the pre-preserved 40-ml glass vials with Teflon™-lined caps.

A trip blank will accompany each sample cooler to verify that sample handling procedures have not affected the integrity of the field samples. Trip blanks will be provided by the laboratory and will be subject to the same handling and transportation procedures as the samples. Trip blanks will be required at the rate of one per shipping container of VOCs.

If re-usable sampling equipment is used, equipment blanks will be prepared by filling the decontaminated sampling device with laboratory supplied reagent water, transferring the sample to bottles, and submitting the sample to the laboratory for analysis. If contaminants are found in the equipment or trip blanks, the source of the contamination will, if possible, be identified and corrective action, such as modifying the procedure and/or re-sampling if appropriate, will be initiated.

FD, MS, and MSD samples will be collected and analyzed to assess the quality of the data resulting from the field sampling and analytical programs. The FD samples will be collected from the wells at a rate of one duplicate for every 10 investigative samples. MS and MSD samples will be collected at a rate of one for every 20 investigative samples. The estimated number of FD, MS, and MSD samples to be analyzed for each constituent is provided in Table 1.

5.3.2 Chain-of-Custody

The chain-of-custody will allow for the tracking of possession and handling of individual samples from the time of field collection through laboratory analysis. The chain-of-custody program will include: sample labels, custody seals, field logbook, chain-of-custody form/sample analysis request sheet, and laboratory logbook. All chain-of-custody procedures will be performed in accordance with the QAPP.

5.3.3 Field Log Book

An up-to-date field log book will be kept and maintained during all field investigation activities. The log book will include a general list of tasks performed, additional data, or observations not listed on field data sheets, and document communication with onsite personnel or visitors as it applies to the project.

5.3.4 Management of Investigative Waste

Investigative wastes generated during the assessment of groundwater is anticipated to be minimal. However, purge water will be collected in DOT-approved 55 gallon drums or other appropriate container, sealed, labeled, and stored on site pending the completion of laboratory analysis and determination of disposal restrictions, if any. As appropriate, waste groundwater will be handled, transported, and disposed of by a licensed waste handler in accordance with federal and state requirements. The generator of the waste will be the property owner at the time of the investigation.

5.3.5 Horizontal and Vertical Survey of Well Locations

The horizontal and vertical location of the top of the well casing and the top of the ground surface (borehole) at each well will be surveyed using either a sub-centimeter GPS unit. Horizontal accuracies within the capabilities of a sub-meter GPS unit (approximately 1.5 feet of error) are acceptable. Vertical accuracy of at least 0.01 feet is required.

Section 6.0 REPORT, SCHEDULE, AND ESTIMATED COSTS

6.1 REPORT

The Phase II ESA will provide a soil and groundwater condition assessment and identify potential contaminant sources at the Site. The Phase II ESA report will include:

- A summary of field methods and procedures
- Results of the geophysical survey,
- Tables and figures summarizing GPR findings, and analytical results for soil and groundwater samples,
- Laboratory analytical reports,
- Soil boring logs,
- Field PID data,
- Groundwater elevation data,
- Maps of boring and well locations,
- A description of any modifications to the scope of work in this SAP and an explanation for the deviation, and
- Photographs of assessment activities.

Recommendations for future actions, if necessary, will be provided in the Phase II ESA Report.

6.2 SCHEDULE

Fieldwork will be scheduled within one week of approval of this SAP. Fieldwork, including soil boring advancement, piezometer installation and groundwater sampling is anticipated to take three (3) days. Laboratory analysis is anticipated to take up to ten (10) business days. The final Phase II ESA report will be submitted no later than 30 days after the receipt of the final laboratory analytical results reports.

6.3 ESTIMATED COSTS

The total estimated costs for the scope of work for this Phase II ESA are \$19,000. A cost breakdown for each task involved in this project is provided in Table 2.



Section 7.0 REFERENCES

Heartland, 2016, Phase I Environmental Site Assessment, Former Gasoline Service Station Property, 204 Roosevelt Road, Walkerton Indiana, February 5, 2016.

Heartland, 2015, Quality Assurance Project Plan, City of South Bend Brownfields Coalition, Community-Wide Brownfields Assessment Project, prepared for The City of South Bend and Coalition Partners, The City of Mishawaka, and Saint Joseph County, Indiana, February 2015.

TABLES

TABLE 1

**Phase II Environmental Site Assessment
Sampling Volume and Laboratory Analysis
Former Gasoline Service Station Property in Walkerton, Indiana**

Sample Location	Anticipated Laboratory Analytical Parameters	Anticipated Sampling Matrix	Anticipated Number of Samples
SB-1 through SB-14	VOCs, PAHs, lead	Soil and Groundwater	1 Soil/1 Groundwater (1 per sample location)
FD-1 (QA/QC Sample)	VOCs, PAHs, lead	Soil	1 Soil
FD-2 (QA/QC Sample)	VOCs, PAHs, lead	Groundwater	1 Groundwater
MS/MSD-1 (QA/QC Sample)	VOCs, PAHs, lead	Soil	1 Soil
MS/MSD-2 (QA/QC Sample)	VOCs, PAHs, lead	Groundwater	1 Groundwater
Trip Blank (a) (QA/QC Sample)	VOCs	Water (Laboratory Provided)	1 Water
Methanol Trip Blank (a) (QA/QC Sample)	VOCs	Liquid (Laboratory Provided)	1 Methanol

(a) = A trip blank and/or methanol blank will be prepared and submitted to the laboratory each day groundwater and/or soil samples are collected.

SB = Soil boring

FD = Field Duplicate

MS/MSD = Matrix Spike/Matrix Spike Duplicate

QA/QC = Quality Assurance/Quality Control

VOCs = Volatile organic compounds

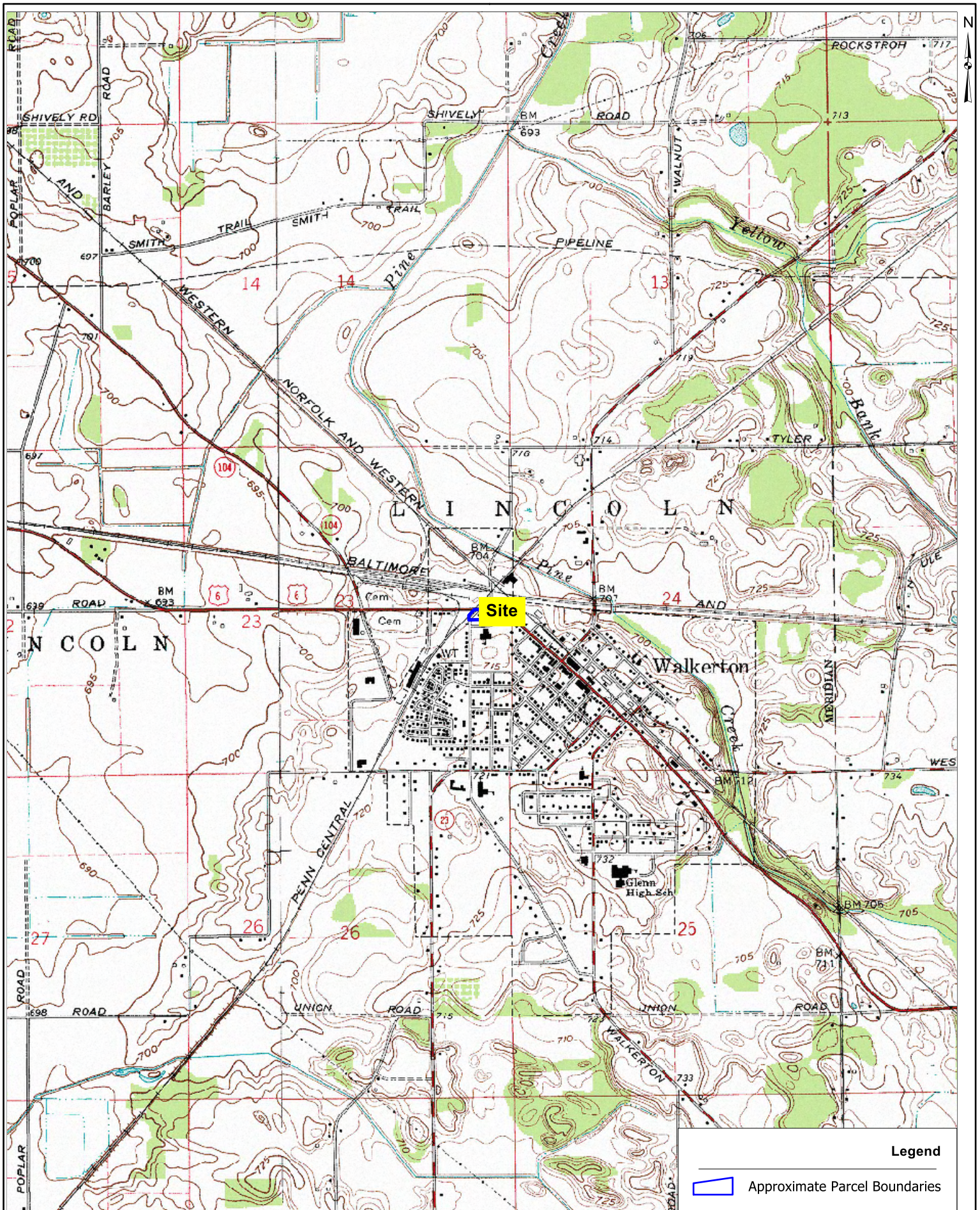
PAHs = Polycyclic Aromatic Hydrocarbons

TABLE 2


**Phase II Environmental Site Assessment
Estimated Costs
Former Gasoline Service Station Property in Walkerton, Indiana**

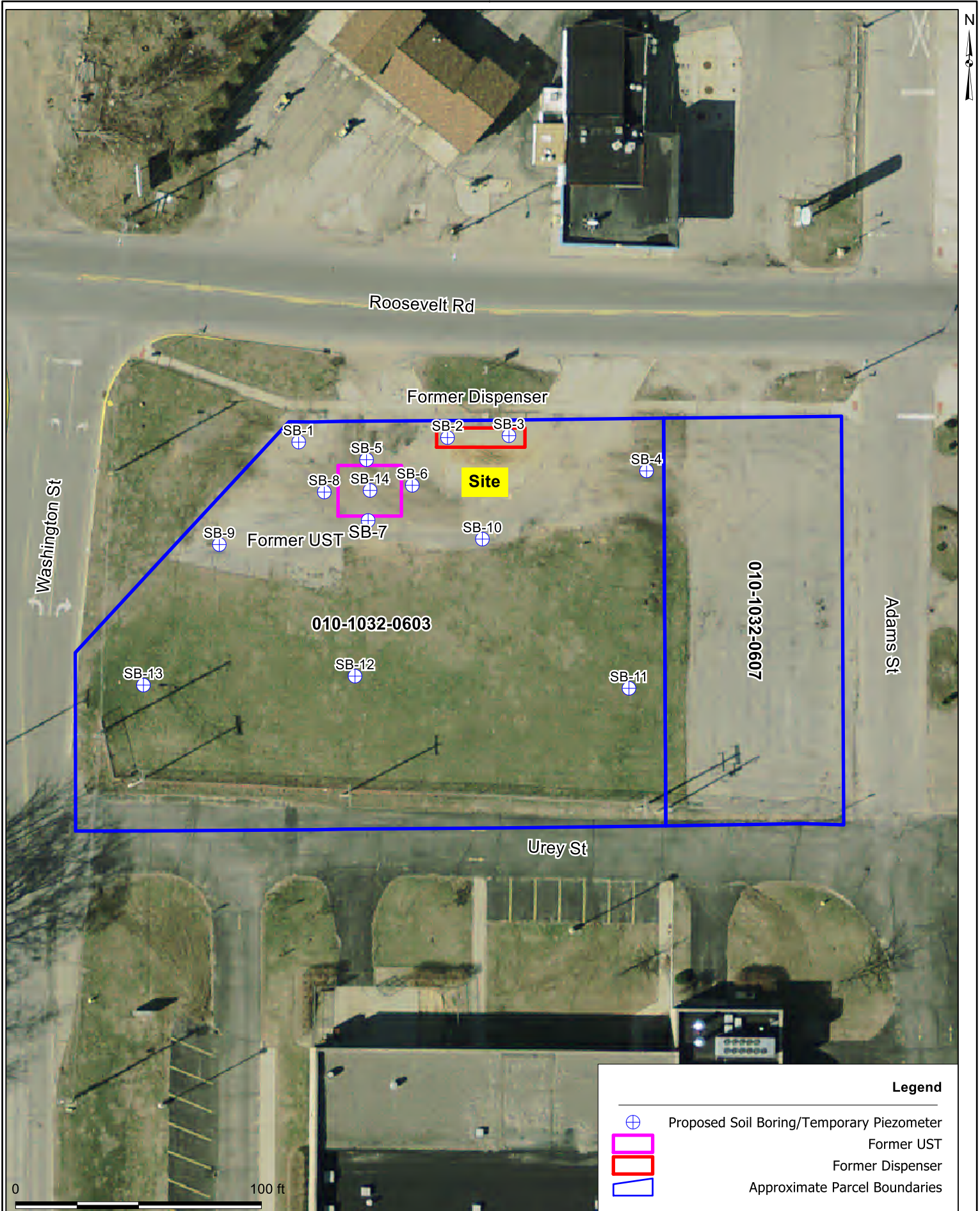
ITEM	ESTIMATED COST
Project Management and Coordination	\$2,400
Soil Boring, Temporary Piezometer Well Installation, and Sample Collection	\$2,000
Equipment and Supplies	\$600
Soil and Groundwater Laboratory Analytical	\$5,000
Drilling Subcontractor and Waste Disposal	\$3,250
Report Preparation	\$5,750
PROJECT TOTAL	\$19,000

FIGURES





 <p>6737 West Washington Street Suite 3440 West Allis, Wisconsin 53214 414.291.8840 FAX 414.291.8841</p>	DSGN: JRB	CHK: NV	<p>Former Gasoline Service Station 204 Roosevelt Road Walkerton, Indiana 46574</p>	<p>Figure 2 Site Location Map w/Parcel Boundaries</p>	SCALE 1 in : 50.00 ft
	DR:	APVD:			DWG
					DATE 3/2/2016
					PROJ. NO. 5200-16-02



APPENDIX A

SITE SPECIFIC HEALTH AND SAFETY PLAN



Heartland Environmental Associates, Inc.

HEALTH AND SAFETY PLAN

**Former Gasoline Service Station
204 Roosevelt Road
Walkerton, Indiana 46574**

March 1, 2016

“Your dependable partner for environmental compliance”

3410 Mishawaka Ave.

South Bend, Indiana 46615

Phone 574.289.1191

Fax 574.289.7480

This report is prepared by:

Heartland Environmental Associates, Inc.
3410 Mishawaka Avenue, South Bend, IN 46615
574-289-1191 Fax: 574-289-7480

Prepared for:

Town of Walkerton, Indiana
301 Michigan Street
Walkerton, Indiana 46574

&

The City of South Bend Brownfields Coalition
227 West Jefferson Boulevard
13th Floor
South Bend, Indiana 46601

For the Site:

Former Liquor Shack Property
3002 East Washington Street
Indianapolis, Indiana

Report prepared by:



Nivas R. Vijay, CHMM
Heartland Environmental Associates, Inc.

03/02/2016
Date

Heartland Environmental Associates, Inc.

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1.0 General Information

1.1. Project Name

Former Gasoline Service Station – Walkerton, Indiana Brownfields Environmental Assessment

1.2. Project Number

Heartland Project ID Number: 5200-16-05

1.3. Location

The site is located at 204 Roosevelt Road (U.S. 6) in Walkerton, Indiana. Site consists of a vacant parcel with asphalt and gravel parking lot and landscaped areas on approximately 1.1-acres.

1.4. Client

All work provided under the planned scope of work will be completed for the City of South Bend Brownfields Coalition and the Town of Walkerton. Work is being completed under a USEPA Community-Wide Brownfields Assessment Grant for Petroleum Substances provided to the City of South Bend Brownfields Coalition.

1.5. Plan Prepared By

Nivas R. Vijay, CHMM - Senior Project Manager - Heartland Environmental Associates, Inc.

1.6. Plan Approved By

John R. Barnhart, LPG – Senior Project Manager - Heartland Environmental Associates, Inc.

2.0 Site Description

2.1. General Site Description

The site was initially developed by at least 1922 with at least two residential dwellings. Beginning in the early 1960s, the site began operation as a gasoline service station. The site operated as a gasoline service station from at least the early 1960s through the mid to late 1980s. The site was vacant from this time through the early 2000s, when the site building was razed. The site remains undeveloped to present day. Prior to residential development the site was undeveloped. Please note due to the rural location of the site specific information related to exact dates of site operation could not be identified. A site location map is provided as Figure 1.

3.0 Project Objectives(s)

3.1. Description of Work Area Activities Planned

The scope of work for this project involves the advancement of soil borings, the installation of temporary groundwater piezometers, and the collection of soil and groundwater samples at the site. The scope of work also includes for sampling of groundwater from temporary piezometers utilizing Indiana Department of Environmental Management approved low-flow sampling methodology. Potential remedial alternatives selected will be addressed as determined.

4.0 Project Organization

Table 1

Team Member	Responsibility
Ryan Eckdale-Dudley	Symbiont – Project Director
Nivas R. Vijay	Project Manager/Site Supervisor/Primary Point of Contact
John R. Barnhart, LPG	Health and Safety Officer
David Nye	Senior Technician/Site Personnel
John A. Sill	Site Personnel
All personnel allowed on site will have current Health & Safety Training as required by 29 CFR 1910.120.	

4.1. Responsibilities

4.1.1. Senior Project Manager/Site Supervisor

The Project Manager will be responsible for preparation of the site work plan, provide adequate personnel, time, and resources to conduct on-site activities. The Project Manager will also be responsible for the project schedule and on-time completion of the project. The Project Manager is also responsible for overall site safety.

The Site Supervisor will be responsible for field team operations and safety. The Site Supervisor will manage daily site operations. The Site Supervisor will conduct daily on-site safety briefings and make sure proper safety procedures and policies are being conducted.

4.1.2. Health and Safety Officer

The Health and Safety Officer (HSO) will advise the Project Manager of all on-site health and safety issues. The HSO will develop or assist in development of this site-specific health and safety plan and is responsible for making sure that the procedures outlined in this plan are properly implemented. The safety officer shall be notified of any emergencies. The safety officer will be available to evaluate changes in site conditions or site operations that may potentially warrant changes in the site safety plan.

4.1.4. Site Personnel

Site personnel will be required to follow safety policies and procedures outlined and set forth in this document. Each individual conducting operation at the site will be required to read and sign the safety plan.

4.1.5. Subcontractors

Drilling subcontractors and UST removal subcontractors conducted site work will be required to be trained on the health and safety plan and will be required to work within all state, federal and OSHA guidelines. Subcontractors involved with site operations dealing with hazardous materials will be required to have current 24 or 40-hour training under 29 CFR 1910.120. Heartland will inform subcontractors of potential site hazards and each subcontractor will be required to develop their own site-specific plan. Each subcontractor will be required to maintain a high level of safety while conducting operations.

4.1.6. Notes

- Any violations of the safety plan may result in disciplinary action against the individual.
- The safety plan may be changed at any time by the project manager due to changes in scope of work or site conditions. The project manager will be immediately notified of the changes.
- All on-site staff will review the safety plan with the senior project manager/project manager before entry onto the site.

5.0 Hazard Analysis

The chemical and physical hazards that may be present are discussed in the following subsections.

5.1. Chemical Hazards

The primary impacts encountered at the site are related to historic operations at the site as a bulk oil terminal. These COCs include petroleum constituents (benzene, ethylbenzene, xylenes, naphthalene), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene and polyaromatic hydrocarbons (PAHs) and lead. The chemical-specific Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) and chemical and physical properties are shown in the following table.

Table 2

Principal Contaminant(s)	PEL ppm	IDLH ppm	Incompatibilities & Reactivities	Symptoms/Effects of ACWE Exposure
Lead	0.050	100	Strong Oxidizers, acids, hydrogen peroxide	Eyes, nose and throat irritant, dizziness, headache, and nausea
VOC's/PAH's	-	-	Vary – Strong oxidizers	Eyes, nose and throat irritant, dizziness, headache, and nausea

Principal Contaminant(s)	PEL ppm	IDLH ppm	Incompatibilities & Reactivities	Symptoms/Effects of ACWE Exposure
*: Represent potential on site exposures				

5.1.1. Waste Type(s)

- Free Product – Potentially, residual petroleum product collected with purged groundwater
- Liquid – Yes, water from soil borings and decontamination water, if necessary
- Solid – Yes, soil cuttings from borings, if necessary
- Sludge – No
- Gas – Possible, volatile organic vapors from constituents in table above

5.1.2. Waste Characteristics

- **Corrosive** – Unlikely, metals and SVOCs if present, but will present minimal hazard.
- **Flammable** – Potentially. Flammable components not likely to be encountered, although degraded petroleum free product is present.
- **Reactive** – Unlikely.
- **Oxidizer** – No
- **Toxic** – Slightly, materials that may be present can be toxic in large quantities or high concentrations for what is expected during this phase of work. If levels of these chemicals reach the OSHA PELs, STELs, or IDLH, they could potentially be acutely toxic. This type of symptom would occur if a person inhaled a very large dose of these chemicals or ingested a large dose. Chronic or long-term exposure is most likely to occur in the human body when an exposure occurs in lower levels over an extended period of time. This may cause damage to internal organs weeks or years after the exposure. Exposure levels for constituents listed in the table above are anticipated to be well below the OSHA PEL-Time Weighted Average (TWA). Because the materials are in a soil or water mix, the toxicity level of the material is anticipated to be very low.

5.1.3. Suspected Route of Exposure

- Ingestion – moderate; impacted soil particles from soil cuttings, but likely from improper sanitation after handling impacted soil or groundwater
- Inhalation – low; vapors from impacted soil or groundwater
- Skin Absorption – low; contact with impacted soil or groundwater.
- Is there potential for direct contact or splash? – Potentially, but unlikely with proper personal protective equipment (PPE). Employees must wear gloves when sampling soils or water.

5.1.4. Safety Data Sheets (SDS)

The SDS for chemicals of concern are provided in Attachment A. Please refer to the SDS for proper first aid and other relevant hazard information. SDS for chemicals most likely to be present are included.

5.2. Physical Hazards

Physical hazards of major concern are trip hazards, heat and cold stress, equipment operations, system operations, and utilities. Each of these issues has been addressed in the following sections.

5.2.1. Heat Stress

This is not as great of concern for this phase of the project, since operations will be conducted during the spring months, but potential does exist for warmer weather days. The wearing of personal protective equipment puts a worker at considerable risks for heat stress. Results from over exposure to heat may include the following signs and symptoms.

Heat Rash results when moisture is held close to the skin when the body sweats, which prevents evaporation and clogs pores. Signs and symptoms include:

- Red rashes and
- Blotchy skin

Heat Cramps are caused by prolonged exposure to heat and sweating without adequate fluid and electrolyte replacement. Signs and symptoms include:

- Muscle spasms in the abdomen and muscled most heavily used, and
- Pain in the hands, feet and abdomen?

Heat Exhaustion occurs from increased stress on various body organs, including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale skin
- Heavy sweating
- Dizziness, fainting, blurred vision, and
- Low blood pressure and a rapid pulse

Heat Stroke is the most serious form of heat stress. Temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. Competent medical help must be obtained immediately. Signs and symptoms include:

- Hot and unusually dry skin, red face
- Lack of or reduced perspiration
- Dizziness and confusion and
- Strong, rapid pulse, and coma?

To reduce the risk of heat exposure workers will drink 16 ounces of non-caffeinated fluid (preferably water or diluted drinks) before beginning work. Workers are urged to drink plenty of fluids throughout the work shift, as needed. A total of 1.6 gallons is recommended, but more may be necessary to maintain hydration. On-site medical monitoring will occur when ambient temperatures indicate the likelihood for heat stress to occur (i.e. Level A or B work).

Operations conducted wearing impermeable ensembles will follow the work/break schedule.

Table 3

Adjusted Temperature	Break Schedule
90 F or above	After 15 minutes of work
87.5 – 90 F	After 30 minutes of work
82.5-87.5 F	After 60 minutes of work
77.5-82.5 F	After 90 minutes of work
72.5-77.5 F	After 120 minutes of work

5.2.2. Cold Stress

Exposure to cold temperatures increases the likelihood and potential for worker disorders or conditions that could result in injury or illness. Strong wind accompanied by cold temperatures can exacerbate the occurrence of injury or illness. The two generally recognized cold disorders or conditions are frostbite and hypothermia. Contributing factors to these disorders or conditions are:

- Exposure to extremely cold air temperatures
- High winds (wind chill or equivalent chill temperature (ECT))
- Contact with liquids (groundwater)
- Inadequate clothing
- Poor worker health

Control measures to prevent cold stress include dressing in warm, layered clothing (insulated or water-impermeable clothing is best) and warming up as necessary by taking shelter or breaks. An outer shell of windproof material is essential to preventing cold stress in high wind conditions when the air temperature is below 39.2° F. Make sure to protect extremities, especially ears and hands. Skin should be kept dry to avoid additional opportunities for frostbite. Replace wet clothing immediately with warm dry clothing as needed.

5.2.3. Excessive Noise

Hearing protection must be utilized during noisy operations (i.e. when performing well installation activities) to conserve hearing. The drilling and sampling activities that will occur for this project should not require implementation of a hearing conservation program. If site operations indicate noise level TWAs above the OSHA Action Level of 85 dBA, then applicable regulations (29 CFR

1910.95, 29 CFR 1926.52 and 29 CFR 1926.101) will be followed for site operations with respect to hearing conservation.

5.2.4. Confined Space Entry

Not applicable for this project. Only Heartland personnel trained to enter areas determined to be a permit-required confined space should do so, if necessary.

5.2.5. Open Excavations

Potential based on UST removal activities. Only UST decommissioning certified personnel in the State of Indiana will be allowed to work with the open excavation areas.

5.2.6. Welding and/or Cutting

Welding is not expected for this project.

Heartland recommends that cold cutting or other similar method be utilized in lieu of hot welding/cutting operations whenever possible. Welding operations should be performed in accordance with the general requirements of 29 CFR 1910 Subpart Q and any specific requirements of that subpart which apply (i.e. oxygen fuel gas welding on tanks and cylinders). The basic general requirements must address fire prevention and protection during welding operations (including providing fire extinguishers and training for personnel who may use them), personal protection of welders and associated personnel, and ventilation in the welding areas. Air monitoring for lower explosive limits (LELs) shall be performed before and during welding operations. If air monitoring data indicates that a LEL exists, all welding/cutting operations should be halted immediately until the hazard is eliminated.

5.2.7. Flammable Liquids

Impacted media are noncombustible in nature; however caution should be utilized when working with or near highly impacted medias, if found to be present on site. Flammable liquids used on site shall be handled, stored and marked properly. Flammable liquid containers will be OSHA-approved Safety Containers. Storage of flammable materials is not expected for this phase of work, but if containers will be stored at the site, they should be stored in a flammable storage cabinet or other appropriate secured location outside the exclusion zone. The area will be posted with NO SMOKING signs.

5.2.8. Equipment Operation/Tools

For the installation of soil borings and groundwater monitoring wells, Heartland will utilize a GeoProbe rig to conduct all site activities. Regular hand held tools will be utilized for all remaining aspects of the project. Heavy equipment (excavator/dozer) will be utilized for the UST removal and backfilling.

- **Equipment**

Each piece of equipment in operation at the site will be inspected before it can be used at the site. This will be the responsibility of the subcontractor. The equipment will be inspected to make sure that all safety devices are clearly labeled and functioning properly. This will include safety lights, emergency shut-off devices, and audio warning devices. Inspections of equipment will also be completed daily. The inspections will attempt to identify any worn parts and/or damaged safety equipment. If a safety issue is discovered, the piece of equipment will be tagged, and placed out of commission. The equipment will either be replaced or repaired. Daily inspection sheets will remain in the custody of the excavator. Each piece of heavy equipment will have a working fire extinguisher and first aid kit.

- **Operators**

Operators will be properly trained on each piece of equipment that they operate. This will be the responsibility of the subcontractor. Operators will have demonstrated competency in the operation of the equipment. Operators will inform other on-site staff of emergency shut-off switches and other safety devices that may be used during emergency situations.

- **Site Personnel**

Employees will not be allowed on or in the proximity of equipment until they have been properly trained and have received a safety briefing. The site supervisor or site personnel will keep a record of this briefing. Staff shall stay out of the operating range of any heavy equipment onsite. Entry into the operating zone is allowed only after the operator's attention has been gained and all buckets or extensions have been grounded.

5.2.9. Slip, Trip, Fall Hazards

The site should be cleared of slip, trip, and fall hazards. Tools and equipment will be stored appropriately, so as not to cause a slip or trip hazard, after decontamination. Any liquids will be contained immediately; areas with permanent walking hazards will be identified with marking paint or caution tape. The site supervisors will complete an assessment of general housekeeping at the site.

5.2.10. Presence of Underground Utilities

In order to eliminate hazards from underground utilities such as electric lines and natural gas supply lines, an underground utility marking service will be notified 48 hours in advance of any excavation activities. The typical color markings used are shown below:

- **Electric:** Marked by red paint.
- **Gas:** Marked by yellow paint,
- **Water:** Marked by blue paint.
- **Sewer:** Marked by green paint.
- **Telephone:** Marked by orange paint.
- **Specify exact location:** Blocks of residential lots.

- **Precautions to be taken:** IUPPS will be contacted to mark all lines.

It should be noted that all underground utilities should be marked and all notifications to Indiana Underground must be made a minimum of 48-hours prior to the initiation of any drilling activities to confirm all utilities in the direct vicinity of the site have been located.

5.2.11. Presence of Overhead Utilities

Special precautions must be taken when using a drill rig or excavator onsite within the vicinity of electrical power lines and other utilities. Contact with live power lines may lead to shock, burns and even electrocution. Also, fires can potentially be started when power lines are contacted or downed.

Overhead utilities will be located, noted and emphasized in project work plans. Each overhead line must be considered dangerous and noted before mobilization of the drill rig. An inspection of the site prior to site operations will be conducted to assess overhead lines and their locations. Overhead lines that are low or sagging must be noted, and the proper utility notified. No sagging or lowered lines are to be touched by site workers.

Areas where excavators are in operation must be inspected before operations occur. The minimum distance from any point or equipment extension to the nearest power lines should be determined when the extension is raised or being raised. The extension should not be raised or equipment operated if the distance is less than 20 feet. This is due to the potential of arcing and the movement of lines in the wind.

5.2.12. Traffic

Traffic hazards are prevalent in this area of Indianapolis. Before leaving for a site, make sure necessary traffic control equipment, cones, caution tape, and warning flags have been loaded into the field vehicle. Warning vests suitable based on visibility must be worn when on-site. Be sure to note traffic concerns, even when wearing vests and utilizing the following demarcation systems.

- Installing a well or advancing a soil boring – Use an appropriate number of cones and flags to demarcate the work zone. Cordon off the cone boundary with caution tape. Set-up the cone system before beginning work and take away upon completion of work tasks.

5.2.13. Weather

Proper care should be taken to understand the daily seasonal weather conditions prior to working onsite. Please refer to the sections on heat and cold stress above. If rain and/or snow is found on the ground at the site, then special caution must be taken with regard to work processes and drilling. Site personnel should exercise caution while walking or carrying equipment or other items on snow. Special considerations should also be made, should excessive temperatures be present during work activities.

5.2.14. Animals/Insects

The site has wooded areas and residential parcels in the vicinity. When entering wooded areas and vacant areas, examine the areas and create noise prior to entry to attempt to scare off any animals present. Survey the areas where work will be performed for signs of insects, such as bee's nests, and use an insect repellant if necessary. If ticks or other attaching insects are prevalent, then site personnel should inspect themselves prior to leaving the site. Be aware of any larger animals (dogs, possums, etc.) that may be present and avoid these animals.

6.0 Site Control

6.1. Site Access

During the course of site activities, it is anticipated that sampling activities will need to be conducted under modified Level C and Level D PPE. No personnel other than Heartland staff or subcontractors who are 40-hr or 24-hr OSHA trained will be allowed onto the site to perform sampling activities outlined in the Scope of Work for this project. Otherwise, site control will be maintained by on site personnel. A sign in sheet of this health and safety plan will be utilized to keep records of the workers entering and exiting the site. Heartland will place safety cones and caution tape, if necessary, around areas where any drilling and sampling activities are being conducted. Site personnel must check in prior to the start of any onsite work.

Work will be conducted at various locations at the site. Area-specific exclusion zones should be set-up by the contractor performing the work at that location. Workers entering these areas will sign in and out to keep track of personnel. Personnel entering these areas will be required to be in level C, or modified C PPE gear, depending on the air monitoring results.

If an outside agency comes onto the site the following procedures should be followed:

- Ask to see the representatives credentials and record pertinent information (name, agency, ID #, etc.) in the field book
- Request that any persons entering the exclusion zone be outfitted in the proper PPE
- **Exclusion Zones**

It is not anticipated that exclusion zones will be required to be set up for this project. Should exclusion zones be necessary, exclusion zones will be limited to the areas where the work pertaining to the containment area is being conducted. Personnel entering this area must be in Level D PPE and may be required to be in level C, or modified C PPE, depending on air monitoring results. Employees are not allowed to smoke, eat, drink, or apply cosmetics or sunscreen in the exclusion zone.

- **Contamination Reduction Zone**

This area is located outside of the exclusion zone. No impacted personnel, PPE, or heavy equipment will be allowed leave the exclusion zone without being properly decontaminated. Specific decontamination procedures are outlined in Section 9.0 of this plan.

- **Support Zone**

The support zone will be considered the remaining area of the facility not included in the exclusion zone or the contamination reduction zone. This area will not contain any contaminated material of personnel. Personnel in this area will be required to have level D PPE.

7.0 Personal Protective Equipment (PPE)

Based on the evaluation of potential hazards, the following levels of personal protection have been designated for site activities. Each contractor must make a hazard assessment in determining the proper PPE required for the activities they will perform. The assessment should include air monitoring and possibly analytical data in order to make the proper PPE determination. Determination of the proper PPE includes decisions on the type of respirator, protective clothing (chemical resistant suits and gloves) and other protective gear, such as hard hats. Site personnel must have successfully passed a qualitative fit test in a respirator present for site use, if needed. Additionally, site personnel must be trained in the use of the equipment utilized on site.

7.1. Level A

Not applicable

7.2. Level B

Not applicable

7.3. Level C

If site air monitoring or sampling results reveal elevated levels warranting respiratory protection, site personnel will use level C protection will include the following:

- Poly-coated tyvek suit;
- Inner glove;
- Nitrile outer glove;
- Inner boot;
- Hard hat;
- Outer boot; and,
- Full-face respirator.

Modified C PPE will be used when no inhalation hazards exist, but where there is a small potential for contact with contamination. Modified C PPE includes the following items:

- Poly-coated tyvek;
- Inner glove;
- Nitrile outer glove;
- Inner boot;
- Outer boot;
- Hearing protection;
- Hard hat; and,
- Safety glasses

7.4. Level D

Level D equipment will include the following equipment:

- Hard hat;
- Safety glasses;
- Steel-toed shoes; and
- Long sleeve shirt with traffic safety vest

Level C PPE will be required only if soil and groundwater data and soil vapor air monitoring suggests the upgrade in PPE. Soil and groundwater sampling will be conducted in modified level C. It is anticipated that Level D and modified Level C will be the primary PPE levels utilized for site work.

8.0 Medical Surveillance

To safeguard the health of field personnel, a medical monitoring program will be implemented. Those Heartland employees and any contractors performing hazardous waste work on-site should be included in the Medical Surveillance Program as highlighted below:

- Any employees who are exposed to hazardous substances above the published exposure limits, without the use of a respirator, for thirty days or more per year.
- Any employee who wears a respirator for 30 days or more per year.
- Any employee who develop symptoms due to overexposure to hazardous substances, become ill, or who are injured due to overexposure to hazardous substances.
- Member of HAZMAT teams.

If Heartland employees and contractors fall into any of the above categories, a baseline medical examination should include the following based on job task:

- Medical and work history
- Physical examination performed by a local licensed physician
- Eye exam
- pulmonary function test
- X-ray (chest)
- EKG
- Audiogram
- Urinalysis
- Blood chemistry
- Heavy metals
- Other tests as deemed necessary

All employees working on-site who will be working in any of the above conditions or any potential hazardous conditions will provide proof of a baseline examination. Periodic medical monitoring every 12 or at a minimum of 24 months is required. Personnel medical records will be maintained according to 29 CFR 1910.120(f) (8). Access to the records will be consistent with 29 CFR 1910.20. Any unexpected exposures will be reported to the safety officer.

9.0 Decontamination

All decontamination procedures will follow Heartland's SOPs. All equipment, machinery, trucks, and personnel shall be properly decontaminated prior to exiting the area. Decontamination of equipment will include washing with both Isopropyl alcohol, Liquinox soap water and a de-ionized water rinse.

9.1. Personnel Decontamination Procedures

All personnel entering the exclusion zone will undergo decontamination prior to leaving the site. Personnel will proceed through the following Level C decontamination stations:

9.1.1. Station 1

- Thorough wash of all equipment (hand tools, monitoring equipment, etc.)
- Disposal of gloves and disposable coveralls
- Equipment Required: Disposal containers, liquid collection facilities

9.1.2. Station 2

- Thorough wash of boots, respirator, and other equipment that is not disposable
- Equipment Required: Alconox and water

9.1.3. Station 3

- Storage facilities for decontaminated PPE and tools.
- Equipment Required: storage shelves

9.1.4. Heavy Equipment Decontamination

Inspection of heavy equipment and vehicles for gross contamination will be conducted prior to leaving the work zone. The equipment will then be placed into a decontamination pad in a contamination reduction zone. A power washer and brushes will be used to remove contaminated material; residual material will be collected and containerized for proper disposal.

9.2. Decontamination Waste Water

Collection: Collect all wastewater on-site in a labeled 55-gallon drum pending analysis.

Disposal: Solid and liquid material will be evaluated and sent for proper waste disposal offsite.

10.0 Air Monitoring

Air monitoring will be conducted by site personnel trained in the use and calibration of the equipment utilized at the site, should chemical hazards be encountered where air monitoring is deemed necessary. Calibration of air monitoring equipment should be conducted in the field and recorded in the log book. Monitoring should be conducted at a minimum as follows: 1) prior to initiating work, 2) when work conditions change, or 3) when conditions dictate that continuous monitoring is necessary. Please note that air monitoring will only be initiated when conditions present themselves to indicate environmental hazards are present which present a threat to human health or the environment.

10.1 Personal Air Monitoring

In accordance with 29 CFR 1910.120, each contractor and subcontractor, as applicable and according to their respective SOPs, will conduct personal air monitoring for their employees. Personal sampling should be performed for those workers in worst-case or high-risk situations. Documentation of sampling and results must be made available, if requested.

10.2 Perimeter/Area Monitoring

Photo-ionization detectors (PIDs) will be used to monitor for elevated levels of contaminants and determine if upgrades in the level of PPE will be necessary. Air monitoring may also be conducted

for LELs and oxygen levels in the atmosphere near the drilling operation using a combustible gas indicator (CGI). If an LEL is detected, operations will be stopped to determine the reason for the reading occurring and if and how the hazardous condition will be eliminated. If oxygen levels are detected below 19.5% or above 23.5%, work will also be stopped to determine the reason for those readings.

Calibration of all equipment will be conducted in accordance with manufacturer's specifications. All documentation of calibration of equipment and sampling results must be available from each contractor and subcontractor upon request.

11.0 Contingency Plan

11.1. Emergency Communication Signal(s)

Emergency communication between Heartland personnel will be direct, if possible. If visual contact cannot be maintained, hand-held radios will be used when and if necessary. Hand signals should be used when necessary as follows:

Signal

Hand gripping throat
Grip partners wrist(s)
Hands on top of head
Thumbs up
Thumbs down

Message

Can't breathe
Leave area immediately
Need assistance
I'm OK/I understand
No/negative

11.2. Emergency Escape Route(s)

In case of an emergency, all site personnel will be directed north of the site. Personnel will be directed to the vacant parking area located off of East Washington Street north of the site to a safe distance away from the site as determined by the onsite H&SO. If it is found that airborne hazards are being carried to this location, then an alternate location should be selected based on weather conditions (i.e. wind direction).

11.3. Emergency Equipment on Site

Each contractor and subcontractor should supply the proper emergency equipment necessary based on the respective job tasks at the site. The Heartland H&SO will be responsible for making sure contractors and subcontractors have the necessary minimum emergency equipment and coordinate the use, if necessary, of these items between subcontractors.

- First Aid Kit: Yes, in field vehicles
- Fire Extinguisher: Yes, in field vehicles
- Telephone: Mobile phone with on site personnel
- Eye Wash/Safety Shower: Eyewash in field vehicles

11.4. Hazards on Site

The on-site safety hazards include the previously mentioned chemical hazards and physical hazards.

11.5. Re-entry to the Exclusion Zone

Re-entry to the Exclusion Zone following an on-site emergency shall not be permitted until the following conditions are satisfied:

- The conditions resulting in an emergency have been corrected.
- Appropriate personnel have received medical attention, if applicable.
- The hazards have been re-evaluated.
- The Site Safety Plan has been reviewed and determined adequate for the hazards encountered.
- All site personnel have been instructed in any new hazards and changes to the Site Safety Plan.

12.0 Emergency Response Plan

12.1. Pre-Emergency Planning

All personnel shall read the Health & Safety Plan (HASP) and sign the signature page. Emergency procedures outlined in this plan should be discussed with on site personnel and followed when appropriate. Should an emergency occur, a safety meeting must be held and documented and relevant personnel outlined in this plan contacted. Site personnel should follow the chain-of-command outlined in this plan with the senior Heartland personnel relinquishing authority to the LEPC when on site. All small, non-life threatening operations will be controlled by site personnel. This will include small releases less than reportable quantities, small equipment fires, or non-emergency first aid issues.

In the case of large emergencies or life-threatening situations, efforts will be focused on the removal of site workers from the hazardous situation. Emergency contact will be made immediately, including all necessary state, local, Federal, and Heartland personnel.

12.2. Lines of Authority

Heartland's Project Manager.....574-360-0961
Heartland's Health & Safety Officer.....574-289-1191
Heartland's Phone No.:574-289-1191

12.3. Hazard Analysis

Refer to Section 5.0 of this Health & Safety Plan

12.4. Safe Distances & Refuge

In the event of an evacuation, personnel will meet at a pre-determined designated location upwind of the site. Information will be gathered and relayed to the first emergency responder at the scene. The location of the meeting place will be determined by the onsite supervisor, due to the fact that operations may be from various areas at the site.

12.4.1. Air Monitoring

In the event of emergency, Heartland will use real time air monitoring to determine a safe distance.

12.4.2. Refuge

Refuge may be sought in a location pre-determined by the site supervisor. If this area is not considered safe, then the company support vehicles will be used to transport site personnel to a safe distance. The support vehicle should be placed at safe distance from site activity and upwind, if possible.

12.5. Site Control & Security

Heartland will assist emergency responders in maintaining site security.

12.6. Evacuation Procedures

Staff will be instructed to move to a safe location or meeting point to make emergency calls and further evaluate the emergency situation.

12.7. Emergency Decontamination

Emergency decontamination will consist of removal of potentially contaminated or otherwise impacted PPE, clothing, disposable gloves and boot covers by workers adequately protected in an environment where the victim will not be re-contaminated. It is not anticipated that PPE will be utilized at the site; therefore any emergency decontamination will be conducted to take care of potential skin absorption, inhalation and ingestion personal pathways.

12.8. Emergencies

Emergencies will be made known to the property owners through the line authority. An evaluation of the situation will dictate whether additional emergency equipment/personnel are necessary to mitigate the problem. Medical treatment for minor problems may be obtained from on site first aid kits. Major medical problems may be addressed at Wishard Hospital, located at 1001 West 10th Street in Indianapolis. Directions to the hospital and emergency phone numbers can be found in Attachment C. When notifying any authority or responder of a chemical emergency, also inform them of the chemical hazards involved.

13.0 Emergency Response

See Attachment A for the SDS sheets. Attachment B includes a general map of the site with relocation areas. Attachment C includes emergency phone numbers and a map with directions to the nearest hospital.

14.0 Signature Page

All personnel have read the above plan and are familiar with its provisions. All personnel have received medical surveillance and training in compliance with the health and & safety policies outlined in this plan, including all applicable Federal, state and local regulations. Heartland personnel may stop work at the site if it is not performed in accordance with this plan or OSHA regulations. In addition, subcontractors shall provide and make available a site safety plan at least as stringent as this plan. Heartland reserves the right to review any subcontractors plan and determine its authority.

All on-site personnel, subcontractor personnel, and any visitors within the confines of the work area are required to sign the following agreement prior to conducting work at the site.

1. I have read and fully understand this Site Health and Safety Plan.
2. I agree to abide by the provisions and my responsibilities outlined in this Site Health and Safety Plan.

Name (Company)	Signature

ATTACHMENT A

MATERIAL SAFETY DATA SHEETS



Genium Publishing Corporation

1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 316
Benzene

Issued: 11/78

Revision: E, 8/90

Section 1. Material Identification

Benzene (C₆H₆) Description: Derived by fractional distillation of coal tar, hydrodealkylation of toluene or pyrolysis of gasoline, catalytic reforming of petroleum, and transalkylation of toluene by disproportionation reaction. Used as a fuel; a chemical reagent; a solvent for a large number of materials such as paints, plastics, rubber, inks, oils, and fats; in manufacturing phenol, ethylbenzene (for styrene monomer), nitrobenzene (for aniline), dodecylbenzene (for detergents), cyclohexane (for nylon), chlorobenzene, diphenyl, benzene hexachloride, maleic anhydride, benzene-sulfonic acid, artificial leather, linoleum, oil cloth, varnishes, and lacquers; for printing and lithography; in dry cleaning; in adhesives and coatings; for extraction and rectification; as a degreasing agent; in the tire industry; and in shoe factories. Benzene has been banned as an ingredient in products intended for household use and is no longer used in pesticides.

Other Designations: CAS No. 0071-43-2, benzol, carbon oil, coal naphtha, cyclohexatriene, mineral naphtha, nitration benzene, phene, phenyl hydride, pyrobenzol.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*⁽⁷³⁾ for a suppliers list.

R 1	NFPA
I 4	
S 2*	3
K 4	0
*Skin absorption	2
	-
	HMIS
	H 3
	F 3
	R 0
	PPG†
	† Sec. 8

Cautions: Benzene is a confirmed *human carcinogen* by the IARC. *Chronic low-level exposure may cause cancer (leukemia) and bone marrow damage, with injury to blood-forming tissue.* It is also a dangerous fire hazard when exposed to heat or flame.

Section 2. Ingredients and Occupational Exposure Limits

Benzene, ca 100%*

1989 OSHA PELs
(29 CFR 1910.1000, Table Z-1-A)
8-hr TWA: 1 ppm, 3 mg/m³
15-min STEL: 5 ppm, 15 mg/m³

1989-90 ACGIH
TLV-TWA: 10 ppm, 32 mg/m³

(29 CFR 1910.1000, Table Z-2)
8-hr TWA: 10 ppm
Acceptable Ceiling Concentration: 25 ppm
Acceptable Maximum Peak: 50 ppm (10 min)†

1988 NIOSH RELs
TWA: 0.1 ppm, 0.3 mg/m³
Ceiling: 1 ppm, 3 mg/m³

1985-86 Toxicity Data‡

Man, oral, LD₅₀: 50 mg/kg; no toxic effect noted
Man, inhalation, TC₁₀: 150 ppm inhaled intermittently over 1 yr in a number of discrete, separate doses affects the blood (other changes) and nutritional and gross metabolism (body temperature increase)
Rabbit, eye: 2 mg administered over 24 hr produces severe irritation

* OSHA 29 CFR 1910.1000, Subpart Z, states that the final benzene standard in 29 CFR 1910.1028 applies to all occupational exposures to benzene except in some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.

† Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift.

‡ See NIOSH, *RTECS* (CY1400000), for additional irritative, mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 176 °F (80 °C)
Melting Point: 42 °F (5.5 °C)
Vapor Pressure: 100 mm Hg at 79 °F (26.1 °C)
Vapor Density (Air = 1): 2.7
Evaporation Rate (Ether = 1): 2.8

Molecular Weight: 78.11
Specific Gravity (15 °C/4 °C): 0.8787
Water Solubility: Slightly (0.180 g/100 g of H₂O at 25 °C)
% Volatile by Volume: 100
Viscosity: 0.6468 mPa at 20 °C

Appearance and Odor: A colorless liquid with a characteristic sweet, aromatic odor. The odor recognition threshold (100% of panel) is approximately 5 ppm (unfatigued) in air. Odor is *not* an adequate warning of hazard.

Section 4. Fire and Explosion Data

Flash Point: 12 °F (-11.1 °C), CC **Autoignition Temperature:** 928 °F (498 °C) **LEL:** 1.3% v/v **UEL:** 7.1% v/v

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish benzene fires. Water may be ineffective as an extinguishing agent since it can scatter and spread the fire. Use water spray to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Unusual Fire or Explosion Hazards: Benzene is a Class 1B flammable liquid. A concentration exceeding 3250 ppm is considered a potential fire explosion hazard. Benzene vapor is heavier than air and can collect in low lying areas or travel to an ignition source and flash back. Explosive and flammable benzene vapor-air mixtures can easily form at room temperature. Eliminate all ignition sources where benzene is used, handled, or stored.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Structural firefighter's protective clothing provides limited protection. Stay out of low areas. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Runoff to sewer can create pollution, fire, and explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Benzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Benzene explodes on contact with diborane, permanganic acid, bromine pentafluoride, peroxodisulfuric acid, and peroxomonosulfuric acid. It ignites on contact with dioxygen difluoride, dioxygenyl tetrafluoroborate, iodine heptafluoride, and sodium peroxide + water. Benzene forms sensitive, explosive mixture with iodine pentafluoride, ozone, liquid oxygen, silver perchlorate, nitryl perchlorate, nitric acid, and arsenic pentafluoride + potassium methoxide (explodes above 30 °C). A vigorous or incandescent reaction occurs with bromine trifluoride, uranium hexafluoride, and hydrogen + Raney nickel [above 410 °F (210 °C)]. Benzene is incompatible with oxidizing materials.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of benzene can produce toxic gases and vapors such as carbon monoxide.

Section 6. Health Hazard Data

Carcinogenicity: The ACGIH, OSHA, and IARC list benzene as, respectively, a suspected human carcinogen, a cancer hazard, and, based on sufficient human and animal evidence, a human carcinogen (Group 1).

Summary of Risks: Prolonged skin contact or excessive inhalation of benzene vapor may cause headache, weakness, appetite loss, and fatigue. The most important health hazards are cancer (leukemia) and bone marrow damage with injury to blood-forming tissue from chronic low-level exposure. Higher level exposures may irritate the respiratory tract and cause central nervous system (CNS) depression.

Medical Conditions Aggravated by Long-Term Exposure: Exposure may worsen ailments of the heart, lungs, liver, kidneys, blood, and CNS.

Target Organs: Blood, central nervous system, bone marrow, eyes, upper respiratory tract, and skin.

Primary Entry Routes: Inhalation, skin contact.

Acute Effects: Symptoms of acute overexposure include irritation of the eyes, nose, and respiratory tract, breathlessness, euphoria, nausea, drowsiness, headache, dizziness, and intoxication. Severe exposure may lead to convulsions and unconsciousness. Skin contact may cause a drying rash (dermatitis).

Chronic Effects: Long-term chronic exposure may result in many blood disorders ranging from aplastic anemia (an inability to form blood cells) to leukemia.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: Quickly remove contaminated clothing. Immediately rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air. Emergency personnel should protect against inhalation exposure. Provide CPR to support breathing or circulation as necessary. Keep awake and transport to a medical facility.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* since aspiration may be fatal. Call a physician immediately.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Physician's Note: Evaluate chronic exposure with a CBC, peripheral smear, and reticulocyte count for signs of myelotoxicity. Follow up any early indicators of leukemia with a bone marrow biopsy. Urinary phenol conjugates may be used for biological monitoring of recent exposure.

Acute management is primarily supportive for CNS depression.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Design and practice a benzene spill control and countermeasure plan (SCCP). Notify safety personnel, evacuate all unnecessary personnel, eliminate all heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against vapor inhalation, eye contact, and skin absorption. Absorb as much benzene as possible with an inert, noncombustible material. For large spills, dike far ahead of spill and contain liquid. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of confined spaces such as sewers, watersheds, and waterways because of explosion danger. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Waste No. U019

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 307 (a), 311 (b)(4), 112; and per RCRA, Sec. 3001]

☐ ARA Extremely Hazardous Substance (40 CFR 355): Not listed

☐ ted as SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Tables Z-1-A and Z-2)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations at least below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰³⁾

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all heat and ignition sources and incompatible materials. *Caution! Benzene vapor may form explosive mixtures in air.* To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. When opening or closing benzene containers, use nonsparking tools. Keep fire extinguishers readily available.

Engineering Controls: Because OSHA specifically regulates benzene (29 CFR 1910.1028), educate workers about its potential hazards and dangers. Minimize all possible exposures to carcinogens. If possible, substitute less toxic solvents for benzene; use this material with extreme caution and only if absolutely essential. Avoid vapor inhalation and skin and eye contact. Use only with adequate ventilation and appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation.

Designate regulated areas of benzene use (see legend in the box below) and label benzene containers with "DANGER, CONTAINS BENZENE, CANCER HAZARD."

Other Precautions: Provide preplacement and periodic medical examinations with emphasis on a history of blood disease or previous exposure.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Benzene (benzol)

DOT Hazard Class: Flammable liquid

☐ No.: UN1114

☐ T Label: Flammable liquid

☐ JT Packaging Exceptions: 173.118

DOT Packaging Requirements: 173.119

IMO Shipping Name: Benzene

IMO Hazard Class: 3.2

ID No.: UN1114

IMO Label: Flammable liquid

IMDG Packaging Group: II

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE—NO SMOKING
AUTHORIZED PERSONNEL ONLY
RESPIRATOR REQUIRED

MSDS Collection References: 1, 2, 12, 26, 73, 84-94, 100, 101, 103, 109, 124, 126, 127, 132, 134, 136, 138, 139, 143

Prepared by: MJ Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: MJ Upfal, MD, MPH; Edited by: JR Stuart, MS

Material Safety Data Sheet

Benzo[a]pyrene, 98%

ACC# 37175

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzo[a]pyrene, 98%**Catalog Numbers:** AC105600000, AC105600010, AC105601000, AC377200000, AC377200010, AC377201000 AC377201000**Synonyms:** 3,4-Benzopyrene; 3,4-Benzpyrene; Benzo[def]chrysene.**Company Identification:**

Acros Organics N.V.

One Reagent Lane

Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01**For emergencies in the US, call CHEMTREC:** 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50-32-8	Benzo[a]pyrene	>96	200-028-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow to brown powder.**Danger!** May cause harm to the unborn child. May impair fertility. May cause eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Cancer hazard. May cause allergic skin reaction. May cause heritable genetic damage.**Target Organs:** Reproductive system, skin.**Potential Health Effects****Eye:** May cause eye irritation.**Skin:** May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.**Ingestion:** May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.**Inhalation:** May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.**Chronic:** May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.**Skin:** Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.**Ingestion:** Never give anything by mouth to an unconscious person. Get medical aid. Do NOT

induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

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

Flash Point: Not available.

Autoignition Temperature: Not available.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

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

Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzo[a]pyrene	0.2 mg/m ³ TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m ³ TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m ³ IDLH (listed under Coal tar pitches).	0.2 mg/m ³ TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Benzo[a]pyrene: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Powder

Appearance: yellow to brown

Odor: faint aromatic odor

pH: Not available.

Vapor Pressure: Not available.

Vapor Density: Not available.

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: 495 deg C @ 760 mm Hg

Freezing/Melting Point: 175 - 179 deg C

Decomposition Temperature: Not available.

Solubility: 1.60×10^{-3} mg/l @ 25°C

Specific Gravity/Density: Not available.

Molecular Formula: C₂₀H₁₂

Molecular Weight: 252.31

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Dust generation.

Incompatibilities with Other Materials: Strong oxidizing agents.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 50-32-8: D33675000

LD50/LC50:

Not available.

Carcinogenicity:

CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found

Teratogenicity: No information found

Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.

Mutagenicity: Mutagenic effects have occurred in humans. Mutagenic effects have occurred in experimental animals.

Neurotoxicity: No information found

Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series:

CAS# 50-32-8; waste number U022.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NOT REGULATED FOR DOMESTIC TRANSPORT	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOL (Benzo{a} pyrene)
Hazard Class:		9
UN Number:		UN3077
Packing Group:		III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 50-32-8 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 50-32-8: immediate, delayed.

Section 313

This material contains Benzo[a]pyrene (CAS# 50-32-8, >96%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Benzo[a]pyrene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 50-32-8: 0.06 鎰/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T N

Risk Phrases:

R 43 May cause sensitization by skin contact.

R 45 May cause cancer.

R 46 May cause heritable genetic damage.

R 60 May impair fertility.

R 61 May cause harm to the unborn child.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 53 Avoid exposure - obtain special instructions before use.

S 60 This material and its container must be disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 50-32-8: No information available.

Canada - DSL/NDSL

CAS# 50-32-8 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997

Revision #7 Date: 6/30/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we

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Material Safety Data Sheets Collection:

Sheet No. 385
Ethylbenzene

Issued: 8/78

Revision: B, 9/92

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Section 1. Material Identification

Ethylbenzene (C₈H₈) Description: Derived by heating benzene and ethylene in presence of aluminum chloride with subsequent distillation, by fractionation directly from the mixed xylene stream in petroleum refining, or dehydrogenation of naphthenes. Used as a solvent, an antiknock agent in gasoline; and as an intermediate in production of synthetic rubber, styrene, cellulose acetate, diethylbenzene, acetophenone, ethyl anthraquinone, propyl oxide, and α -methylbenzyl alcohol. Other Designations: CAS No. 100-41-4, ethylbenzol, EB, phenylethane, NCI-C56393. Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

R 1
I 3
S 2*
K 4
* Skin
absorption



HMIS
H 2+
F 3
R 0
PPE - Sec. 8
† Chronic
effects

Cautions: Ethylbenzene is a skin and mucous membrane irritant considered the most irritating of the benzene series. Inhalation causes acute and chronic central nervous system (CNS) effects. It is highly flammable and forms explosive mixtures with air.

Section 2. Ingredients and Occupational Exposure Limits

Ethylbenzene, ca >99.0%. Impurities include ~0.1% *meta* & *para* xylene, ~0.1% cumene, and ~0.1% toluene.

1991 OSHA PELs

8-hr TWA: 100 ppm (435 mg/m³)
15-min STEL: 125 ppm (545 mg/m³)
Action Level: 50 ppm (217 mg/m³)

1990 IDLH Level

2000 ppm

1990 NIOSH REL

TWA: 100 ppm (435 mg/m³)
STEL: 125 ppm (545 mg/m³)

1992-93 ACGIH TLVs

TWA: 100 ppm (434 mg/m³)
STEL: 125 ppm (545 mg/m³)

1990 DFG (Germany) MAK

TWA: 100 ppm (440 mg/m³)
Category 1: local irritants
Peak Exposure Limit: 200 ppm, 5 min
momentary value, max of 8/shift
Danger of cutaneous absorption

1985-86 Toxicity Data*

Human, inhalation, TC_{Lo}: 100 ppm/8 hr caused eye effects, sleep, and respiratory changes.

Human, lymphocyte: 1 mmol/L induced sister chromatid exchange.

Rat, oral, LD₅₀: 3500 mg/kg; toxic effects not yet reviewed

Rat (female), inhalation, TC_{Lo}: 1000 ppm/7 hr/day, 5 days/wk, for 3 wk prior to mating and daily for 19 days of gestation produced pups with high incidence of extra ribs.⁽¹⁷⁹⁾

* See NIOSH, RTECS (DA0700000), for additional irritation, mutation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 277 °F (136 °C)
Melting Point: -139 °F (-95 °C)
Surface Tension: 31.5 dyne/cm
Ionization Potential: 8.76 eV
Viscosity: 0.64 cP at 77 °F (25 °C)
Refraction Index: 1.4959 at 68 °F (20 °C)
Relative Evaporation Rate (ether = 1): 0.0106
Bulk Density: 7.21 lb/Gal at 77 °F (25 °C)
Critical Temperature: 651 °F (343.9 °C)
Critical Pressure: 35.6 atm

Molecular Weight: 106.16
Density: 0.863 at 77 °F (25 °C)
Water Solubility: Slightly, 14 mg/100 mL at 59 °F (15 °C)
Other Solubilities: Miscible in alcohol, ether; soluble in carbon tetrachloride, benzene, sulfur dioxide, and many organic solvents; insoluble in ammonia
Odor Threshold: 2.3 ppm
Vapor Pressure: 7.1 mm Hg at 68 °F (20 °C); 10 mmHg at 78.62 °F (25.9 °C); 100 mm Hg 165.38 °F (74.1 °C)
Saturated Vapor Density (Air = 0.075 lb/ft³ or 1.2 kg/m³): 0.0768 lb/ft³ or 1.2298 kg/m³

Appearance and Odor: Colorless, flammable liquid with a pungent odor.

Section 4. Fire and Explosion Data

Flash Point: 64 °F (18 °C) CC Autoignition Temperature: 810 °F (432 °C) LEL: 1.0% v/v UEL: 6.7% v/v

Extinguishing Media: Class 1B Flammable liquid. For small fires, use dry chemical, carbon dioxide, or 'alcohol-resistant' foam. For large fires, use fog or 'alcohol-resistant' foam. Use water only if other agents are unavailable; EB floats on water and may travel to an ignition source and spread fire. **Unusual Fire or Explosion Hazards:** Burning rate = 5.8 mm/min. Vapors may travel to an ignition source and flash back. Container may explode in heat of fire. EB poses a vapor explosion hazard indoors, outdoors, and in sewers. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Cool container sides with water until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Withdraw immediately if you hear rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Ethylbenzene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Reacts vigorously with oxidizers.

Conditions to Avoid: Exposure to heat and oxidizers.

Hazardous Products of Decomposition: Thermal oxidative decomposition of EB can produce acrid smoke and irritating fumes.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,⁽¹⁶⁴⁾ NTP,⁽¹⁶⁹⁾ and OSHA⁽¹⁶⁴⁾ do not list EB as a carcinogen. **Summary of Risks:** Occupational exposure to EB alone is rare since it is usually present together with other solvents. EB is irritating to the eyes, skin, and respiratory tract. Vapor inhalation produces varying degrees of CNS effects depending on concentration. The liquid is absorbed through the skin but vapors are not. 56 to 64% of inhaled ethylbenzene is retained and metabolized. Urinary metabolites following exposure to 23 to 85 ppm for 8 hr are mandelic acid (64%), phenylglyoxylic acid (25%), and methylphenylcarbinol/1-phenyl ethanol (5%). Concurrent exposure to xylene and ethylbenzene causes slower excretion of EB metabolites. Based on the rat LD₅₀, one manufacturer gives 3 to 4 oz. as the lethal dose for a 100 lb person.

Continue on next page

Section 6. Health Hazard Data

Medical Conditions Aggravated by Long-Term Exposure: Skin and CNS diseases and impaired pulmonary function (especially obstructive airway disease). **Target Organs:** Eyes, respiratory system, skin, CNS, blood. **Primary Entry Routes:** Inhalation, skin and eye contact. **Acute Effects:** Vapor inhalation of 200 ppm caused transient eye irritation; 1000 ppm caused eye irritation with profuse watering (tolerance developed rapidly); 2000 ppm caused severe and immediate eye irritation and watering, nasal irritation, chest constriction, and vertigo; 5000 ppm was tolerable and caused eye and nose irritation. Inhalation of high concentrations may cause narcosis, cramps, and death due to respiratory paralysis. Man exposed to pure ethylbenzene for 10 to 15 min absorbed 22 to 33 mg/cm²/hr. Immersion of hand in solutions of 112 & 156 mg/L for 1 hr absorbed 118 & 215.7 µg/cm²/hr, respectively. **Chronic Effects:** Repeated skin contact may cause dryness, scaling, and fissuring. Workers chronically exposed to > 100 ppm complained of fatigue, sleepiness, headache, and mild irritation of the eyes and respiratory tract. Repeated vapor inhalation may result in blood disorders, particularly leukopenia (abnormally low level of white blood cells) and lymphocytosis.

FIRST AID

Eyes: Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that conscious and alert person drink 1 to 2 glasses of water to dilute. Do not induce vomiting! Aspiration of even a small amount of EB in vomitus can cause severe damage since its low viscosity and surface tension will cause it to spread over a large area of the lung tissue.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: BEI = mandelic acid in urine (1.5 g/g of creatinine), sample at end of shift at workweeks end. Since this test is not specific, test for EB in expired air for confirmation.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel. Isolate and ventilate area, deny entry and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against vapor inhalation and skin/eye contact. Take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable container. Dike far ahead of large spill for later reclamation or disposal. Report any release >1000 lb. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** If released to soil, EB partially evaporates into the atmosphere, with a half-life of hrs to wks, and some leaches into groundwater, especially in soil with low organic carbon content. Biodegradation occurs with a half-life of 2 days. Some EB may absorb to sediment or bioconcentrate in fish. Evidence points to slow biodegradation in groundwater. In air, it reacts with photochemically produced hydroxyl radicals with a half-life of hrs to 2 days. Additional amounts may be removed by rain. **Ecotoxicity Values:** Shrimp (*Mysidopsis bahia*), LC₅₀ = 87.6 mg/L/96 hr; sheepshead minnow (*Cyprinodon variegatus*) LC₅₀ = 275 mg/L/96 hr; fathead minnow (*Pimephales promelas*) LC₅₀ = 42.3 mg/L/96 hr in hard water & 48.5 mg/L/96 hr in softwater. **Disposal:** A candidate for rotary kiln incineration at 1508 to 2912°F (820 to 1600°C), liquid injection incineration at 1202 to 2912°F (650 to 1600°C), and fluidized bed incineration at 842 to 1796°F (450 to 980°C). Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.21): No. D001

Listed as a SARA Toxic Chemical (40 CFR 372.65)

A Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per CWA, Sec. 311 (b)(4) & CWA, Sec. 307 (a)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 1000 ppm, use a powered air-purifying respirator with an appropriate organic vapor cartridge, a supplied-air respirator (SAR), SCBA, or chemical cartridge respirator with appropriate organic vapor cartridge. For < 2000 ppm, use a SAR or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning!** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. If respirators are used, OSHA requires a respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets made of Viton or polyvinylchloride to prevent skin contact. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰³⁾ **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in a cool, dry, well-ventilated area away from ignition sources and oxidizers. Outside or detached storage is preferred. If inside, store in a standard flammable liquids cabinet. Containers should have flame-arrester or pressure-vacuum venting. To prevent static sparks, electrically ground and bond all equipment used with ethylbenzene. Install Class 1, Group D electrical equipment. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain levels as low as possible. Purge and ventilate reaction vessels before workers are allowed to enter for maintenance or cleanup. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers that emphasize the CNS, skin, blood, and respiratory system.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Ethylbenzene

DOT Hazard Class: 3

ID No.: UN1175

Packing Group: II

Label: Flammable liquid

Special Provisions (172.102): T1

Packaging Authorizations

a) Exceptions: 173.150

b) Non-bulk Packaging: 173.202

c) Bulk Packaging: 173.242

Quantity Limitations

a) Passenger Aircraft or Railcar: 5L

b) Cargo Aircraft Only: 60 L

Vessel Stowage Requirements

a) Vessel Stowage: B

b) Other: —

MSDS Collection References: 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 153, 159, 162, 163, 164, 167, 168, 171, 176, 179

Prepared by: M Gannon, BA; Industrial Hygiene Review: D Wilson, CIH; Medical Review: W Silverman, MD

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
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No. 624

NAPHTHALENE

Issued: November 1987

SECTION 1. MATERIAL IDENTIFICATION

24

Material Name: NAPHTHALENE

Description (Origin/Uses): Used as a moth repellant and in many industrial processes.

Other Designations: Naphthalin; Naphthene; Tar Camphor; $C_{10}H_8$;
NIOSH RTECS No. QJ0525000; CAS No. 0091-20-3

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the
Chemicalweek Buyer's Guide (Genium ref. 73) for a list of suppliers.

HMIS

H 2

F 2

R 0

PPG*

*See sect. 8

R 1

I 4

S 1

K 2



SECTION 2. INGREDIENTS AND HAZARDS

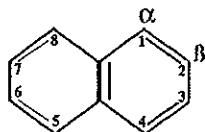
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EXPOSURE LIMITS

Naphthalene, CAS No. 0091-20-3

ca 100

IDLH* Level: 500 ppm



ACGIH TLVs, 1987-88

TLV-TWA: 10 ppm, 50 mg/m³

OSHA PEL

8-Hr TWA: 10 ppm, 50 mg/m³

Toxicity Data**

Child, Oral, LD₅₀: 100 mg/kg

Man, Unknown, LD₅₀: 74 mg/kg

Rat, Oral, LD₅₀: 1250 mg/kg

*Immediately dangerous to life and health

**See NIOSH RTECS for additional data with references to irritative, mutagenic, reproductive, and tumorigenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 424°F (218°C)

Vapor Density (Air = 1): 4.4

Vapor Pressure: 0.087 Torr at 77°F (25°C)

Water Solubility: Insoluble

Specific Gravity (H₂O = 1): 1.162 at 68°F (20°C)

Melting Point: 176°F (80°C)

Molecular Weight: 128 Grams/Mole

% Volatile by Volume: ca 100

Appearance and Odor: White crystalline flakes; strong coal tar odor.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

174°F (79°C) OC; 190°F (88°C) CC

979°F (526°C)

% by Volume

0.9

5.9

Extinguishing Media: Use water spray, dry chemical, or carbon dioxide to fight fires involving naphthalene. Caution: Foam or direct water spray applied to molten naphthalene may cause extensive foaming.

Unusual Fire or Explosion Hazards: Naphthalene is a volatile solid that gives off flammable vapor when heated (as in fire situations). This vapor is much denser than air and will collect in enclosed or low-lying areas like sumps. In these areas an explosive air-vapor mixture may form, and extra caution is required to prevent any ignition sources from starting an explosion or fire.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Naphthalene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Naphthalene is incompatible with strong oxidizing agents, chromic anhydride, and mixtures of aluminum trichloride and benzoyl chloride.

Conditions to Avoid: Ignition sources like open flame, unprotected heaters, excessive heat, lighted tobacco products, and electric sparks must not occur in work areas where naphthalene vapor may become concentrated.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide are produced during fire conditions. Irritating, flammable vapor forms below the melting point because even solid naphthalene has a significant vapor pressure.

SECTION 6. HEALTH HAZARD INFORMATION

Naphthalene is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: Renal shutdown (kidney failure), hemolytic effects (breakdown of red blood cells), hematuria (blood in the urine), oliguria (low volume of urine), jaundice, eye damage, and depression of the central nervous system (CNS) are the primary health concerns associated with exposure to naphthalene. The ACGIH TLVs in section 2 are set to prevent eye damage. These recommended exposure limits may not be low enough to prevent blood changes in genetically hypersensitive individuals.

Medical Conditions Aggravated by Long-Term Exposure: Diseases of the blood, liver, and kidneys. Administer medical exams emphasizing these organs. **Target Organs:** Eyes, skin, kidneys, liver, blood (red blood cell effects), and CNS.

Primary Entry: Inhalation, skin contact. **Acute Effects:** Inhalation of naphthalene vapor causes excitement, confusion, headache, nausea, and loss of appetite. **Chronic Effects:** Increased incidence of cataracts.

FIRST AID

Eye Contact: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes to remove particles.

Skin Contact: Immediately wash the affected area with soap and water.

Inhalation: Remove victim to fresh air; restore and/or support his breathing as needed.

Ingestion: Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. Administer a gastric lavage followed by saline catharsis. Monitor blood and electrolytic balance. Other sources recommend giving the victim several glasses of water to drink.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all ignition sources immediately. Cleanup personnel need protection against contact and inhalation of vapor (see sect. 8). Contain large spills and collect waste. Use nonsparking tools to place naphthalene into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.

Waste Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U165

CERCLA Hazardous Substance, Reportable Quantity: 100 lbs (45.4 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow the eye- and face-protection guidelines of 29 CFR 1910.133. **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Respirator usage must be in accordance with the OSHA regulations of 29 CFR 1910.134. IDLH or unknown concentrations require an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres.

Other Equipment: Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specific work environment to prevent skin contact. **Ventilation:** Install and operate general and local maximum explosion-proof ventilation systems of sufficient power to maintain airborne levels of naphthalene below the OSHA PEL standard cited in section 2. **Safety Stations:** Make eyewash stations, washing facilities, and safety showers available in areas of use and handling. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove and launder contaminated clothing before wearing it again; clean this material from shoes and equipment.

Comments: Practice good personal hygiene; always wash thoroughly after using this material. Keep this material off of your clothing and equipment. Avoid transferring this material from hands to mouth while eating, drinking, or smoking. Do *not* smoke, eat, or drink in any immediate work area. Avoid inhalation of vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store naphthalene in a cool, dry, well-ventilated area away from chemical incompatibles (see sect. 5).

Special Handling/Storage: Protect containers from physical damage. All bulk storage facilities must be built with an explosion-proof design. All containers used in shipping/transferring operations must be electrically grounded to prevent static sparks. Use monitoring equipment to measure the extent of vapor present in any storage facility containing naphthalene because of potential fire and explosion hazards.

Comments: All operations with naphthalene must be done carefully to prevent accidental ignition of its flammable/explosive vapor. If the weather is warm, more naphthalene vapor forms and the potential for explosion increases. Do *not* smoke in any use or storage area!

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Naphthalene

DOT Hazard Class: ORM-A

IMO Class: 4.1

DOT ID No. UN1334

IMO Label: Flammable Solid

DOT Label: None

References: 1, 2, 12, 73, 84-94, 103, PJI

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Approvals

Indust. Hygiene/Safety

Medical Review



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Material Safety Data Sheets Collection:

Sheet No. 318
Xylene (Mixed Isomers)

Issued: 11/80

Revision: E, 9/92

39

Section 1. Material Identification

Xylene (Mixed Isomers) (C_8H_{10}) Description: The commercial product is a blend of the three isomers [*ortho*-(*o*-), *meta*-(*m*-), *para*-(*p*-)] with the largest proportion being *m*-xylene. Xylene is obtained from coal tar, toluene by transalkylation, and pseudocumene. Used in the manufacture of dyes, resins, paints, varnishes, and other organics; as a general solvent for adhesives, a cleaning agent in microscope technique; as a solvent for Canada balsam microscopy; as a fuel component; in aviation gasoline, protective coatings, sterilizing catgut, hydrogen peroxide, perfumes, insect repellants, pharmaceuticals, and the leather industry; in the production of phthalic anhydride, isophthalic, and terephthalic acids and their dimethyl esters which are used in the manufacture of polyester fibers; and as an indirect food additive as a component of adhesives. Around the home, xylene is found as vehicles in paints, paint removers, degreasing cleaners, lacquers, glues and cements and as solvent/vehicles for pesticides.

Other Designations: CAS No. 1330-20-7 [95-47-6; 108-38-3; 106-42-3 (*o*-, *m*-, *p*-isomers)], dimethylbenzene, methyltoluene, NCI-C55232, Violet 3, xylol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

Cautions: Xylene is an eye, skin, and mucous membrane irritant and may be narcotic in high concentrations. It is a dangerous fire hazard.

R	1	NFPA
I	2	
S	2	
K	3	
HMIS		
H	2†	
F	3	
R	0	
PPE ‡		
† Chronic Effects		
‡ Sec. 8		

Section 2. Ingredients and Occupational Exposure Limits

Xylene (mixed isomers): the commercial product generally contains ~ 40% *m*-xylene; 20% each of *o*-xylene, *p*-xylene, and ethylbenzene; and small quantities of toluene. Unpurified xylene may contain pseudocumene.

1991 OSHA PELs

8-hr TWA: 100 ppm (435 mg/m³)
15-min STEL: 150 ppm (655 mg/m³)

1990 IDLH Level
1000 ppm

1990 NIOSH RELs

TWA: 100 ppm (435 mg/m³)
STEL: 150 ppm (655 mg/m³)

1992-93 ACGIH TLVs

TWA: 100 ppm (434 mg/m³)
STEL: 150 ppm (651 mg/m³)

BEI (Biological Exposure Index): Methylhippuric acids in urine at end of shift: 1.5 g/g creatinine

1990 DFG (Germany) MAK

TWA: 100 ppm (440 mg/m³)
Category II: Substances with systemic effects

Half-life: < 2 hr

Peak Exposure: 200 ppm, 30 min, average value, 4 peaks per shift

1985-86 Toxicity Data*

Human, inhalation, TC_{Lo} : 200 ppm produced olfaction effects, conjunctiva irritation, and other changes involving the lungs, thorax, or respiration. Man, inhalation, LC_{Lo} : 10000 ppm/6 hr; toxic effects not yet reviewed.

Human, oral, LD_{Lo} : 50 mg/kg; no toxic effect noted. Rat, oral, LD_{50} : 4300 mg/kg; toxic effect not yet reviewed.

Rat, inhalation, LC_{50} : 5000 ppm/4 hr; toxic effects not yet reviewed.

* See NIOSH, RTECS (XE2100000), for additional toxicity data.

Section 3. Physical Data

Boiling Point Range: 279 to 284 °F (137 to 140 °C)*

Boiling Point: *ortho*: 291 °F (144 °C); *meta*: 281.8 °F (138.8 °C); *para*: 281.3 °F (138.5 °C)

Freezing Point/Melting Point: *ortho*: -13 °F (-25 °C); *meta*: -53.3 °F (-47.4 °C); *para*: 55 to 57 °F (13 to 14 °C)

Vapor Pressure: 6.72 mm Hg at 70 °F (21 °C)

Saturated Vapor Density (Air = 1.2 kg/m³): 1.23 kg/m³, 0.077 lbs/ft³

Appearance and Odor: Clear, sweet-smelling liquid.

* Materials with wider and narrower boiling ranges are commercially available.

Molecular Weight: 106.16

Specific Gravity: 0.864 at 20 °C/4 °C

Water Solubility: Practically insoluble

Other Solubilities: Miscible with absolute alcohol, ether, and many other organic liquids.

Octanol/Water Partition Coefficient: logKow = 3.12-3.20

Odor Threshold: 1 ppm

Viscosity: <32.6 SUS

Section 4. Fire and Explosion Data

Flash Point: 63 to 77 °F (17 to 25 °C) CC | **Autoignition Temperature:** 982 °F (527 °C) (*m*-) | **LEL:** 1.1 (*m*-, *p*-); 0.9 (*o*-) | **UEL:** 7.0 (*m*-, *p*-); 6.7 (*o*-)

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO₂), water spray or regular foam. For large fires, use water spray, fog or regular foam. Water may be ineffective. Use water spray to cool fire-exposed containers. **Unusual Fire or Explosion Hazards:** Xylene vapors or liquid (which floats on water) may travel to an ignition source and flash back. The heat of fire may cause containers to explode and/or produce irritating or poisonous decomposition products. Xylene may present a vapor explosion hazard indoors, outdoors, or in sewers. Accumulated static electricity may occur from vapor or liquid flow sufficient to cause ignition. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing will provide limited protection. If feasible and without risk, move containers from fire area. Otherwise, cool fire-exposed containers until well after fire is extinguished. Stay clear of tank ends. Use unmanned hose holder or monitor nozzles for massive cargo fires. If impossible, withdraw from area and let fire burn. Withdraw immediately in case of any tank discoloration or rising sound from venting safety device. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Xylene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Xylene is easily chlorinated, sulfonated, or nitrated. **Chemical Incompatibilities:** Incompatibilities include strong acids and oxidizers and 1,3-dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin). Xylene attacks some forms of plastics, rubber, and coatings. **Conditions to Avoid:** Avoid heat and ignition sources and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of xylene can produce carbon dioxide, carbon monoxide, and various hydrocarbon products.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,⁽¹⁶⁴⁾ NTP,⁽¹⁶⁹⁾ and OSHA⁽¹⁶⁴⁾ do not list xylene as a carcinogen. **Summary of Risks:** Xylene is an eye, mucous membrane, and respiratory tract irritant. Irritation starts at 200 ppm; severe breathing difficulties which may be delayed in onset can occur at high concentrations. It is a central nervous system (CNS) depressant and at high concentrations can cause coma. Kidney and liver damage can occur with xylene exposure. With prolonged or repeated cutaneous exposure, xylene produces a defatting dermatitis. Chronic toxicity is not well defined, but it is less toxic than benzene. Prior to the 1950s, benzene was often found as a contaminant of xylene and the effects attributed to xylene such as blood dyscrasias are questionable. Since the late 1950s, xylenes have been virtually benzene-free and blood dyscrasias have not been associated with xylenes. Chronic exposure to high concentrations of xylene in animal studies have demonstrated milk reversible decrease in red and white cell counts as well as increases in platelet counts.

Continue on next page

Section 6. Health Hazard Data, continued

irregularity was reported in association with workplace exposure to xylene perhaps due to effects on liver metabolism. Xylene crosses the human placenta, but does not appear to be teratogenic under conditions tested to date. **Medical Conditions Aggravated by Long-Term Exposure:** CNS, respiratory, eye, skin, gastrointestinal (GI), liver and kidney disorders. **Target Organs:** CNS, eyes, GI tract, liver, kidneys, and skin. **Primary Entry Routes:** Inhalation, skin absorption (slight), eye contact, ingestion. **Acute Effects:** Inhalation of high xylene concentrations may cause dizziness; nausea, vomiting, and abdominal pain; eye, nose, and throat irritation; respiratory tract irritation leading to pulmonary edema (fluid in lung); drowsiness; and unconsciousness. Direct eye contact can result in conjunctivitis and corneal burns. Ingestion may cause a burning sensation in the oropharynx and stomach and transient CNS depression. **Chronic Effects:** Repeated or prolonged skin contact may cause drying and defatting of the skin leading to dermatitis. Repeated eye exposure to high vapor concentrations may cause reversible eye damage, peripheral and central neuropathy, and liver damage. Other symptoms of chronic exposure include headache, fatigue, irritability, chronic bronchitis, and GI disturbances such as nausea, loss of appetite, and gas.

FIRST AID Emergency personnel should protect against exposure. **Eyes:** Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Carefully dispose of contaminated clothing as it may pose a fire hazard. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. Monitor exposed person for respiratory distress. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, *do not induce vomiting!* If spontaneous vomiting should occur, keep exposed person's head below the hips to prevent aspiration (breathing liquid xylene into the lungs). **Aspiration of a few millimeters of xylene can cause chemical pneumonitis, pulmonary edema, and hemorrhage.** Note to Physicians: Hippuric acid or the ether glucuronide of *ortho*-toluic acid may be useful in diagnosis of *meta*-, *para*- and *ortho*-xylene exposure, respectively. Consider gastric lavage if a large quantity of xylene was ingested. Proceed gastric lavage with protection of the airway from aspiration; consider endotracheal intubation with inflated cuff.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove all heat and ignition sources, and ventilate spill area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. If feasible and without undue risk, stop leak. Use appropriate foam to blanket release and suppress vapors. Water spray may reduce vapor, but does not prevent ignition in closed spaces. For small spills, absorb on paper and evaporate in appropriate exhaust hood or absorb with sand or some non-combustible absorbent and place in containers for later disposal. For large spills dike far ahead of liquid to contain. Do not allow xylene to enter a confined space such as sewers or drains. On land, dike to contain or divert to impermeable holding area. Apply water spray to control flammable vapor and remove material with pumps or vacuum equipment. On water, contain material with natural barriers, booms, or weirs; apply universal gelling agent; and use suction hoses to remove spilled material. Report any release in excess of 1000 lb. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** Little bioconcentration is expected. Biological oxygen demand 5 (after 5 days at 20 °C): 0.64 (no stated isomer). **Ecotoxicity values:** LD₅₀, Goldfish, 13 mg/L/24 hr, conditions of bioassay not specified, no specific isomer. **Environmental Degradation:** In the atmosphere, xylenes degrade by reacting with photochemically produced hydroxyl radicals with a half-life ranging from 1-1.7 hr. in the summer to 10-18 hr in winter or a typical loss of 67-86% per day. Xylenes are resistant to hydrolysis. **Soil Absorption/Mobility:** Xylenes have low to moderate adsorption to soil and when spilled on land, will volatilize and leach into groundwater. **Disposal:** As a hydrocarbon, xylene is a good candidate for controlled incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

RA Extremely Hazardous Substance (40 CFR 355): Not listed

Listed as a SARA Toxic Chemical (40 CFR 372.65)

Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U239, F003 (spent solvent)

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per Clean Water Act, Sec. 311(b)(4); per RCRA, Sec. 3001]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For concentrations >1000 ppm, use any chemical cartridge respirator with organic vapor cartridges; any powered, air-purifying respirator with organic vapor cartridges; any supplied-air respirator; or any self-contained breathing apparatus. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.** If respirators are used, **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent all skin contact. With breakthrough times > 8 hr, consider polyvinyl alcohol and fluorocarbon rubber (Viton) as materials for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰³⁾ **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in clearly labelled, tightly closed, containers in a cool, well-ventilated place, away from strong oxidizing materials and heat and ignition sources. During transferring operations, electrically ground and bond metal containers. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Use hermetically sealed equipment, transfer xylene in enclosed systems, avoid processes associated with open evaporating surfaces, and provide sources of gas release with enclosures and local exhaust ventilation. Use Class I, Group D electrical equipment. **Administrative Controls:** Establish air and biological monitoring programs and evaluate regularly. Consider preplacement and periodic medical examinations including a complete blood count, a routine urinalysis, and liver function tests. Consider hematologic studies if there is any significant contamination of the solvent with benzene. If feasible, consider the replacement of xylene by less toxic solvents such as petrol (motor fuel) or white spirit. Before carrying out maintenance and repair work, steam and flush all equipment to remove any xylene residues.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Xylenes	Packaging Authorizations	Quantity Limitations	Vessel Stowage Requirements
DOT Hazard Class: 3	a) Exceptions: 173.150	a) Passenger, Aircraft, or Railcar: 5L	a) Vessel Stowage: B
UN No.: UN1307	b) Nonbulk Packaging: 173.202	b) Cargo Aircraft Only: 60L	b) Other: —
HAZARDOUS GROUP: II	c) Bulk Packaging: 173.242		
DOT Label: Flammable Liquid			
Special Provisions (172.102): T1			

MSDS Collection References: 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 148, 149, 153, 159, 163, 164, 167, 171, 174, 176, 180.

Prepared by: MJ Wurth, BS; Industrial Hygiene Review: PA Roy, MPH, CIH; Medical Review: W Silverman, MD

Material Safety Data Sheet

Version 4.2

Revision Date 11/21/2012

Print Date 03/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,2,4-Trimethylbenzene

Product Number : T73601

Brand : Aldrich

Supplier : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Combustible Liquid

Target Organs

Central nervous system

GHS Classification

Flammable liquids (Category 3)

Acute toxicity, Inhalation (Category 4)

Acute toxicity, Oral (Category 5)

Skin irritation (Category 2)

Eye irritation (Category 2A)

Specific target organ toxicity - single exposure (Category 3)

Acute aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H303	May be harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if

present and easy to do. Continue rinsing.

HMIS Classification

Health hazard: 1
Chronic Health Hazard: *
Flammability: 2
Physical hazards: 0

NFPA Rating

Health hazard: 2
Fire: 2
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C₉H₁₂
Molecular Weight : 120.19 g/mol

Component		Concentration
1,2,4-Trimethylbenzene		
CAS-No.	95-63-6	-
EC-No.	202-436-9	
Index-No.	601-043-00-3	

4. FIRST AID MEASURES

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability

Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
1,2,4-Trimethylbenzene	95-63-6	TWA	25 ppm 125 mg/m ³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	25 ppm 123 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		TWA	25 ppm 125 mg/m ³	USA. NIOSH Recommended Exposure Limits
Remarks	hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.			

Personal protective equipment

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: > 480 min

Material tested: Vitoject® (Aldrich Z677698, Size M)

Splash protection

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: > 30 min

Material tested: Camatril® (Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an Industrial Hygienist familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Eye protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	light blue colourless

Safety data

pH	no data available
Melting point/freezing point	-43.7 °C (-46.7 °F)
Boiling point	168.0 - 169.0 °C (334.4 - 336.2 °F)
Flash point	48.0 °C (118.4 °F) - closed cup
Ignition temperature	515 °C (959 °F)
Autoignition temperature	515.0 °C (959.0 °F)
Lower explosion limit	0.9 %(V)
Upper explosion limit	6.4 %(V)
Vapour pressure	2.3 hPa (1.7 mmHg) at 20.0 °C (68.0 °F) 6.0 hPa (4.5 mmHg) at 37.7 °C (99.9 °F) 9.3 hPa (7.0 mmHg) at 44.4 °C (111.9 °F)
Density	0.88 g/cm ³
Water solubility	insoluble
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

Heat, flames and sparks.

Materials to avoid

Strong oxidizing agents

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION**Acute toxicity****Oral LD50**

LD50 Oral - rat - 5,000 mg/kg

Inhalation LC50

LC50 Inhalation - rat - 4 h - 18,000 mg/m3

Dermal LD50

no data available

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

Genotoxicity in vitro - in vitro assay - S. typhimurium - with or without metabolic activation - negative

Genotoxicity in vivo - rat - male and female - Intraperitoneal - negative

Carcinogenicity

no data available

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

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

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

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

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

prolonged or repeated exposure can cause:., narcosis, Bronchitis., Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects

no data available

Additional Information

RTECS: DC3325000

12. ECOLOGICAL INFORMATION**Toxicity**

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 7.72 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 3.6 mg/l - 48 h

Persistence and degradability

no data available

Bioaccumulative potential

no data available

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS**Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.

Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 3295 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: HYDROCARBONS, LIQUID, N.O.S.
Marine pollutant: No

IATA

UN number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.

15. REGULATORY INFORMATION**OSHA Hazards**

Combustible Liquid

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

SARA 311/312 Hazards

Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION**Further information**

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 3.4

Revision Date 12/19/2012

Print Date 03/14/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,3,5-Trimethylbenzene

Product Number : 442236

Brand : Supelco

Supplier : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555

Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards

Combustible Liquid, Target Organ Effect, Irritant

Target Organs

Peripheral nervous system., Central nervous system, Blood

GHS Classification

Flammable liquids (Category 3)

Acute toxicity, Inhalation (Category 5)

Skin irritation (Category 2)

Eye irritation (Category 2B)

Specific target organ toxicity - single exposure (Category 3)

Acute aquatic toxicity (Category 2)

Chronic aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H226

Flammable liquid and vapour.

H315 + H320

Causes skin and eye irritation.

H333

May be harmful if inhaled.

H335

May cause respiratory irritation.

H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P273

Avoid release to the environment.

P305 + P351 + P338

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard: 2
Chronic Health Hazard: *
Flammability: 2
Physical hazards: 0

NFPA Rating

Health hazard: 2
Fire: 2
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Mesitylene
1,3,5-Trimethylbenzene

Formula : C₉H₁₂
Molecular Weight : 120.19 g/mol

Component		Concentration
Mesitylene		
CAS-No.	108-67-8	-
EC-No.	203-604-4	
Index-No.	601-025-00-5	

4. FIRST AID MEASURES**General advice**

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES**Conditions of flammability**

Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**Personal precautions**

Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE**Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**Components with workplace control parameters**

Components	CAS-No.	Value	Control parameters	Basis
Mesitylene	108-67-8	TWA	25 ppm 125 mg/m ³	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	25 ppm 123 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
		TWA	25 ppm 125 mg/m ³	USA. NIOSH Recommended Exposure Limits

Personal protective equipment**Respiratory protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash protection

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min
Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an Industrial Hygienist familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Eye protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Impervious clothing., Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -45 °C (-49 °F) - lit.
Boiling point	163 - 166 °C (325 - 331 °F) - lit.
Flash point	53.0 °C (127.4 °F) - closed cup
Ignition temperature	550 °C (1,022 °F)
Auto-ignition temperature	550.0 °C (1,022.0 °F)
Lower explosion limit	0.88 %(V)
Vapour pressure	18.7 hPa (14.0 mmHg) at 55.0 °C (131.0 °F) 3.3 hPa (2.5 mmHg) at 25.0 °C (77.0 °F)
Density	0.864 g/cm ³ at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapor density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

Heat, flames and sparks.

Materials to avoid

Strong oxidizing agents

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION**Acute toxicity****Oral LD50**

LD50 Oral - mouse - 7,000 mg/kg

LD50 Oral - rat - 5,000 mg/kg

Inhalation LC50

LC50 Inhalation - rat - 4 h - 24,000 mg/m3

Dermal LD50

no data available

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

Eyes - rabbit - Mild eye irritation - 24 h

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

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

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

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

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

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

Aspiration hazard

no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects

no data available

Additional Information

RTECS: OX6825000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Carassius auratus (goldfish) - 12.52 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h

Persistence and degradability

no data available

Bioaccumulative potential

no data available

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2325 Class: 3 Packing group: III
Proper shipping name: 1,3,5-Trimethylbenzene
Marine Pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 2325 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: 1,3,5-TRIMETHYLBENZENE

Marine Pollutant: No

IATA

UN number: 2325 Class: 3 Packing group: III
Proper shipping name: 1,3,5-Trimethylbenzene

15. REGULATORY INFORMATION

OSHA Hazards

Combustible Liquid, Target Organ Effect, Irritant

SARA 302 Components

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

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

Mesitylene	CAS-No. 108-67-8	Revision Date 1994-04-01
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Pennsylvania Right To Know Components

Mesitylene	CAS-No. 108-67-8	Revision Date 1994-04-01
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New Jersey Right To Know Components

Mesitylene	CAS-No. 108-67-8	Revision Date 1994-04-01
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California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

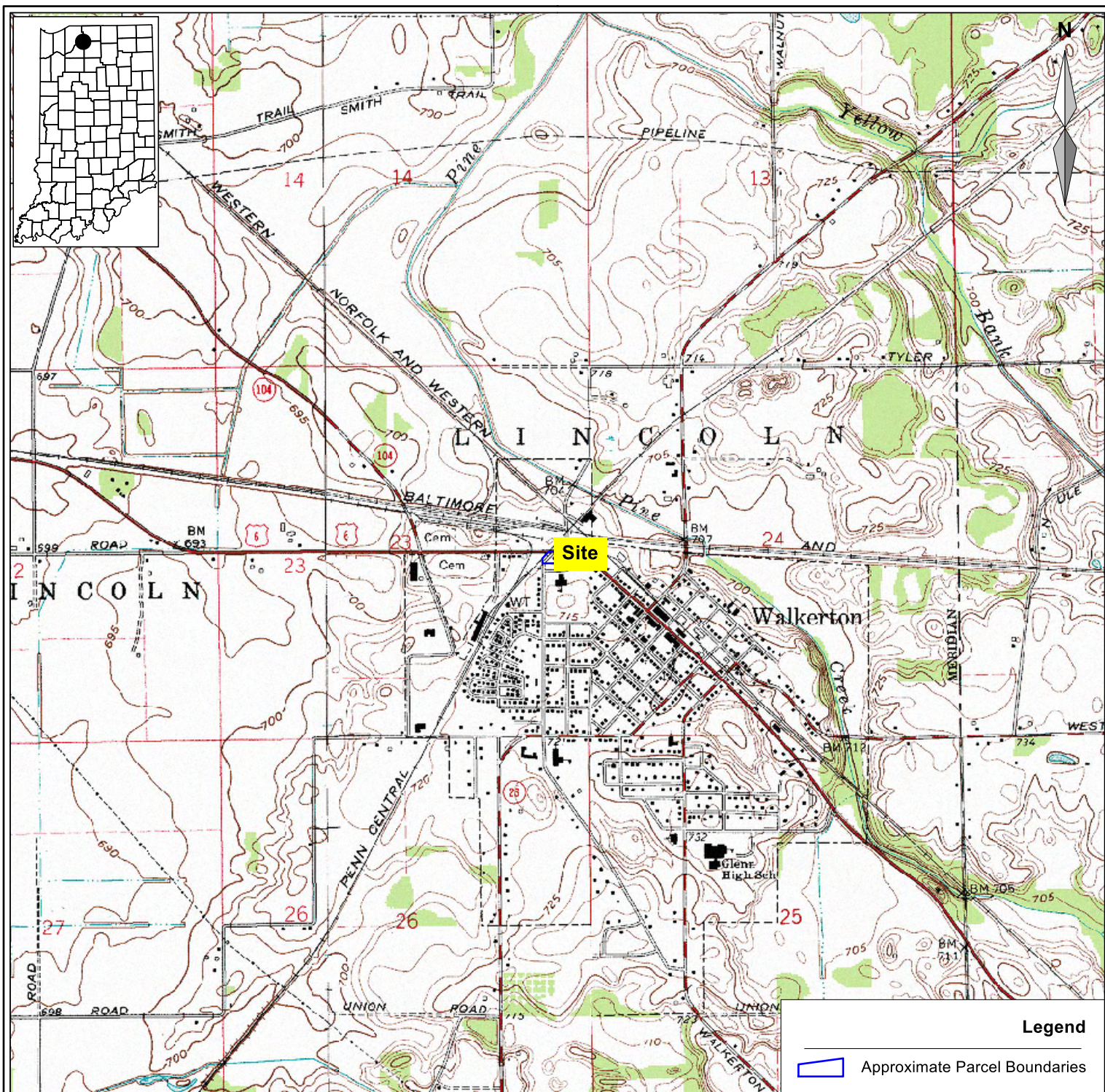
16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

ATTACHMENT B

SITE LOCATION MAP



0 1 mi

St. Joseph County, Lincoln Township
Walkerton Quadrangle
Section 23, T35N, R1W
SECOND Meridian

Parcel boundaries, as shown, are approximate and are not suitable for conveyance or property boundary descriptions. This data should not be used as a substitute for a professional land survey.

Basemap: U.S. Geological Survey Digital Raster Graphic



Heartland Environmental Associates, Inc.
3410 Mishawaka Avenue
South Bend, Indiana 46615
888.289.1191

Figure 1
Site Location Map topo
204 Roosevelt Road
Walkerton, Indiana 46574

Project Number:
5200-16-02

Date:
2/5/2016

Drawn by:
JRB

Scale:
1 in : 2000.00 ft

ATTACHMENT C

HOSPITAL DIRECTIONS AND EMERGENCY CONTACT
NUMBERS

Emergency Phone Numbers

Heartland Health and Safety Officer..... (574) 289-1191
Heartland Project Manager..... (574) 360-0961
US EPA Region V Emergency Response Center(312) 886-2395
ATF Explosives Hotline.....(800) 283-2662
Centers for Disease Control Emergency Response Hotline(770) 488-7100
National Response Center (HazMat Spills/Pipeline Leaks)(800) 424-8802
IDEM – Emergency Response.....(888) 233-7745
CHEMTREC(800) 262-8200

Hospital.....911 or (317) 639-6671

Name: *Saint Joseph Medical Center*

Address: *1915 Lake Ave, Plymouth, IN 46563-9366*

Travel Time: *25 minutes*

Directions: *Head east on US 6 to Michigan Road, then head south to US 30. Head west on US 30 to destination*

Map Attached: *Yes*

Site Control (Nivas R. Vijay)..... (574) 360-0961

Paramedics..... 911
Fire Department..... 911
Local Police..... 911

YOUR TRIP TO:

1915 Lake Ave Plymouth, IN 46563-9366




26 MIN | 19.1 MI 

Trip time based on traffic conditions as of 10:58 AM on March 4, 2016. Current Traffic: Light


-  1. Start out going **east** on Roosevelt Rd/US-6 E toward Adams St. Continue to follow US-6 E.

----- Then 9.85 miles ----- 9.85 total miles


-  2. Turn **right** onto Michigan Rd.
Michigan Rd is 0.7 miles past 2A Rd.

If you are on US Highway 6 and reach 2A Rd you've gone about 0.2 miles too far.

----- Then 5.77 miles ----- 15.62 total miles

-  3. Michigan Rd becomes N Michigan St.

----- Then 0.21 miles ----- 15.82 total miles

-  4. Merge onto US-30 W/US Highway 30 via the ramp on the **left**.

If you reach Skylane Dr you've gone about 0.2 miles too far.


----- Then 1.14 miles ----- 16.97 total miles

-  5. Turn **left** onto N Oak Dr.


Wendy's is on the corner.

If you are on US Highway 30 and reach Pioneer Dr you've gone about 0.9 miles too far.

----- Then 1.65 miles ----- 18.61 total miles

-  6. N Oak Dr becomes Lake Ave/IN-17.


----- Then 0.29 miles ----- 18.90 total miles

-  7. Turn **left**.
Just past Meadow Ln.

----- Then 0.07 miles ----- 18.97 total miles

-  8. Turn **left**.

----- Then 0.18 miles ----- 19.15 total miles

-  9. 1915 LAKE AVE.

Use of directions and maps is subject to our [Terms of Use](#). We don't guarantee accuracy, route conditions or usability. You assume all risk of use.

