

## **Appendix D**

### **PROJECT HEALTH AND SAFETY PLAN**

**FORMER McCANDLESS FUELS SITE  
2231 DELSEA DRIVE  
FRANKLINVILLE, NEW JERSEY**

**Prepared by  
BLUE LIGHTNING UNDERGROUND ENTERPRISES, LLC  
RESOURCE CONTROL CONSULTANTS, LLC  
10 LIPPINCOTT LANE, UNIT 1  
MT. HOLLY, NEW JERSEY 08060**

RCC/BLUE Job #s	:	18,016-01/014-013-0001-04
Date Prepared	:	July 2006
Date Revised	:	August 2019
Prepared by	:	Matthew D McCoog
Project Manager	:	John Mateo
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**REVIEWS AND APPROVALS  
CLIENT NAME: ANTEA GROUP USA  
FORMER MCCANDLESS FUELS SITE  
2231 DELSEA DRIVE  
FRANKLINVILLE, NEW JERSEY**

We the undersigned have read and approve of the health and safety guidelines presented in this health and safety plan for on-site work activities at the Former McCandless Fuels site.

Name	Signature	Date
<u>Jeffrey Dey</u> Blue Lightning Underground Enterprises Project Director	_____	_____
<u>John Mateo</u> Blue Lightning Underground Enterprises Project Manager	_____	_____
<u>Peter Borst</u> Blue Lightning Underground Enterprises Corporate Health and Safety Officer	_____	_____
_____	_____	_____


**EMERGENCY INFORMATION  
POST ON SITE  
EMERGENCY CONTACTS AND ROUTE TO HOSPITAL**

<b>Emergency Contact</b>	<b>Telephone No.</b>
U.S. Coast Guard National Response Center	(800) 424-8801
InfoTrac Chemical Monitoring System	(800) 535-5053
Fire Department	911
Police Department	911
NJDEP Personnel:	
LSRP: Jeff Dey #573494	(609) 352-5389
Blue Lightning Underground Enterprises Personnel:	
Corporate Health and Safety Officer: Peter Borst	(609) 352-5387
Project Director: Jeff Dey	(609) 352-5389
Project Manager: John Mateo	(609) 410-4354
<b>Hospital Name: SOUTH JERSEY HEALTHCARE</b>	
Hospital Address:	501 Front St Elmer, NJ 08318
<b>Hospital Telephone No.:</b>	<b>Emergency – (856) 363-1000</b> General – (856) 363-1000
Ambulance Telephone No.:	911
Fire Department:	911
Police Department:	911
Route to Hospital: (see next page hospital route map)	
Go Southeast on <b>Delsea Drive</b> toward Elmer Street. Turn Right onto <b>Williamstown Road</b> . <b>Williamstown Road</b> becomes <b>Porchtown Road</b> . Turn Left to stay on <b>Porchtown Road</b> . Turn Right onto <b>Harding Hwy</b> , Turn Left onto <b>Front St</b> . Arrive at South Jersey Healthcare.	

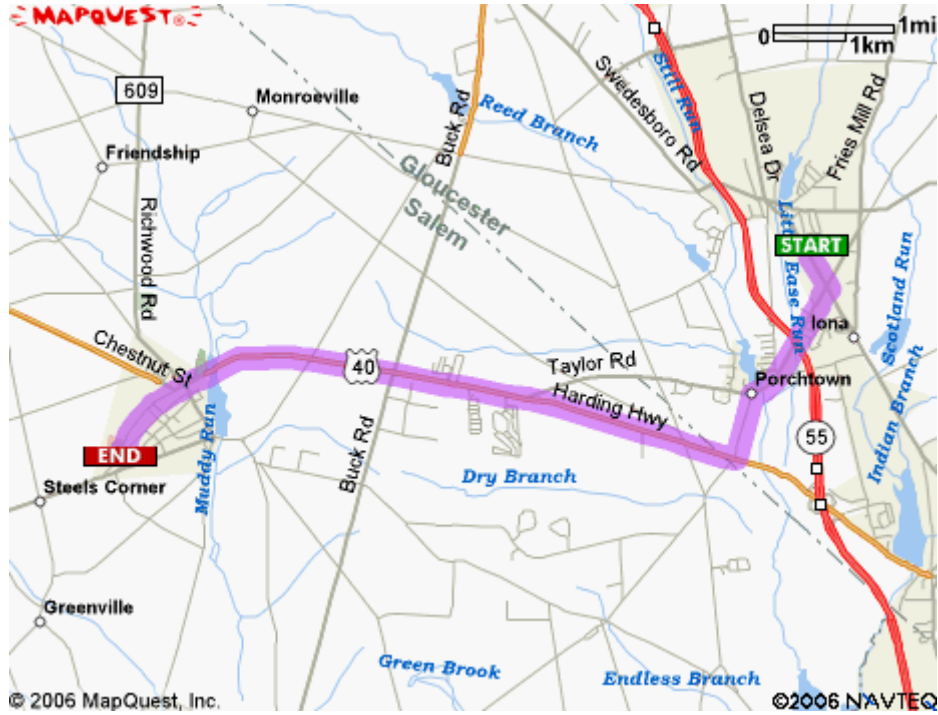
**Note: This sheet must be posted on site.**

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### EMERGENCY INFORMATION HOSPITAL ROUTE MAP



SOURCE: MODIFIED FROM MAPQUEST

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- Appendix B- Air Monitoring/ Calibration Logs
- Appendix C – Material Safety Data Sheets

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## 1.0 INTRODUCTION

The site-specific health and safety provisions in this document have been developed for use during remedial activities to be conducted at this McCandless Fuels site. This document addresses items specified under Occupational Safety and Health Administration (OSHA) Title 29 of the *Code of Federal Regulations* (CFR), Part 1910.120 (b), "Final Rule." This health and safety plan (HASP) will be available to all on-site personnel who may be exposed to hazardous on-site conditions, including Resource Control Consultants (RCC) and Blue Lightning Underground Enterprises (BLUE) personnel and subcontractors participating in remedial activities, and all site visitors, including regulatory agency representatives.

RCC and BLUE are both entities of Resource Renewal, LLC of Mt. Holly, New Jersey.

The purpose of this HASP is to define requirements and designate protocols to be followed during remedial activities at this McCandless Fuels site. All personnel on site, including RCC/BLUE and subcontractor employees and site visitors, must be informed of site emergency response procedures and any potential fire, explosion, health, or safety hazards associated with on-site activities. This HASP summarizes potential hazards and defines protective measures planned for site activities.

This plan must be reviewed and approved by the RCC/BLUE Corporate Health and Safety Officer (HSO) or designee, RCC/BLUE Project Director, RCC/BLUE Project Manager and Project Engineer (see the Reviews and Approvals form after the Contents in this document). All personnel must sign the Compliance Agreement form (**Appendix A**) before they enter the site. Daily sign-in logs are also provided (**Appendix A**). Protocols established in this HASP are based on site conditions and health and safety hazards known or anticipated to be present and on available site data. This plan is intended solely for use during proposed activities described in the corresponding site-specific work plan. Specifications herein are subject to review and revision based on actual conditions encountered in the field during site activities. Significant revisions to this plan must be approved by the RCC/BLUE Project Manager, the RCC/BLUE HSO, and the RCC/BLUE Project Director.

## 2.0 HEALTH AND SAFETY PERSONNEL AND PLAN ENFORCEMENT

This section describes responsibilities of project personnel, summarizes requirements for subcontractors and visitors who wish to enter this McCandless Fuels site, and discusses HASP enforcement.

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## 2.1 PROJECT PERSONNEL

The following personnel and organizations are associated with planned activities at the site. The organizational structure will be reviewed and updated as necessary during the course of the project.

<u>Name/Title</u>	<u>Responsibility</u>	<u>Telephone No.</u>
<b>Antea Personnel:</b>		
Tim Fisher	Project Manager	914-495-9935
Paul Durkee	Project Director	615-697-5220
<b>BLUE/RCC Personnel:</b>		
Peter Borst	Health and Safety Officer	609-352-5387
Jeff Dey	Project Director	609-352-5389
John Mateo	Project Manager	609-410-4354

The RCC/BLUE Project Manager and HSO will be responsible for implementation and enforcement of the provisions of this HASP as required by OSHA Title 29 CFR Part 1910.120 (b), "Final Rule." Their duties and the expectations for RCC/BLUE employees are described in the following sections.

### 2.1.1 Project Manager

The RCC/BLUE Project Manager has ultimate responsibility for ensuring implementation of the requirements set forth in this HASP. Some of this responsibility may be achieved through delegation to site-dedicated personnel that report directly to the project manager. The project manager shall regularly confer with site personnel regarding safety and health compliance.

The RCC/BLUE Project Manager, or designated Field Supervisor, will oversee and direct field activities and has day-to-day responsibility for ensuring implementation of the HASP. Compliance with the HASP shall be monitored by the Project Manager. The field supervisor will report directly to the Project Manager any health and safety-related issues.

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### **2.1.2 Site Safety Coordinator**

A RCC/BLUE Site Safety Coordinator (SSC) will be appointed by the Project Manager on a daily basis during the implementation of field work and will be responsible for field implementation of tasks and procedures contained in this HASP, including the signing of the Compliance Agreement (**Appendix A**) by all personnel working on site. The SSC will have advanced fieldwork experience and be familiar with health and safety requirements specific to the project. The SSC will also maintain daily air monitoring and calibration logs (**Appendix B**).

### **2.1.3 Health and Safety Representative**

The BLUE Health and Safety Officer (HSO) is responsible for administration of the company health and safety program. The HSO will act in an advisory capacity to project managers and site personnel for project-specific health and safety issues. The BLUE Project Manager will establish a liaison with the HSO on matters relating to health and safety specific to this project.

### **2.1.4 BLUE Employees**

BLUE employees are expected to fully participate in implementing the site HASP by obtaining necessary training, attending site safety meetings, always wearing designated personal protective equipment (PPE), complying with site safety and health rules, and advising the BLUE SSC of health and safety concerns at the site.

## **2.2 BLUE SUBCONTRACTORS**

Subcontractor personnel participating in the remedial activities at the McCandless Fuels site will be required to read and comply with all sections of this plan. All BLUE subcontractor personnel entering the site must sign the Compliance Agreement form (**Appendix A**) indicating that they have read and understand the HASP and Daily sign in/out sheets will be maintained.

Subcontractor personnel must comply with all applicable 29 CFR 1910.120 training, fit testing, and medical surveillance requirements, where required. Subcontractors are responsible for providing PPE required by this plan for their personnel (refer to **Section 6.1**,

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Protective Equipment and Clothing) and are directly responsible for the health and safety of their employees.

### **2.3 VISITORS**

All site visitors for the remediation activities will be required to read the HASP and sign the Compliance Agreement form and appropriate daily sign in logs (**Appendix A**). Visitors will be expected to comply with relevant OSHA requirements. Visitors will also be expected to provide their own PPE required by the HASP. Visitors who have not met OSHA training, medical surveillance, and PPE requirements are not permitted to enter areas where exposure to hazardous materials is possible.

### **2.4 HEALTH AND SAFETY PLAN ENFORCEMENT**

This HASP applies to all site activities and all BLUE personnel and BLUE subcontractors working at this McCandless Fuels site. HASP enforcement shall be rigorous. Violators of the HASP will be verbally notified upon first violation, and the violation will be noted by the RCC/BLUE SSC in a field logbook. Upon second violation, the violator will be notified in writing, and the RCC/BLUE project manager and the violator's supervisor will be notified. A third violation will result in a written notification and violator's eviction from the site. The written notification will be sent to human resources development and the HSO.

Personnel will be encouraged to report to the SSC any conditions or practices that they consider to be detrimental to their health or safety or those they believe are in violation of applicable health and safety standards. Such reports may be made orally or in writing. Personnel who believe that an imminent danger threatens human health or the environment will be encouraged to bring the matter to the immediate attention of the SSC for resolution.

At least one copy of this HASP will be available to all site personnel at all times. Minor changes in HASP procedures will be discussed at the beginning of each workday by the SSC at the daily tailgate safety meeting. Significant plan revisions must be discussed with the RCC/BLUE HSO, Project Manager and Project Director.

### **3.0 SITE BACKGROUND**

The site is currently an inactive former petroleum fuel distribution center.

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### 3.1 SITE DESCRIPTION

The Former McCandless Fuels site is located in the southwestern part of New Jersey in the township of Franklinville. The site and surrounding area are characterized as residentially developed land. The site location is provided on **Figure 1** and a site layout plan is provided as **Figures 2 and 3**.

### 3.2 SITE HISTORY

Site assessments/characterizations have been performed that revealed impacts to the subsurface soils and groundwater attributable to leaking underground storage tanks (UST), aboveground storage tanks (ASTs), and indiscriminate dumping and spillage at the site resulting in the release of chlorinated solvents and polychlorinated biphenyl (PCBs). The chemicals of concern include volatile organic compounds associated with petroleum fuel, PCBs, and chlorinated solvents that have impacted soil in the central area of the property.

#### **Hazard Assessment Summary**

The following describes the general physical and chemical hazards at the site.

- *Physical:*
  - Noise,
  - slip, trip and fall hazards,
  - excavation hazards,
  - heavy machinery/equipment hazards,
  - drilling hazards,
  - hot/cold temperature hazards,
  - overhead/underground utilities, and
  - automobile and truck traffic.
  
- *Chemical:*
  - Petroleum fuels,
  - volatile organic compounds,
  - chlorinated solvents, and
  - PCBs.

#### **Field Project Scope of Work**

Project specific site activities include:

- installation of soil borings,
- excavation, drilling and stockpiling of contaminated soils,
- stockpiling soils/soils management,
- backfilling excavations,

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- sampling of groundwater, and
- sampling of soil.

### **3.3 PLANNED ACTIVITIES**

Field activities to be performed during the remedial activities at the site include the following tasks:

- Soil boring installation and sampling for classification purposes
- Excavation and stockpiling soils
- Backfilling excavated/removed materials
- Site restoration, capping and paving
- Stockpiled soil management
- Stockpiled soil loading for off-site disposal
- Periodic monitoring of soil and groundwater.

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**Figure 1 - Site Location Map**

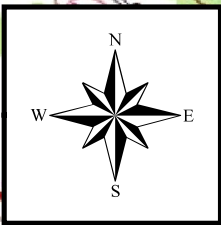
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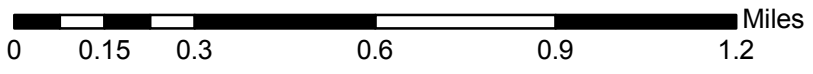
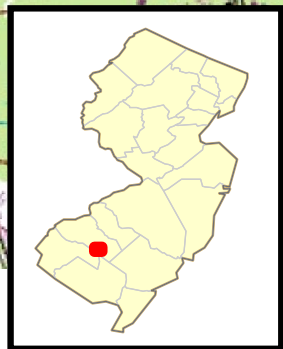
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**Site**



Site Location Map				
Former McCandless Petroleum Site 2231 Delsea Drive Franklinville, New Jersey				
DRAWN BY	SCALE	DATE:	DWG. NO.	FIGURE
JCR	1:20237	10/19/06	RAW-001	1

**Figure 2 - Site Layout Map**

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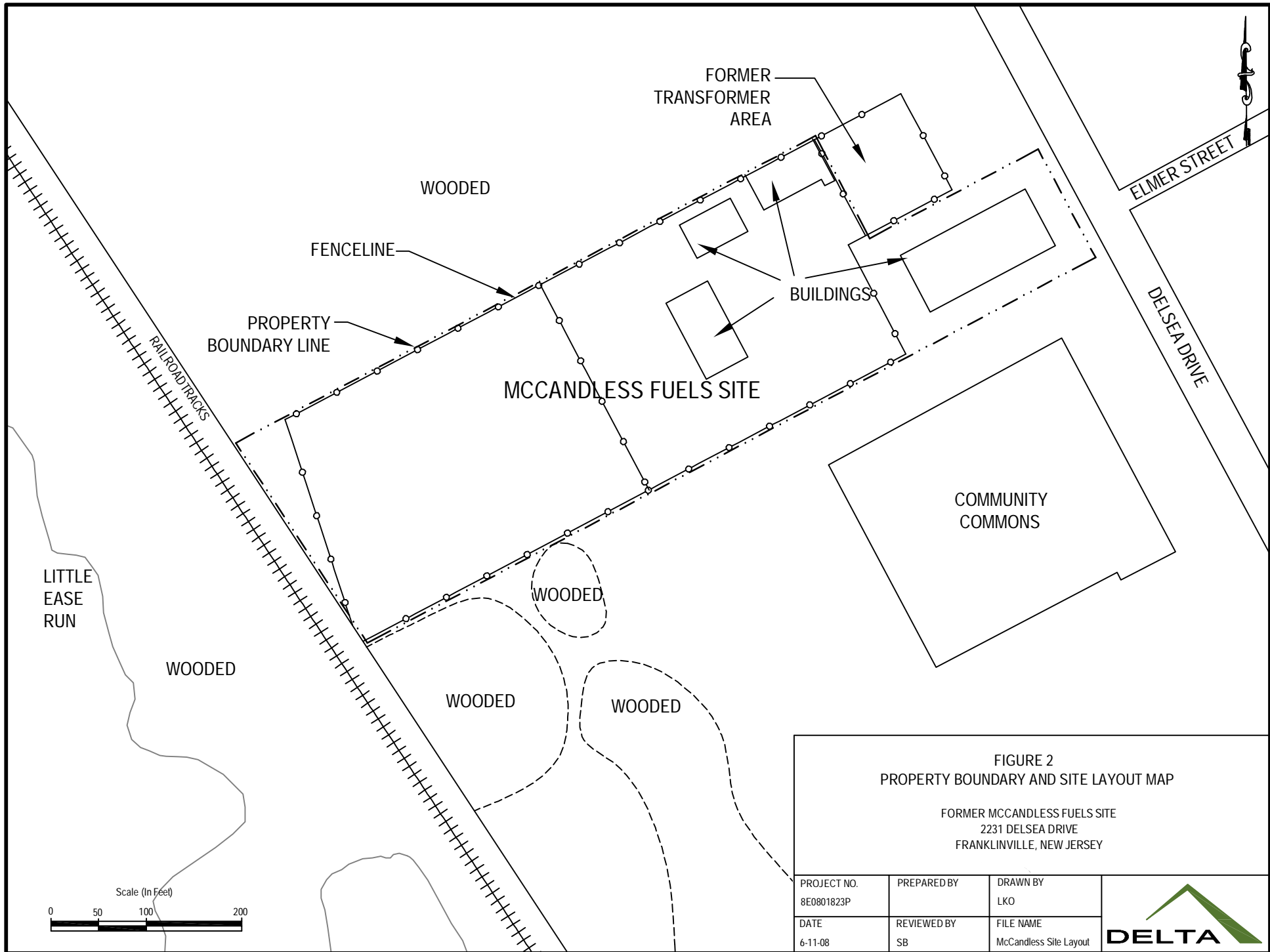


FIGURE 2  
PROPERTY BOUNDARY AND SITE LAYOUT MAP

FORMER MCCANDLESS FUELS SITE  
2231 DELSEA DRIVE  
FRANKLINVILLE, NEW JERSEY

PROJECT NO. 8E0801823P	PREPARED BY	DRAWN BY LKO
DATE 6-11-08	REVIEWED BY SB	FILE NAME McCandless Site Layout



**Figure 3 - Site Layout (Remedial Design)**

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**LEGEND**

- PROPERTY LINE
- MONITORING WELL
- TEMPORARY WELL
- SOIL BORING
- SOIL SAMPLE LOCATION
- (0.25) TOTAL PCBs (mg/kg)
- (N/A) PCBs NOT DETECTED

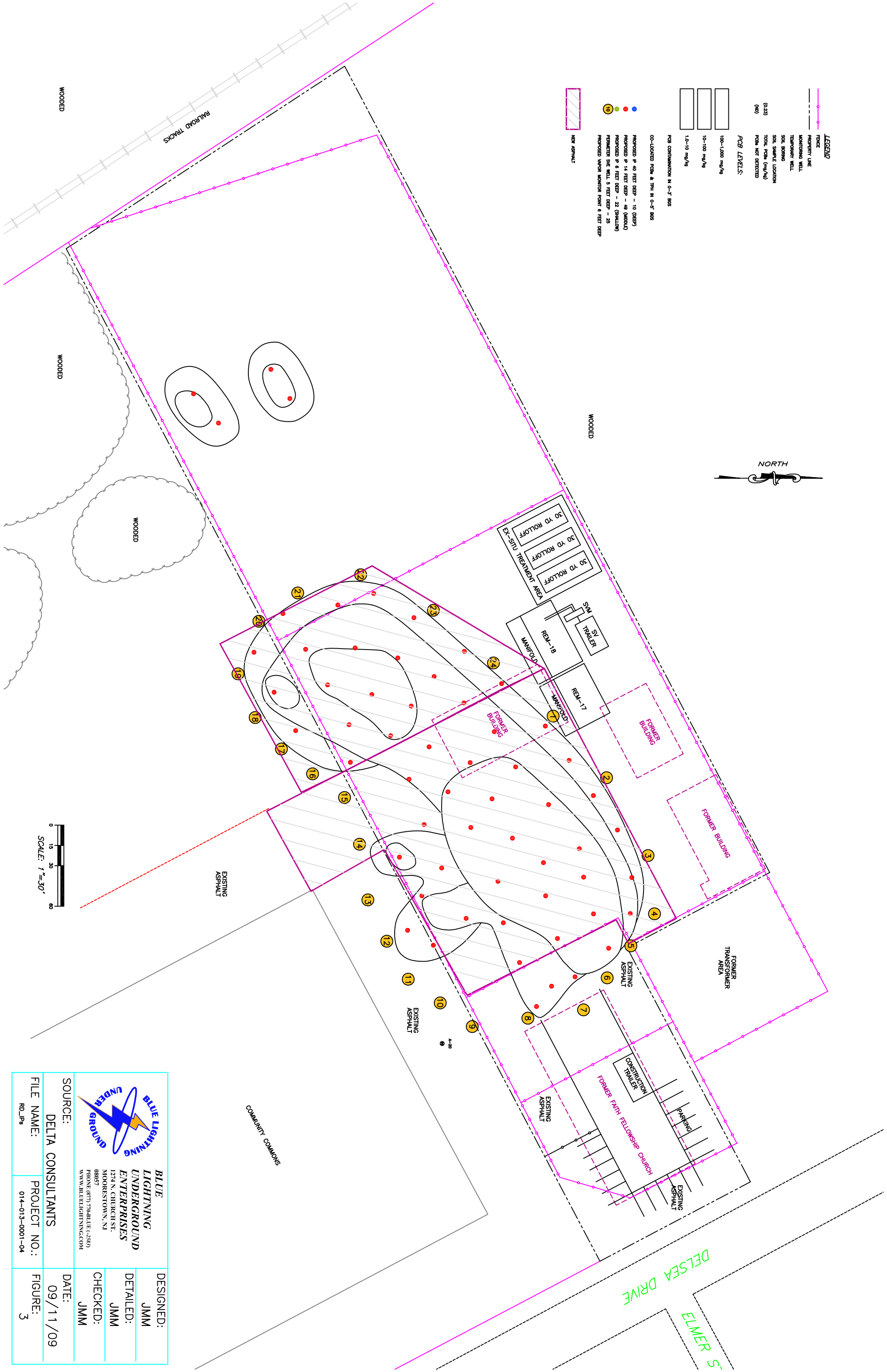
**PCB LEVELS:**

- 100-1,000 mg/kg
- 10-100 mg/kg
- 1.0-10 mg/kg

CO-LOCATED PCBs & TPH IN 0-3" BGS

- PROPOSED P 40 FEET DEEP - 10 (DEEP)
- PROPOSED P 14 FEET DEEP - 48 (MIDDLE)
- PROPOSED P 6 FEET DEEP - 22 (SHALLOW)
- PRELIMINARY ONE WELL, 5 FEET DEEP - 25
- PROPOSED WAGON MONITOR POINT 6 FEET DEEP

NEW ASPHALT



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 MOORESTOWN, NJ 08057  
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SOURCE:	DELTA CONSULTANTS	DESIGNED:	JMM
FILE NAME:	RD_LPs	DATE:	09/11/09
PROJECT NO.:	014-013-0001-04	DETAILED:	JMM
FIGURE:	3	CHECKED:	JMM

## 4.0 SITE-SPECIFIC HAZARD EVALUATION

Field activities and physical features of the site may expose field personnel to a variety of hazards. This section provides information on potential hazards related to site activities and the nature of hazardous material impacts. Potential chemical and physical hazards related to site activities are discussed below.

### 4.1 CHEMICAL HAZARDS

Chemicals that may be present in the exterior work areas at the site are listed in **Table 4-1**. These chemicals pose various physical, chemical, and toxicological hazards. Potential routes of exposure include dermal (skin) contact, inhalation, and ingestion. The chemicals may also contaminate equipment, vehicles, instruments, and personnel. The overall health threat from exposure to these chemicals is uncertain because (1) actual concentrations that personnel could be exposed to cannot be predicted, (2) the actual duration of exposure is unknown, and (3) the effects of low-level exposure to a mixture of chemicals cannot be predicted. However, BLUE believes that the potential for high-level exposure is limited.

Specific information on potential chemical hazards at the site is provided in **Table 4-1**, including exposure limits, anticipated exposure routes, and toxic characteristics. **Table 4-2** provides a task hazard analysis of the planned field activities listed in **Section 3.3**.

The Material Safety Data Sheets (MSDS) included in **Appendix C** of this HASP summarizes health and safety information for hazardous materials that may be encountered on the site.

### 4.2 PHYSICAL HAZARDS

Physical hazards associated with site activities present a potential threat to on-site personnel. Dangers are posed by surface piping, utility and power lines, slippery surfaces, unseen obstacles, noise, pressurized gases, heat, cold and equipment traffic. Injuries may result, for example, from the following:

- Accidents caused by slipping, tripping, or falling
- Construction (e.g. earth moving) equipment operation
- Moving or rotating equipment

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- Equipment mobilization and operation (such as electrocution from contact with power lines)
- Improperly maintained equipment

Injuries resulting from physical hazards can be avoided by using safe work practices and employing caution when working with machinery. To ensure a safe workplace, the BLUE SSC will conduct and document regular safety inspections and will make sure that all BLUE personnel and visitors are informed of any potential physical hazards related to the site. Potential physical hazards that have been identified at this site include the following:

- Noise
- slip, trip and fall hazards
- excavation hazards
- heavy machinery/equipment hazards
- drilling hazards
- hot and cold temperatures
- overhead/underground utilities, and
- automobile and truck traffic.

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**TABLE 4-1**  
**Potential Chemical Hazards**  
**McCANDLESS FUELS SITE**

Chemical and Media	Exposure Limits and IDLH Level	Exposure Routes	Toxic Characteristics
PCBs (Polychlorinated Biphenyl)	TLV-TWA 0.5 mg/m <sup>3</sup> (skin) IDLH 5mg/m <sup>3</sup>	Inhalation, Ingestion, Skin and/or eye contact	Respiratory and skin irritation, possible aspiration into lungs could cause breathing to cease.
Trichloroethylene	OSHA PEL: TWA 100ppm ACGIH TLV: TWA 50ppm ACGIH STEL: 200ppm IDLH – 1000ppm, potential human carcinogen	Inhalation, Ingestion, Contact	Irritation of eyes, skin; headache; visual disturbance; lassitude (weakness, exhaustion), dizziness; tremor; drowsiness, nausea; vomiting; dermatitis; cardiac arrhythmias; paresthesia; liver injury; potential male reproductive toxin
Diesel Fuel	OSHA PEL: N/A ACGIH TLV: TWA 100ppm IDLH: NA	Inhalation, Ingestion, Contact	Irritation of eyes, skin, respiratory tract; dizziness, headache, nausea; chemical pneumonitis (from aspiration of liquid); dry, red skin; irritant contact dermatitis; eye redness, pain

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Benzene	OSHA PEL: TWA 1 ppm ACGIH TLV: TWA 10 ppm IDLH - NA , potential human carcinogen	Inhalation, Ingestion, Skin and/or eye contact	Dizziness, drowsiness, headache, nausea, shortness of breath, convulsions, unconsciousness, abdominal pain, sore throat, vomiting
Toluene	OSHA PEL: TWA 100 ppm 300 ppm 5 minute ceiling for two hour peak IDLH- NA , potential human carcinogen	Inhalation, Ingestion, Contact	Dizziness, drowsiness, headache, nausea, shortness of breath, convulsions, unconsciousness, abdominal pain, sore throat, vomiting
Xylenes	OSHA PEL: 100 ppm ACGIH TLV: TWA 100 ppm IDLH NA , potential human carcinogen	Inhalation, Ingestion, Contact	Eye and skin irritation, possible aspiration into lungs could cause breathing to cease.

Notes:

IDLH Immediately dangerous to life or health

mg/m<sup>3</sup> Milligram per cubic meter

TLV Threshold Limit Value

TWA Time weighted average

OSHA PEL: Permissible Exposure Limit

NA Not Applicable

Sources: National Institute for Occupational Safety and Health. 1997. "Pocket Guide to Chemical Hazards." U.S. Department of Health and Human Services. U.S. Government Printing Office. Washington, DC. June.

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**TABLE 4-2**  
**Task Hazard Analysis**  
**McCANDLESS FUELS SITE**

<b>Task</b>	<b>Potential Hazard</b>	<b>Controls</b>	<b>Initial Level of Protection</b>	<b>Upgraded Level of Protection</b>
Mobilization, setup, and equipment staging, setup of hot, exclusion and support zones.	<b>Physical Hazards:</b> Potential hazards include slips, trips and falls as well as Heavy equipment use.	Work in teams to maintain safe work practices and awareness of surroundings.  Use of personnel to spot and observe equipment operators.  Restricting access to work areas to appropriate personnel.	Level D <b>Suit Material</b> <i>Work Uniform-hardhat, safety glasses, high visibility vest</i> <b>Inner Glove Material</b> <i>none</i> <b>Outer Glove Material</b> <i>Work Glove</i> <b>Boot Material</b> <i>Steel or composite toe Work Boots</i>	Modified Level D <b>Suit Material</b> <i>Saranex or Tyvek</i> <b>Inner Glove Material</b> <i>Nitrile</i> <b>Outer Glove Material</b> <i>Nitrile</i> <b>Boot Material</b> <i>Latex</i>

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<p>Excavation/drilling for removal of contaminated soils</p>	<p><b>Chemical Hazards:</b> Potential hazards include contact with contaminated soils/groundwater, vapor exposures from open excavation, dust</p> <p><b>Physical Hazards:</b> Slips/trips/falls, heavy equipment operation, noise, overhead/underground utilities.</p>	<p>Work in teams to maintain safe work practices and awareness of surroundings.</p> <p>Use of personnel to spot and observe equipment operators.</p> <p>Restricting access to work areas to appropriate personnel.</p>	<p>Level D</p> <p><b>Suit Material</b> <i>Work Uniform-hardhat, safety glasses, high visibility vest</i></p> <p><b>Inner Glove Material</b> <i>none</i></p> <p><b>Outer Glove Material</b> <i>Work Glove</i></p> <p><b>Boot Material</b> <i>Steel or composite toe Work Boots</i></p>	<p>Level C</p> <p><b>Suit Material</b> <i>Saranex or Tyvek</i></p> <p><b>Inner Glove Material</b> <i>Nitrile</i></p> <p><b>Outer Glove Material</b> <i>Nitrile</i></p> <p><b>Boot Material</b> <i>Latex</i></p> <p><b>Respiratory Protection</b> <i>Respirator Mask</i></p>
<p>Backfilling excavations/boring installations</p>	<p><b>Chemical Hazards:</b> Potential hazards include contact with contaminated soils/groundwater, vapor exposures from open excavation, dust</p> <p><b>Physical Hazards:</b> Slips/trips/falls, heavy equipment operation, noise, overhead/underground utilities.</p>	<p>Work in teams to maintain safe work practices and awareness of surroundings.</p> <p>Use of personnel to spot and observe equipment operators.</p> <p>Restricting access to work areas to appropriate personnel.</p>	<p>Level D</p> <p><b>Suit Material</b> <i>Work Uniform-hardhat, safety glasses, high visibility vest</i></p> <p><b>Inner Glove Material</b> <i>none</i></p> <p><b>Outer Glove Material</b> <i>Work Glove</i></p> <p><b>Boot Material</b> <i>Steel or composite toe Work Boots</i></p>	<p>Level C</p> <p><b>Suit Material</b> <i>Saranex or Tyvek</i></p> <p><b>Inner Glove Material</b> <i>Nitrile</i></p> <p><b>Outer Glove Material</b> <i>Nitrile</i></p> <p><b>Boot Material</b> <i>Latex</i></p> <p><b>Respiratory Protection</b> <i>Respirator Mask</i></p>

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<p>Stockpiled soil management/loading</p>	<p><b>Chemical Hazards:</b> Potential hazards include contact with contaminated soils/groundwater, vapor exposures from open excavation, dust</p> <p><b>Physical Hazards:</b> Slips/trips/falls, heavy equipment operation, noise, overhead/underground utilities.</p>	<p>Work in teams to maintain safe work practices and awareness of surroundings.</p> <p>Use of personnel to spot and observe equipment operators.</p> <p>Restricting access to work areas to appropriate personnel.</p>	<p>Level D</p> <p><b>Suit Material</b> <i>Work Uniform-hardhat, safety glasses, high visibility vest</i></p> <p><b>Inner Glove Material</b> <i>none</i></p> <p><b>Outer Glove Material</b> <i>Work Glove</i></p> <p><b>Boot Material</b> <i>Steel or composite toe Work Boots</i></p>	<p>Level C</p> <p><b>Suit Material</b> <i>Saranex or Tyvek</i></p> <p><b>Inner Glove Material</b> <i>Nitrile</i></p> <p><b>Outer Glove Material</b> <i>Nitrile</i></p> <p><b>Boot Material</b> <i>Latex</i></p> <p><b>Respiratory Protection</b> <i>Respirator Mask</i></p>
<p>Groundwater Sampling</p>	<p><b>Chemical Hazards:</b> Chemical exposure due to splashing or spilling of groundwater</p> <p><b>Physical Hazards:</b> Slips/trips/falls, heavy equipment hazards</p>	<p>Conduct headspace and ambient air monitoring of well head prior to sampling. Periodic air monitoring during sampling activities.</p> <p>Work upwind of well locations.</p>	<p>Level D</p> <p><b>Suit Material</b> <i>Work Uniform-hardhat, safety glasses, high visibility vest</i></p> <p><b>Inner Glove Material</b> <i>none</i></p> <p><b>Outer Glove Material</b> <i>Work Glove</i></p> <p><b>Boot Material</b> <i>Steel or composite toe Work Boots</i></p>	<p>Level C</p> <p><b>Suit Material</b> <i>Saranex</i></p> <p><b>Inner Glove Material</b> <i>Nitrile</i></p> <p><b>Outer Glove Material</b> <i>Nitrile</i></p> <p><b>Boot Material</b> <i>Latex</i></p> <p><b>Respiratory Protection</b> <i>Respirator Mask</i></p>

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<p>Soil sampling</p>	<p><b>Chemical Hazards:</b> Chemical exposure due to soil vapors or groundwater</p> <p><b>Physical Hazards:</b> Slips/trips/falls, heavy equipment hazards</p>	<p>Conduct headspace and ambient air monitoring of sampling location. Periodic air monitoring during sampling activities.</p> <p>Establish engineering controls for vapor abatement, Stay upwind of sampling location.</p>	<p>Modified Level D <b>Suit Material</b> <i>Work Uniform-hardhat, safety glasses, high visibility vest</i> <b>Inner Glove Material</b> <i>none</i> <b>Outer Glove Material</b> <i>Work Glove</i> <b>Boot Material</b> <i>Steel or composite toe Work Boots</i></p>	<p>Level C <b>Suit Material</b> <i>Saranex</i> <b>Inner Glove Material</b> <i>Nitrile</i> <b>Outer Glove Material</b> <i>Nitrile</i> <b>Boot Material</b> <i>Latex</i> <b>Respiratory Protection</b> <i>Respirator Mask</i></p>
<p>Personnel and Equipment Decontamination</p>	<p><b>Chemical Hazards:</b> Chemical exposure due to contact with impacted soil /groundwater</p>	<p>Work in teams to maintain safe work practices and awareness of surroundings.</p> <p>Decontaminate in designated support-zone areas.</p> <p>Appropriate PPE including face shield to protect from splashing.</p>	<p>Level D <b>Suit Material</b> <i>Work Uniform-hardhat, safety glasses, high visibility vest</i> <b>Inner Glove Material</b> <i>none</i> <b>Outer Glove Material</b> <i>Work Glove</i> <b>Boot Material</b> <i>Steel or composite toe Work Boots</i></p>	<p>N/A</p>

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<p>Transportation and Disposal of impacted soils</p>	<p><b>Physical Hazards:</b> Back Strain, heavy machinery hazards.</p>	<p>Work in teams to maintain safe work practices and awareness of surroundings Appropriate PPE Use of personnel to spot and observe equipment operators.</p>	<p>Modified Level D <b>Suit Material</b> <i>Work Uniform-hardhat, safety glasses, high visibility vest</i> <b>Inner Glove Material</b> <i>none</i> <b>Outer Glove Material</b> <i>Work Glove</i> <b>Boot Material</b> <i>Steel or composite toe Work Boots</i></p>	<p>Level C <b>Suit Material</b> <i>Saranex</i> <b>Inner Glove Material</b> <i>Nitrile</i> <b>Outer Glove Material</b> <i>Nitrile</i> <b>Boot Material</b> <i>Latex</i> <b>Respiratory Protection</b> <i>Respirator Mask</i></p>
<p>Oversight</p>	<p><b>Physical Hazards:</b> Heavy machinery hazards associated with point installation and sampling. Slips/trips/falls <b>Chemical Hazards:</b> Chemical exposure from samples.</p>	<p>Maintain strong communication with personnel inside and outside the work zone. Appropriate PPE.</p>	<p>Equal to the highest level of PPE used by the personnel performing the observed task.</p>	<p>N/A</p>

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## 5.0 TRAINING REQUIREMENTS

All on-site personnel who may be exposed to hazardous conditions, including RCC/BLUE and subcontractor personnel and site visitors who will participate in on-site activities, will be required to meet training requirements outlined in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response." All personnel and visitors entering the site will be required to review this HASP and sign the Compliance Agreement form (**Appendix A**), and site supervisors will be required to execute the Daily Safe Work Permit (**Appendix A**). Daily site sign in logs will also be required for signing by anyone while on site.

Before on-site activities begin, the RCC/BLUE SSC will present a briefing for all personnel who will participate in on-site activities. The following topics will be addressed during the pre-work briefing:

- Names of the SSC and the designated alternate
- Site history
- Work tasks
- Hazardous chemicals that may be encountered on site
- Physical hazards that may be encountered on site
- PPE, including type or types of respiratory protection to be used for work tasks
- Training requirements
- Environmental surveillance (air monitoring) equipment use and maintenance
- Action levels and situations requiring upgrade or downgrade of level of protection
- Site control measures, including site communications, control zones, and safe work practices
- Emergency communication signals and codes
- Environmental accident emergency procedures (in case contamination spreads outside the exclusion zone)
- Personnel exposure and accident emergency procedures (in case of falls, exposure to hazardous substances, and other hazardous situations)
- Fire and explosion emergency procedures
- Emergency telephone numbers
- Emergency routes

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Any other health and safety-related issues that may arise before on-site activities begin will also be discussed during the pre-work briefing.

Issues that arise during implementation of on-site activities will be addressed during tailgate safety meetings to be held daily before the workday or shift begins and will be documented in the Daily Safe Work Permit. Any changes in procedures or site-specific health and safety-related matters will be addressed during these meetings.

## 6.0 PERSONAL PROTECTION REQUIREMENTS

The levels of personal protection to be used for work tasks at this Former McCandless Fuels site have been selected based on known or anticipated physical hazards; types and concentrations of contaminants that may be encountered on site; and contaminant properties, toxicity, exposure routes, and matrixes. The following sections describe protective equipment and clothing; reassessment of protection levels; limitations of protective clothing; and respirator selection, use, and maintenance.

### 6.1 PROTECTIVE EQUIPMENT AND CLOTHING

Personnel will wear protective equipment when (1) site activities involve known or suspected atmospheric contamination; (2) site activities may generate vapors, gases, or particulates; or (3) direct contact with hazardous materials may occur. The anticipated levels of protection selected for use by BLUE field personnel and subcontractors during site activities are listed in **Table 4-2**, Task Hazard Analysis. Based on the anticipated hazard level, personnel will initially perform field tasks in Level D protection. If site conditions or the results of air monitoring performed during on-site activities warrant a higher level of protection, all field personnel will withdraw from the site, immediately notify the BLUE SSC, and wait for further instructions. Descriptions of equipment and clothing required for Level D, modified Level D, and Level C protection are provided below:

- **Level D**
  - Coveralls or work clothes, if applicable
  - Boots with steel-toe protection and steel shanks
  - Hard hat (face shield optional)
  - Disposable gloves (nitrile), if applicable
  - Safety glasses or goggles

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- Hearing protection (for areas with a noise level exceeding 85 decibels on the A-weighted scale)
- **Modified Level D**
  - Coveralls or work clothes, if applicable
  - Chemical-resistant clothing (such as Tyvek® or Saranex® coveralls)
  - Outer gloves (nitrile), if applicable
  - Disposable inner gloves (nitrile)
  - Boots with steel-toe protection and steel shanks
  - Disposable boot covers or chemical-resistant outer boots
  - Safety glasses or goggles
  - Hard hat (face shield optional)
  - Hearing protection (for areas with a noise level exceeding 85 decibels on the A-weighted scale)
- **Level C**
  - Coveralls or work clothes, if applicable
  - Chemical-resistant clothing (such as Tyvek® or Saranex® coveralls)
  - Outer gloves (nitrile), if applicable
  - Disposable inner gloves (nitrile)
  - Boots with steel-toe protection and steel shanks
  - Disposable boot covers or chemical-resistant outer boots
  - Full- or half-face, air-purifying respirator with National Institute for Occupational Safety and Health (NIOSH)-approved cartridges to protect against organic vapors, dust, fumes, and mists.
  - Safety glasses or goggles (with a half-face respirator only)
  - Hard hat (face shield optional)
  - Hearing protection (for areas with a noise level exceeding 85 decibels on the A-weighted scale)

## 6.2 REASSESSMENT OF PROTECTION LEVELS

PPE levels shall be upgraded or downgraded based on a change in site conditions or investigation findings. When a significant change in site conditions occurs, hazards will be reassessed. Some indicators of the need for reassessment are as follows:

- Commencement of a new work phase, such as the start of a significantly different sampling activity or work that begins on a different portion of the site
- A change in job tasks during a work phase
- A change of season or weather
- Temperature extremes or individual medical considerations limiting the effectiveness of PPE

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- Discovery of contaminants other than those previously identified
- A change in ambient levels of airborne contaminants (see the action levels listed in **Table 8-1**)
- A change in work scope that affects the degree of contact with contaminated media

### 6.3 LIMITATIONS OF PROTECTIVE CLOTHING

PPE clothing ensembles designated for use during site activities have been selected to provide protection against contaminants at known or anticipated on-site concentrations and physical states. However, no protective garment, glove, or boot is entirely chemical-resistant, nor does any protective clothing provide protection against all types of chemicals. Permeation of a given chemical through PPE depends on the contaminant concentration, environmental conditions, physical condition of the protective garment, and resistance of the garment to the specific contaminant. Chemical permeation may continue even after the source of contamination has been removed from the garment.

All site personnel will use the procedures presented below to obtain optimum performance from PPE.

- When chemical-protective coveralls become contaminated, don a new, clean garment after each rest break or at the beginning of each shift.
- Inspect all clothing, gloves, and boots both before and during use for the following:
  - Imperfect seams
  - Non-uniform coatings
  - Tears
  - Poorly functioning closures
- Inspect reusable garments, boots, and gloves both before and during use for visible signs of chemical permeation, such as the following:
  - Swelling
  - Discoloration
  - Stiffness
  - Brittleness
  - Cracks
  - Any sign of puncture
  - Any sign of abrasion

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Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above must be discarded. Reusable PPE will be decontaminated in accordance with procedures described in **Section 10.0** and will be neatly stored in the support zone away from work zones.

#### **6.4 RESPIRATOR/SCBA SELECTION, USE, AND MAINTENANCE**

RCC/BLE and subcontractor personnel will be informed of the proper use, maintenance, and limitations of respirators and /or self-contained breathing apparatus (SCBA) during annual health and safety refresher training and the pre-work briefing. Any on-site personnel who will use a tight-fitting respirator/SCBA unit must pass a qualitative fit test for the respirator/SCBA that follows the fit testing protocol provided in Appendix A of the OSHA respirator standard (29 CFR 1910.134). Fit testing must be repeated annually or when a new type of respirator is used.

Respirator and/or SCBA selection is based on the assessment of the nature and extent of hazardous atmospheres anticipated during field activities. This assessment includes a reasonable estimate of employee exposure to respiratory hazards and identification of each contaminant's anticipated chemical form and physical state. Work tasks requiring respirator use at the McCandless Fuels site will be discussed during daily tailgate safety meetings.

When the atmospheric contaminant is an identified gas or vapor and its concentration is known or can be reasonably estimated, respiratory protection options include the following:

- An atmosphere-supplying respirator (air-line or SCBA); however, Level B is not anticipated for this Site.
- An air-purifying respirator equipped with a NIOSH-certified, end-of-service-life indicator (ESLI) for the identified contaminant. If no ESLI is available, a change-out schedule for cartridges must be developed based on objective data or information. Respirator cartridge selection and change-out schedules will be evaluated by the HSO at the time of the respiratory hazard assessment.

For protection against particulate contaminants, approved respirators can include the following:

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- An atmosphere supplying respirator
- A respirator equipped with a filter certified by NIOSH under 32 CFR Part 11 or 42 CFR Part 84 as a P100 filter (formerly known as a high-efficiency particulate [HEPA] air filter)

For any tasks performed in Level C PPE, a full- or half-face, air-purifying respirator equipped with NIOSH-approved cartridges or filters will be selected to protect against vapors, gases, and aerosols.

Air-purifying respirators will be used only in conjunction with breathing-space air monitoring, which must be conducted in adherence to the action levels outlined in **Table 8-1**. Air-purifying respirators will be used only when they can provide protection against the substances encountered on site.

Factors precluding use of Level C and air-purifying respirators are as follows:

- Oxygen-deficient atmosphere (less than 19.5 percent oxygen)
- Concentrations of substances that may be immediately dangerous to life and health
- Confined or unventilated areas that may contain airborne contaminants not yet characterized
- Unknown contaminant concentrations or concentrations that may exceed the maximum use levels for designated cartridges documented in the selected cartridge manufacturer's instructions
- Unidentified contaminants
- High relative humidity (more than 85 percent, which reduces the sorbent life of the cartridges)
- Respirator cartridges with an undetermined service life
- Contaminants at the site where Level B protection is required.

## 7.0 MEDICAL SURVEILLANCE

The following sections describe RCC/BLUE's medical surveillance program, including health monitoring requirements, site-specific medical monitoring, and medical support and follow-up requirements. Procedures documented in these sections will be followed for all activities

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at the Former McCandless Fuels site. Additional requirements are defined in RCC/BLUE's Health and Safety Program.

## 7.1 HEALTH MONITORING REQUIREMENTS

All personnel involved in on-site activities at the Former McCandless Fuels site must participate in a health monitoring program as required by 29 CFR 1910.120(f). RCC/BLUE has established a health monitoring program with WORNET Occupational Medicine of New Jersey. Under this program, RCC/BLUE personnel receive baseline and annual physical examinations consisting of the following:

- Complete medical and work history
- Physical examination
- Vision screening
- Audiometric screening
- Pulmonary function test
- Urinalysis

For each employee, RCC/BLUE receives a copy of the examining physician's written opinion after post examination laboratory tests have been completed; the RCC/BLUE employee also receives a copy of the written opinion. This opinion includes the following information (in accordance with 29 CFR 1910.120[f][7]):

- The results of the medical examination and tests
- The physician's opinion as to whether the employee has any medical conditions that would place the employee at an increased risk of health impairment from work involving hazardous waste operations or during an emergency response
- The physician's recommended limitations, if any, on the employee's assigned work; special emphasis is placed on fitness for duty, including the ability to wear any required PPE under conditions expected on site (for example, temperature extremes)
- A statement that the employee has been informed by the physician of the medical examination results and of any medical conditions that require further examination or treatment

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All subcontractors must have health monitoring programs conducted by their own clinics in compliance with 29 CFR 1910.120(f). Any visitor or observer at the site will be required to provide records in compliance with 29 CFR 1910.120(f) before entering portions of the site.

## 7.2 SITE-SPECIFIC MEDICAL MONITORING

For activities at the Former McCandless Fuels site, no specific tests will be required before an individual can enter the site.

## 7.3 MEDICAL SUPPORT AND FOLLOW-UP REQUIREMENTS

As a follow-up to an injury requiring care beyond basic first aid or to possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Such injuries and exposures must be reported to the RCC/BLUE HSO. Depending on the type of injury or exposure, follow-up testing, if required, must be performed within 24 to 48 hours of the incident. It will be the responsibility of the employer's medical consultant to advise the type of test required to accurately monitor for exposure effects. An accident report must be completed by the RCC/BLUE SSC in the event of an accident, illness, or injury. A copy of the report must be forwarded to the BLUE HSO for use in determining the recordability of the incident and for inclusion in RCC/BLUE's medical surveillance records. Accident reporting procedures are outlined in RCC/BLUE's Health and Safety Program.

## 8.0 ENVIRONMENTAL MONITORING AND SAMPLING

Environmental monitoring or sampling will be conducted to assess personnel exposure levels as well as site or ambient conditions and to determine appropriate levels of PPE for work tasks. The following sections discuss initial and background air monitoring, personal monitoring, ambient air monitoring, monitoring parameters and devices, use and maintenance of survey equipment, thermal stress monitoring, and noise monitoring. Site-specific air monitoring requirements and action levels are provided in **Table 8-1**.

## 8.1 INITIAL AND BACKGROUND AIR MONITORING

Initial air monitoring of the work area will be performed before a work task begins. This monitoring will be performed using real-time field survey instrumentation. Air will also be

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monitored at the beginning of each workday to identify any potentially hazardous situation that might have developed during off-shift periods.

Operations at the site may result in variable background levels of airborne compounds. Airborne compounds may be released from vehicles, blowing dust, material transfers, and so on. These sources can complicate evaluation of contaminant emissions during project tasks. Therefore, several upwind and pre-work measurements will be taken to assess contributions to airborne contamination by other potential sources. Specific contaminants of concern, monitoring methods, and action levels are listed in **Table 8-1**.

## **8.2 PERSONAL MONITORING**

The employees working closest to a source of contamination or soil stockpiles have the highest likelihood of exposure to airborne contaminant concentrations that may exceed established exposure limits. Therefore, selective monitoring of the workers who are closest to a source of contaminant generation will be conducted during site activities. Personal monitoring shall be conducted in the breathing zone and, if a worker is wearing respiratory protective equipment, outside the face piece.

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**TABLE 8-1  
Site-Specific Air Monitoring Requirements and Action Levels**

Contaminant Hazard	Task	Monitoring Device	Action Level	Monitoring Frequency	Action <sup>a</sup>
Chlorinated & volatile organic compounds	Visual Assessment Equipment mobilization Work-zone Setup	Multi-Rae Plus with 11.7 eV bulb	<one half of PEL or TLV  >one half of PEL or TLV	Continuous	Continue work in Level D PPE with regular monitoring  Stop work and evacuate area, upgrade to Level C if approved by SSC.
	Excavation of soils	Multi-Rae Plus with 11.7 eV bulb	<one half of PEL or TLV  >one half of PEL or TLV	Continuous	Continue work in Level D PPE with regular monitoring  Stop work and evacuate area, upgrade to Level C if approved by SSC.
	Soil Sampling	Multi-Rae Plus with 11.7 eV bulb Draeger Detector Tubes	<one half of PEL or TLV  >one half of PEL or TLV	Continuous	Continue work in Level D PPE with regular monitoring  Stop work and evacuate area, upgrade to Level C if approved by SSC.
	Decontamination of Equipment	Multi-Rae Plus with 11.7 eV bulb	<one half of PEL or TLV	Continuous	Modified Level D, engineering controls with regular monitoring
	Oversight	Multi-Rae Plus with 11.7 eV bulb	<one half of PEL or TLV	Continuous	Level equivalent to that being used for the task being observed within specific work zone

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**TABLE 8-1 (Continued)**

**SITE-SPECIFIC AIR MONITORING REQUIREMENTS AND ACTION LEVELS**

Contaminant Hazard	Task	Monitoring Device	Action Level	Monitoring Frequency	Action <sup>a</sup>
Combustible atmosphere	Visual Assessment		<10% LEL	Continuous	Continue work
	Multimedia Sampling		10 to 25% LEL	Continuous	Continue work with extreme caution
	Hazcatting Oversight				
Particulates	Visual Assessment	MIE PdRam	<5 mg/m <sup>3</sup>	Continuous during any level D activities	Use modified Level D PPE
			5 to 10 mg/m <sup>3</sup>	Continuous during any level D activities	Use Level C PPE and implement dust suppression activities

Notes: <sup>a</sup> Refer to **Table 4-2** for specific types of gloves, chemical resistant clothing, respirators, and cartridges.

CGI Combustible gas indicator  
 dBA Decibel as measured on the A-weighted scale  
 LEL Lower explosive limit  
 Rem Roentgen-equivalent man units

mg/m<sup>3</sup> Milligram per cubic meter  
 mRem/hr Millirem per hour  
 N/A Not applicable  
 PEL Permissible exposure limit

PPE Personal protective equipment  
 ppm Part per million  
 SSC Site Safety Coordinator  
 TLV Threshold limit value

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### 8.3 AMBIENT AIR MONITORING

Most tasks will require monitoring of the general work area or ambient site conditions. Ambient monitoring will generally be conducted using direct-reading survey instrumentation or compound-specific instruments.

Initial ambient air monitoring will be performed as a minimum requirement when any of the situations listed below arise.

- Work begins on a different portion of the site.
- Contaminants other than those previously identified are encountered.
- A different type of operation is initiated (for example, well installation is initiated after drilling activities).
- Obvious lithologic changes are noticed during excavation/drilling activities.
- Workers experience physical difficulties.

Periodic ambient air monitoring will be performed at the frequency listed in **Table 8-1**.

### 8.4 MONITORING PARAMETERS AND DEVICES

The following sections below briefly describe the use and limitations of instruments used to monitor for organic vapors, combustible atmospheres, percent oxygen, particulates, and exposures to ozone through the operation of BLUE's ozone remediation systems. Site-specific air monitoring requirements and action levels are listed in **Table 8-1**.

All monitors will be calibrated in accordance with manufacturer recommendations at the beginning of every workday, if possible. Calibration results along with air monitoring data will be recorded on the data forms established for this Site (**Appendix A**).

#### 8.4.1 Organic Vapors

A direct-reading organic vapor monitor, such as a photoionization detector (PID), will be used to determine the presence of volatile organic compounds (VOC). Because chlorinated compounds are present in soils and groundwater at the site, a PID with an 11.7 eV bulb will be utilized for vapor screening. **Table 8-1** specifies the instrument that will be used for the

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project. The concentrations of individual VOCs of concern cannot usually be determined using the instrument because the detector responds to the total VOC mixture. To verify the concentrations of the specific targeted compounds at the site, fixed analytical laboratory analysis of collected samples will be utilized to verify compound specific concentrations.

#### **8.4.2 Combustible Atmospheres**

When a flammable compound reaches a certain concentration in air, it can become explosive when exposed to an ignition source. The lowest concentration able to support combustion is known as the lower explosive limit (LEL). Each flammable compound has its own LEL. Monitoring indicates how close to this limit the airborne concentration of a flammable compound is. Site activities will cease when the airborne concentration of any flammable vapor or gas reaches 25 percent of its LEL (10 percent in a confined space). The monitoring device, monitoring frequency, and general action levels for combustible atmospheres during site activities are outlined in **Table 8-1**.

#### **8.4.3 Particulate**

Aerosols are a group of airborne materials that include particulates, fumes, mists, and smoke. If climatic conditions, surface soil conditions, or site operations (such as excavation activities) adversely impact ambient air quality by increasing particulate matter for extended periods of time, air monitoring using a direct-reading instrument for particulates may become necessary. If elevated (visible) particulate matter conditions persist for 5 minutes or longer, the BLUE SSC is responsible for sampling the breathing zone with a particulate monitor.

Generally, particulate monitors are capable of measuring both solid and liquid particulates within the size range of 0.1 to 10 micrometers (the respirable range). A monitor indicates the concentration of these particulates in units of milligrams per cubic meter of air.

Action levels for particulates will be based on the type of dust and hazardous materials that may contribute to the composition of the particulates and will be determined with the assistance of the RCC/BLUE HSO or designee. **Table 8-1** lists the monitoring device, monitoring frequency, and general action levels expected to be used during site activities.

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## 8.5 USE AND MAINTENANCE OF SURVEY EQUIPMENT

All personnel using field survey equipment must have training in its operation, limitations, and maintenance. Maintenance and internal or electronic calibration will be performed in accordance with manufacturer recommendations by individuals familiar with the devices before their use on site. Repairs, maintenance, and internal or electronic calibration of these devices will be recorded in an equipment maintenance logbook. The equipment maintenance logbook for each instrument will be kept in that instrument's case. For rented monitoring equipment, the rental company will conduct repairs and maintenance. Results of routine calibration will be recorded in the field logbook or on **Appendix A** forms.

Air monitoring equipment (such as combustible gas indicators, oxygen meters, and PIDs) will be calibrated before work begins. Only basic maintenance (such as changing batteries) will be performed by on-site personnel. Any additional maintenance or repairs will be performed by a trained service technician.

## 8.6 THERMAL STRESS MONITORING

Heat stress and cold stress are common and serious threats at hazardous waste sites. Monitoring methods will be conducted appropriate for the season and location of work.

## 8.7 NOISE MONITORING

In most cases, high noise levels at a work site are caused by heavy equipment, such as drill rigs and backhoes, sources associated with the work site, such as factory equipment and vehicles, or the remediation trailer equipment. When noise levels at the McCandless Fuels site are suspected to equal or exceed an 8-hour time-weighted average (TWA) of 85 decibels on an A-weighted scale in slow response mode (85 dBA), the RCC/BLUE SSC or HSO will evaluate the work area to characterize the noise source and exposure levels. A sound level meter may be used for the evaluation but a noise dosimeter is recommended for documenting full-shift noise exposures. If neither instrument is available, the SSC may use a simple rule-of-thumb test to determine whether noise levels exceed 85 dBA. The test requires the SSC to determine how loud he or she must speak to be heard at an arm's length from another person. If the SSC must raise his or her voice to be heard, the average noise level likely exceeds 85 dBA.

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If employees are exposed to noise levels that exceed the action level of 85 dBA, hearing protection must be worn. Personnel entering the remediation trailers (REM-018 & REM-019) or the SVE trailer (REM-005) must utilize hearing protection. The protectors will be ear plugs or muffs that must provide sufficient attenuation to limit noise exposure to less than 85 dBA. The SSC will supervise use of hearing protectors at the work site as necessary. **Table 8-1** lists the monitoring device and action levels to be used.

**9.0 SITE CONTROL**

Site control is an essential component in HASP implementation. The following sections discuss measures and procedures for site control, such as on-site communications, site control zones, site access control, site safety inspections, and standard operating procedures.

**9.1 ON-SITE COMMUNICATIONS**


Successful communication between field teams and personnel in the support zone is essential. The following communication systems will be available during site activities:

- Cellular telephones
- Two-way radios

The hand signals listed below will be used by site personnel in emergency situations or when verbal communication is difficult.

<u>Signal</u>	<u>Definition</u>
Hands clutching throat	Out of air or cannot breathe
Hands on top of head	Need assistance
Thumbs up	Okay, I am all right, or I understand
Thumbs down	No or negative
Arms waving upright	Send backup support
Gripping partner's wrist	Exit area immediately

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## 9.2 SITE CONTROL ZONES

To control the spread of contamination and employee exposures to chemical and physical hazards, on-site work areas have been divided into an exclusion zone, a decontamination zone, and a support zone (**Figure 4**). Access to the exclusion and decontamination zones will be restricted to authorized personnel. Any visitors to these areas must present proper identification and be authorized to be on-site. The RCC/BLUE SSC will identify work areas that visitors or personnel are authorized to enter and will enforce site control measures.

The following sections describe the exclusion zone, the decontamination zone, and the support zone as well as procedures to be followed in each.

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## Figure 4 – Site Control Zones

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**LEGEND**

- PROPERTY LINE
- FENCE
- MONITORING WELL
- TEMPORARY WELL
- SOIL BORING
- SOIL SAMPLE LOCATION
- TOTAL PCBs (mg/kg)
- (0.25)
- (N/A)
- PCBs NOT DETECTED

**PCB LEVELS:**

- 100-1,000 mg/kg
- 10-100 mg/kg
- 1.0-10 mg/kg

0-LOCATED PCBs & TPH IN 0-3" BGS

- PROPOSED P 40 FEET DEEP - 10 (DEEP)
- PROPOSED P 14 FEET DEEP - 48 (MEDIUM)
- PROPOSED P 6 FEET DEEP - 22 (SHALLOW)
- PRELIMINARY SITE WELL 5 FEET DEEP - 25
- PROPOSED WAGON MONITOR POINT 6 FEET DEEP

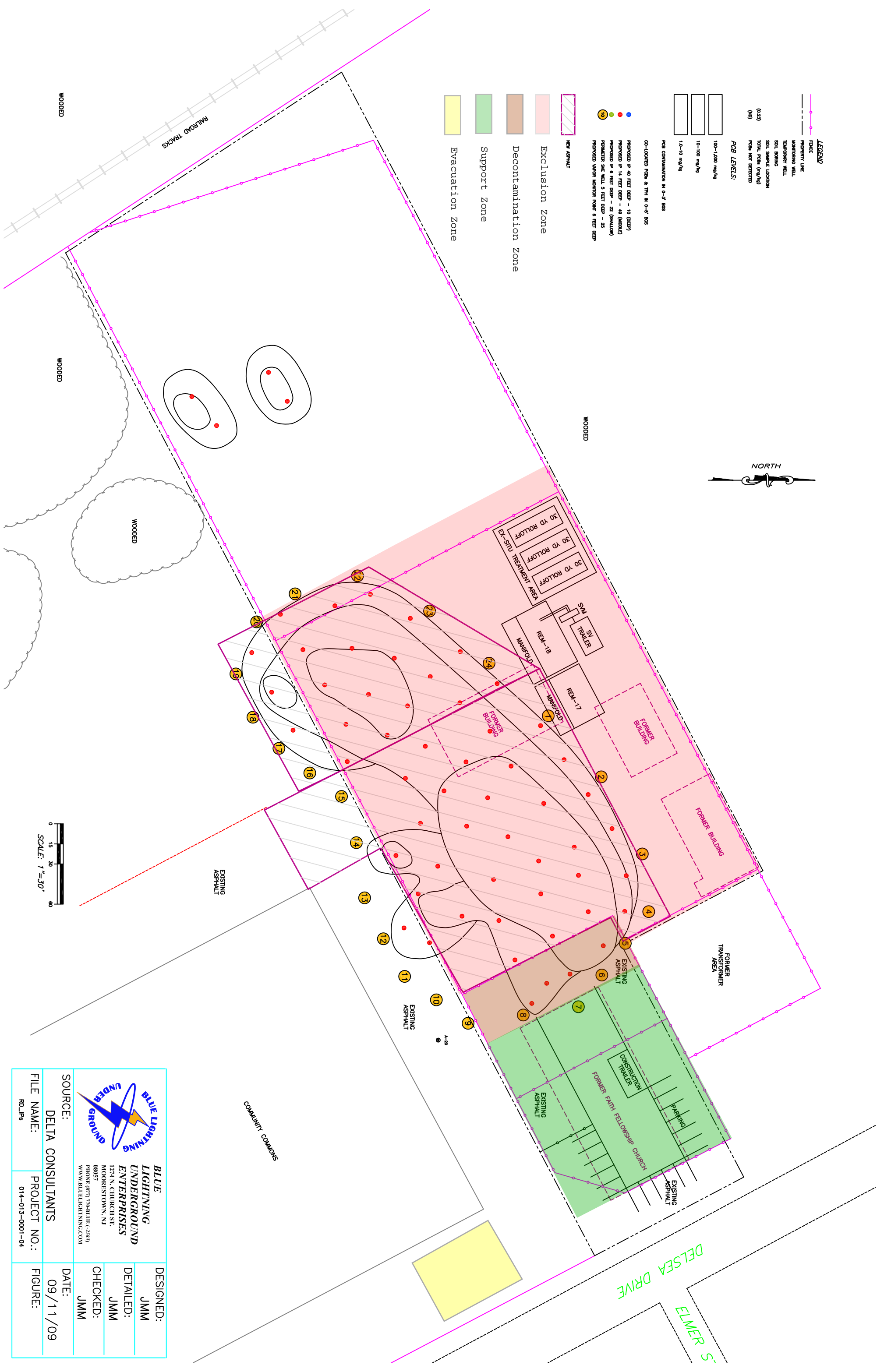
**NEW ASPHALT**

**Exclusion Zone**

**Decontamination Zone**

**Support Zone**

**Evacuation Zone**



**BLUE LIGHTNING UNDERGROUND ENTERPRISES**  
 1274 N. CHURCH ST.  
 MOORESTOWN, NJ 08057  
 PHONE: (609) 794-8181  
 WWW.BLUELIGHTNING.COM

SOURCE:	DELTA CONSULTANTS	DESIGNED:	JMM
FILE NAME:	RD_LPs	DETAILED:	JMM
PROJECT NO.:	014-013-0001-04	CHECKED:	JMM
DATE:	09/11/09	FIGURE:	

### 9.2.1 Zone 1: Exclusion Zone

An exclusion zone includes areas where contamination is either known or likely to be present or, because of work activity, has the potential to cause harm to personnel. The perimeter of the exclusion zone and an appropriate radius around work task areas will be demarcated by a physical barrier, such as barricade tape or orange construction fence, to restrict access. Visitors will not be permitted to enter the exclusion zone without proper qualifications, equipment, and RCC/BLUE SSC authorization. As initial air monitoring and visual assessment information is gathered the exclusion will be adjusted to an appropriate area. Work tasks that may require establishment of an exclusion zone include the following:

- Site Preparation/grading
- Excavation of soils and sediments
- Loading of soils
- Monitoring well installation
- Installation of remediation system
- Operation of RemedO<sub>3</sub>zone™ system
- Soil/Groundwater sampling

### 9.2.2 Zone 2: Decontamination Zone

A decontamination zone will be required for select activities to be conducted at the McCandless Fuels site. The decontamination zone will contain facilities to decontaminate personnel and portable equipment. A steam-cleaning area for decontamination of heavy equipment and vehicles may be established at a location readily accessible from work areas. Visitors will not be permitted to enter the decontamination zone without proper qualifications and BLUE SSC authorization.

### 9.2.3 Zone 3: Support Zone

A support zone may consist of any uncontaminated and non-hazardous area of the site. The support zone should be situated in an area generally upwind of any exclusion zone whenever possible. Site visitors not meeting training, medical surveillance, and PPE requirements must stay in the support zone.

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### 9.3 SITE ACCESS CONTROL

The Site is secured by a six-foot chain link fence around the entire perimeter. There are three (3) padlocked gates providing access. Visitor and RCC/BLUE subcontractors will access the Site through the Delsea Drive gate and register at the construction trailer, which are located in the Support Zone. RCC/BLUE personnel can also access the Site through the rear or side entrance gates. All personnel must register in the Daily sign-in log, which is kept at the construction trailer.

### 9.4 SITE SAFETY INSPECTIONS

Periodic site safety inspections shall be conducted by the RCC/BLUE SSC to ensure safe work areas and compliance with this HASP. Results of the site safety inspections will be recorded in the field logbook.

### 9.5 STANDARD OPERATING PROCEDURES

Various standard operating procedures (SOPs) for site specific tasks are applicable to the McCandless Site. These SOPs are included as part of RCC/BLUE's Health and Safety Program. The following SOPs are applicable to the site activities to be conducted by RCC/BLUE and will be included in daily tailgate meetings and detailed in the Daily Safe Work Permit executed for the specified tasks:

- Daily Safe Work Permit
- Heavy Equipment Operation
- Excavation and Trenching Safety
- Drilling Procedures
- Air Monitoring
- Electrical Safety
- LO/TO procedures
- Noise
- Fire Prevention

## 10.0 DECONTAMINATION

Decontamination is the process of removing or neutralizing contaminants on personnel or equipment. When properly conducted, decontamination procedures protect workers from contaminants that may have accumulated on PPE, tools, and other equipment. Proper

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decontamination also prevents transport of potentially harmful materials to uncontaminated areas. Personnel and equipment decontamination procedures are described in the following sections.

### 10.1 PERSONNEL DECONTAMINATION

Personnel decontamination at the site will be limited by using disposable PPE whenever possible. Any personnel decontamination procedures will follow guidance in the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH and others 1985). Personnel and PPE will be decontaminated with potable water or a mixture of detergent and water. Liquid and solid wastes generated during decontamination will be collected and drummed.

The decontamination procedures listed below will be conducted if personnel decontamination is required.

- Wash neoprene boots or disposable booties with a Liquinox® or Alconox® solution, and rinse them with water. Remove and retain neoprene boots for reuse, if possible. Place disposable booties in plastic bags for disposal.
- Wash outer gloves in a Liquinox® or Alconox® solution, and rinse them in water. Remove outer gloves and place them in a plastic bag for disposal.
- Remove chemical-resistant clothing, and place it in a plastic bag for disposal.
- Remove the SCBA or air purifying respirator, if used, and place the spent filter in a plastic bag for disposal. The filter must be changed in accordance with the Respiratory Hazard Assessment form. Clean and disinfect the respirator in accordance with SWP 6-27, and place it in a plastic bag for storage.
- Remove inner gloves and place them in a plastic bag for disposal.
- Thoroughly wash the hands and face with water and soap.

Used, disposable PPE will be collected in airtight containers and will be disposed of in accordance with applicable regulations. Personnel decontamination procedures may be modified as necessary while on site.

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## 10.2 EQUIPMENT DECONTAMINATION

Decontamination of all drilling, sampling, heavy equipment and field monitoring equipment used during site activities will be required. Decontamination of on-site heavy equipment and sampling equipment will follow procedures defined in the Site's field sampling plan.

### 10.2.1 Heavy Equipment

Heavy equipment, such as excavators, backhoes will be decontaminated at a designated location in the decontamination zone. Decontamination will be performed using a cleaning brush to loosen debris, and steam-cleaning with a high-pressure steam spray. If equipment still has soil on it after steam-cleaning, an appropriate cleaning brush will be used to further loosen debris, and the equipment will be steam-cleaned again. All wastewater generated from decontamination activities will be treated on-site or collected and stored in 55-gallon drums until proper disposal is arranged.

### 10.2.2 Sampling Equipment

Sampling equipment, such as split spoons, will be decontaminated before and after each use as described below.

- Scrub the equipment with a brush in a bucket containing Liquinox® or Alconox® solution and distilled water.
- Triple-rinse the equipment with distilled water, and allow it to air-dry.
- Reassemble the equipment, and place it on plastic or aluminum foil in a clean area. If aluminum foil is used, wrap the equipment with the dull side of the aluminum foil toward the equipment.

## 11.0 EMERGENCY RESPONSE PLANNING

This section describes emergency response planning procedures to be implemented for the Site. This section is consistent with local, state, and federal disaster and emergency management plans. The following sections discuss pre-emergency planning, personnel roles and lines of authority, emergency recognition and prevention, evacuation routes and procedures, emergency contacts and notifications, hospital route directions, emergency

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medical treatment procedures, protective equipment failure, fire or explosion, weather-related emergencies, spills or leaks, emergency equipment and facilities, and reporting.

### **11.1 PRE-EMERGENCY PLANNING**

During the pre-work briefing and daily safety meetings, all on-site employees will be trained in and reminded of the provisions of **Section 9.0**, site communication systems, and site evacuation routes. The emergency response provisions will be reviewed on a regular basis by the BLUE SSC and will be revised, if necessary, to ensure that they are adequate and consistent with prevailing site conditions.

### **11.2 PERSONNEL ROLES AND LINES OF AUTHORITY**

The RCC/BLUE SSC has primary responsibility for responding to and correcting emergency situations and for taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may include evacuation of personnel from the site area. The BLUE SSC is also responsible for ensuring that corrective measures have been implemented, appropriate authorities have been notified, and follow-up reports have been completed.

Individual subcontractors are required to cooperate with the RCC/BLUE SSC, within the parameters of their scopes of work.

Personnel are required to report all injuries, illnesses, spills, fires, and property damage to the RCC/BLUE SSC. The RCC/BLUE SSC must be notified of any on-site emergencies and is responsible for ensuring that the appropriate emergency procedures described in this section are followed.

### **11.3 EMERGENCY RECOGNITION AND PREVENTION**

**Table 4-1** lists potential on-site chemical hazards, and **Table 4-2** provides information on the hazards associated with the different tasks planned for the site. On-site personnel will be made familiar with this information and with techniques of hazard recognition through pre-work training and site-specific briefings.

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#### **11.4 EVACUATION ROUTES AND PROCEDURES**

In the event of an emergency that necessitates evacuation of a work task area, the RCC/BUE SSC shall contact all nearby personnel using the on-site communications discussed in **Section 9.1** to advise the personnel of the emergency. The personnel will proceed along site driveways/roads to a safe distance upwind from the hazard source. A designated congregating area (Evacuation Zone) is the street side parking lot of the adjoining property, Community Commons (**Figure 4**). The personnel will remain in that area until the RCC/BUE SSC or an authorized individual provides further instructions.

#### **11.5 EMERGENCY CONTACTS AND NOTIFICATIONS**

The "Emergency Information" provided before **Section 1.0** of this HASP lists the names and telephone numbers of emergency contact personnel. THIS PAGE MUST BE POSTED ON SITE OR MUST BE READILY AVAILABLE AT ALL TIMES. In the event of a medical emergency, personnel will notify the appropriate emergency organization and will take direction from the RCC/BUE SSC. In the event of a fire, explosion, or spill at the site, the RCC/BUE SSC will notify the appropriate local, state, and federal agencies and will follow procedures discussed in **Section 11.9 or 11.11**.

#### **11.6 HOSPITAL ROUTE DIRECTIONS**

Before performing any site activities, RCC/BUE personnel will conduct a pre-emergency hospital run to familiarize themselves with the route to the local hospital. A map showing the hospital route is provided in the "Emergency Information" provided before **Section 1.0** of this HASP.

#### **11.7 EMERGENCY MEDICAL TREATMENT PROCEDURES**

A person who becomes ill or injured during work tasks may require decontamination. If the illness or injury is minor, any decontamination necessary will be completed and first aid should be administered prior to patient transport. If the patient's condition is serious, partial decontamination will be completed (such as complete disrobing of the person and redressing in the person in clean coveralls or wrapping in a blanket). First aid should be administered until an ambulance or paramedics arrive. All injuries and illnesses must be reported immediately to the RCC/BUE Project Manager and HSO.

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Any person transported to a clinic or hospital for chemical exposure treatment will be accompanied by information on the chemical he or she has been exposed to at the site, if possible. **Table 4-1** and **Appendix C** contains this information.

### **11.8 PROTECTIVE EQUIPMENT FAILURE**

If any worker in the exclusion zone experiences a failure of protective equipment (either engineering controls or PPE) that affects his or her personal protection, the worker and all coworkers will immediately leave the exclusion zone. Re-entry to the exclusion zone will not be permitted until (1) the protective equipment has been repaired or replaced, (2) the cause of the equipment failure has been determined, and (3) the equipment failure is no longer considered to be a threat.

### **11.9 FIRE OR EXPLOSION**

In the event of a fire or explosion on site, the local fire department will be immediately summoned. The RCC/BLUE SSC or a site representative will advise the fire department of the location and nature of any hazardous materials involved. Appropriate provisions of **Section 11.0** will be implemented by site personnel.

### **11.10 WEATHER-RELATED EMERGENCIES**

Site work shall not be conducted during severe weather conditions, including high-speed winds or lightning. In the event of severe weather, field personnel will stop work, secure and lower all equipment (for example, drilling masts), and leave the site.

Thermal stress caused by excessive heat or cold may occur as a result of extreme temperatures, workload, or the PPE used. Heat and cold stress treatment will be administered appropriately.

### **11.11 SPILLS OR LEAKS**

In the event of a severe spill or a leak of hazardous materials in the work area, site personnel will follow the procedures listed below.

- Evacuate the affected area and relocate personnel to an upwind location.

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- Inform the RCC/BUE SSC, the RCC/BUE office, and a site representative immediately.
- Locate the source of the spill or leak, and stop the flow if it is safe to do so.
- Begin containment and recovery of spilled or leaked materials.
- Notify appropriate local, state, and federal agencies.

### **11.12 EMERGENCY EQUIPMENT AND FACILITIES**

The following emergency equipment will be available on site:

- First aid kit
- Eye wash (portable)
- Fire extinguisher
- Two-way radios
- Mobile telephones
- Sorbent materials
- Spill kits
- Monitoring stations

### **11.13 REPORTING**

All emergency situations require follow-up and reporting. An accident and illness investigation report is to be completed by the RCC/BUE SSC. This report must be completed and submitted to the RCC/BUE Project Manager within 24 hours of an emergency situation. The Project Manager will review the report and then forward it to the RCC/BUE HSO for review. The report must include proposed actions to prevent similar incidents from occurring. The HSO must be fully informed of the corrective action process so that she may implement applicable elements of the process at other sites.

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## REFERENCES

National Institute for Occupational Safety and Health (NIOSH) and others. 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. October.

NIOSH. 1997. "Pocket Guide to Chemical Hazards." U.S. Department of Health and Human Services. U.S. Government Printing Office. Washington, DC. June.

RCC/BLUE 2010. "Health and Safety Program"

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## **APPENDIX A**

- **Compliance Agreement Form**
- **Daily Tailgate Safety Meeting**
- **Daily Sign in log**





# DAILY TAILGATE SAFETY MEETING

Job/Task Number : 014-013-0001-01 Job Site : Former McCandless Fuels

Date: \_\_\_\_\_ Responsible Person : \_\_\_\_\_

Summary of Work to be Performed: \_\_\_\_\_

On Site Personnel/Contractor(s): \_\_\_\_\_

Weather Conditions: \_\_\_\_\_

## CHECKLIST

	YES	NO	N/A
<b><u>IN SHOP/OFFICE</u></b>			
WORKSCOPE REVIEW _____ (Plan of Action)	<input type="checkbox"/>	<input type="checkbox"/>	
TOOLS AND EQUIPMENT _____ (Correct tools for job, in good condition, equipment calibrated)	<input type="checkbox"/>	<input type="checkbox"/>	
PROTECTIVE EQUIPMENT _____ (PPE, head, eye, face, hand, and foot protection)	<input type="checkbox"/>	<input type="checkbox"/>	
SITE SAFETY PLAN _____ (Reviewed and signed)	<input type="checkbox"/>	<input type="checkbox"/>	
HAZARD COMMUNICATION _____ (MSDS Sheets available)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b><u>IN FIELD</u></b>			
EMERGENCY PROCEDURES REVIEW/SSP _____ (Phone Numbers, Fire Control, Hospital, First Aid)	<input type="checkbox"/>	<input type="checkbox"/>	
HAZARD IDENTIFICATION _____ (Chemical/Biological, Environmental/Mechanical, Ergonomic, Physical, Psychosocial)	<input type="checkbox"/>	<input type="checkbox"/>	
LOCKOUT/TAGOUT PROCEDURES _____ (Machinery/Equipment de-energized or disengaged)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ELECTRICAL PROCEDURES _____ (Authorized/Capable Person Review)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OTHER (List below): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I have reviewed the work authorized by this permit and the information contained here in. Written instructions and safety procedures have been received and are understood. Work should not be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit Prepared By: \_\_\_\_\_ Supervisor Review: \_\_\_\_\_  
(Responsible Person) (Initial)



**APPENDIX B**  
**Air Monitoring Logs**



## **APPENDIX C**

### **Material Safety Data Sheets**

# Monsanto

## Material Safety Data

### POLYCHLORINATED BIPHENYLS (PCBs)

Emergency Phone No.  
(Call Collect)  
314-694-1000

---

#### 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

---

PRODUCT NAME: POLYCHLORINATED BIPHENYLS (PCBs)  
Aroclor® Series 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, 1268  
Therminol® FR Series

MSDS Number: M00018515

Date: 12/95

Chemical Family: Chlorinated Hydrocarbons  
Chemical Name: Polychlorinated biphenyls  
Synonyms: PCBs, Chlorodiphenyls, Chlorinated biphenyls

Trade Names/Common Names:

PYRANOL® and INERTEEN® are trade names for commonly used dielectric fluids that may have contained varying amounts of PCBs as well as other components including chlorinated benzenes.

ASKAREL is the generic name for a broad class of fire resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30 - 70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs and some contained no PCBs.

PYDRAUL® is the trade name for hydraulic fluids that, prior to 1972, may have contained varying amounts of PCBs and other components including phosphate esters.

The product names/trade names are representative of several commonly used Monsanto products (or products formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product, if not in this listing, to determine if the formulation contained PCBs.

In 1972, Monsanto restricted sales of PCBs to applications involving only closed electrical systems, (transformers and capacitors). In 1977, all manufacturing and sales were voluntarily terminated. In 1979, EPA restricted the manufacture, processing, use, and distribution of PCBs to specifically exempted and authorized activities.

**MONSANTO COMPANY, 800 N. LINDBERGH BLVD., ST. LOUIS, MO 63167**

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT  
Call CHEMTREC - Day or Night - 1-800-424-9300 Toll free in the continental U.S., Hawaii, Puerto Rico, Canada, Alaska, or Virgin Islands. For calls originating elsewhere: 202-483-7616 (collect calls accepted)

For additional nonemergency information, call: 314-694-3344.

---



---

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

---



---

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile, oily liquids to white crystalline solids and hard noncrystalline resins. Technical products vary in composition, in the degree of chlorination, and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They were used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic, and other industrial fluids, plasticizers, carbonless copy paper, paints, inks, and adhesives.

<u>Component</u>	<u>CAS No.</u>
chlorinated biphenyl	1336-36-3
Aroclor 1016	12674-11-2
Aroclor 1221	11104-28-2
Aroclor 1232	11141-16-5
Aroclor 1242	53469-21-9
Aroclor 1248	12672-29-6
Aroclor 1254	11097-69-1
Aroclor 1260	11096-82-5
Aroclor 1262	37324-23-5
Aroclor 1268	11100-14-4

There are also CAS Numbers for individual PCB congeners and for mixtures of Aroclor® products.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Seventh).

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## 3. HAZARDS IDENTIFICATION

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### EMERGENCY OVERVIEW

Appearance and Odor: PCB mixtures range in form and color from clear to amber liquids to white crystalline solids. They have a mild, distinctive odor and are not volatile at room temperature. Refer to Section 9 for details.

**WARNING!**  
**CAUSES EYE IRRITATION**  
**MAY CAUSE SKIN IRRITATION**

**PROCESSING AT ELEVATED TEMPERATURES MAY RELEASE VAPORS OR FUMES WHICH MAY CAUSE RESPIRATORY TRACT IRRITATION**

### POTENTIAL HEALTH EFFECTS

#### Likely Routes

of Exposure: Skin contact and inhalation of heated vapors

Eye Contact: Causes moderate irritation based on worker experience.

Skin Contact: Prolonged or repeated contact may result in redness, dry skin and defatting based on human experience. A potential exists for developing chloracne. PCBs can be absorbed through intact skin.

Inhalation: Due to the low volatility of PCBs, exposure to this material in ambient conditions is not expected to produce adverse health effects. However, at elevated processing temperatures, PCBs may produce a vapor that may cause respiratory tract irritation if inhaled based on human experience.

Ingestion: No more than slightly toxic based on acute animal toxicity studies. Coughing, choking and shortness of breath may occur if liquid material is accidentally drawn into the lungs during swallowing or vomiting.

MSDS #: M00018515



Other: Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

Refer to Section 11 for toxicological information.

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#### 4. FIRST AID MEASURES

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IF IN EYES, immediately flush with plenty of water for at least 15 minutes. If easy to do, remove any contact lenses. Get medical attention. Remove material from skin and clothing.

IF ON SKIN, immediately flush the area with plenty of water. Wash skin gently with soap as soon as it is available. Get medical attention if irritation persists.

IF INHALED, remove person to fresh air. If breathing is difficult, get medical attention.

IF SWALLOWED, do NOT induce vomiting. Rinse mouth with water. Get medical attention. Contact a Poison Control Center. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

NOTE TO PHYSICIANS: Hot PCBs may cause thermal burn. If electrical equipment arcs between conductors, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce hydrochloric acid (HCl), a respiratory irritant. If large amounts are swallowed, gastric lavage may be considered.

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#### 5. FIRE FIGHTING MEASURES

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Flash Point: 284 degrees F (140 degrees C) or higher depending on the chlorination level of the Aroclor product

Fire Point: 349 degrees F (176 degrees C) or higher depending on the chlorination level of the Aroclor product

NOTE: Refer to Section 9 for individual flash points and fire points.

##### Extinguishing

Media: Extinguish fire using agent suitable for surrounding fire. Use dry chemical, foam, carbon dioxide or water spray. Water may be ineffective. Use water spray to keep fire-exposed containers or transformer cool.

PCBs are fire-resistant compounds. They may decompose to form CO, CO<sub>2</sub>, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

Dielectric fluids having PCBs and chlorinated benzenes as components have been reported to produce polychlorinated dibenzo-p-dioxins (PCDDs) and furans (PCDFs) during fire situations involving electrical equipment. At temperatures in the range of 600-650 degrees C in the presence of excess oxygen, PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

Federal regulations require all PCB transformers to be registered with fire response personnel.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state and local regulations.

Fire Fighting Equipment: Fire fighters and others exposed to products of combustion should wear self-contained breathing apparatus. Equipment should be thoroughly decontaminated after use.

## 6. ACCIDENTAL RELEASE MEASURES

Cleanup and disposal of liquid PCBs and other PCB items are strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any cleanup or disposal of PCBs, PCB items, or PCB contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All nonessential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways, and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. Refer to Section 8 for personal protection equipment and clothing.

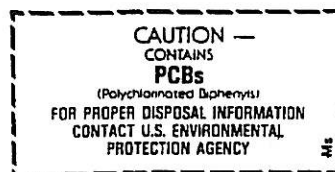
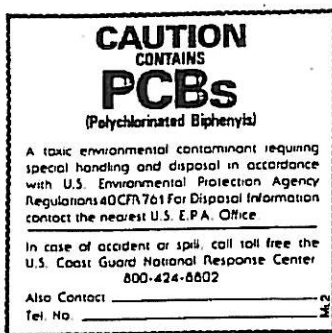
Personnel trained in emergency procedures and protected against attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks, and fight fires in PCB areas.

Refer to Section 13 for disposal information and Sections 14 and 15 for information regarding reportable quantity, and Section 7 for marking information.

## 7. HANDLING AND STORAGE

Care should be taken to prevent entry into the environment through spills, leakage, use vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

Federal regulations under the Toxic Substances Control Act require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be marked (check regulations, 40 CFR 761, for details).



**Storage:** The storage of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB waste is strictly regulated by 40 CFR Part 761. The storage time is limited, the storage area must meet physical requirements, and the area must be labeled.

**Avoid contact with eyes.  
Wash thoroughly after handling.  
Avoid breathing processing fumes or vapors.  
Process using adequate ventilation.**

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**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**


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**Eye Protection:** Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.

**Skin Protection:** Wear appropriate protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine the appropriate type glove for a given application. Wear chemical goggles, face shield, and chemical resistant clothing such as a rubber apron when splashing is likely. Wash immediately if skin is contacted. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

ATTENTION! Repeated or prolonged skin contact may cause chloracne in some people.

**Respiratory Protection:** Avoid breathing vapor, mist, or dust. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended when airborne exposure limits are exceeded and, if used, replaces the need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine the type of equipment for a given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.

ATTENTION! Repeated or prolonged inhalation may cause chloracne in some people.

**Ventilation:** Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of vapor or mist, such as open process equipment.

**Airborne Exposure Limits:**

**Product:** Chlorodiphenyl (42% chlorine)

OSHA PEL: 1 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*  
ACGIH TLV: 1 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*

**Product:** Chlorodiphenyl (54% chlorine)

OSHA PEL: 0.5 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*  
ACGIH TLV: 0.5 mg/m<sup>3</sup> 8-hour time-weighted average - Skin\*

\*For Skin notation see Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Government Industrial Hygienists, 1995-1996.

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**9. PHYSICAL AND CHEMICAL PROPERTIES**


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PROPERTIES OF SELECTED AROCLORS <sup>1</sup>							
PROPERTY	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	inert	inert	inert	inert	inert	inert	inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	176	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Flash point (°C)	170	141-150	152-154	176-180	193-196	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F) (centistokes)	71-81 13-16	38-41 3.6-4.6	44-51 5.5-7.7	82-92 16-19	185-240 42-52	1800-2500 390-540	— —

NA—Not Available

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

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**10. STABILITY AND REACTIVITY**


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Stability: PCBs are very stable, fire-resistant compounds.

Materials to Avoid: None

Hazardous Decomposition

Products: PCBs may decompose to form CO, CO<sub>2</sub>, HCl, phenolics, aldehydes, and other toxic combustion products under severe conditions such as exposure to flame or hot surface.

Hazardous Polymerization: Does not occur.

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**11. TOXICOLOGICAL INFORMATION**


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Data from laboratory studies conducted by Monsanto and from the available scientific literature are summarized below.

Single exposure (acute) studies indicate:

Oral - Slightly Toxic (Rat LD50 - 8.65 g/kg for 42% chlorinated; 11.9 g/kg for 54% chlorinated)

MSDS #: M00018515

The liquid products and their vapors are moderately irritating to eye tissues. Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

There are literature reports that PCBs can impair reproductive functions in monkeys. The National Cancer Institute (NCI) performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay. There is sufficient evidence in the scientific literature to conclude that Aroclor 1260 can cause liver cancer when fed to rodents at high doses. Similar experiments with less chlorinated PCB products have produced negative or equivocal results.

The consistent finding in animal studies is that PCBs produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and nonworker environmentally exposed population, have not demonstrated any causal relationship between PCB exposure and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs at high dosage can cause skin symptoms; however, these subside upon removal of the exposure source.

PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Seventh Annual Report on Carcinogens.

## 12. ECOLOGICAL INFORMATION

Care should be taken to prevent entry of PCBs into the environment through spills, leakage, use, vaporization or disposal of liquid or solids. PCBs can accumulate in the environment and can adversely affect some animals and aquatic life. In general, PCBs have low solubility in water, are strongly bound to soils and sediments, and are slowly degraded by natural processes in the environment.

## 13. DISPOSAL CONSIDERATIONS

The disposal of PCB items or equipment (those containing 50 ppm or greater PCBs) and PCB wastes is strictly regulated by 40 CFR Part 761. For example, all wastes and residues containing PCBs (wiping cloths, absorbent material, used disposable protective gloves and clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

## 14. TRANSPORT INFORMATION

The data provided in this section are for information only. Please apply the appropriate regulations to properly classify a shipment for transportation.

DOT Classification:	IF WEIGHT OF PCBs TO BE SHIPPED IS OVER ONE POUND, THE FOLLOWING CLASSIFICATION AND LABEL APPLY.
DOT Label:	LIQUID: Environmentally Hazardous Substance, liquid, n.o.s. (Contains PCB), 9, UN 3082, III
	SOLID: Environmentally Hazardous Substance, solid, n.o.s. (Contains PCB), 9, UN 3077, III
DOT Label:	Class: 9
DOT Reportable Quantity:	One Pound
IMO Classification:	Polychlorinated Biphenyls, IMO Class 9, UN 2315, II IMO Page 9034, EMS 6.1-02
IATA/ICAO Classification:	Polychlorinated Biphenyls, 9, UN2315, II

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**15. REGULATORY INFORMATION**

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For regulatory purposes, under the Toxic Substances Control Act, the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such a substance (40 CFR Part 761).

TSCA Inventory: not listed.

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370): Immediate, Delayed.  
SARA Section 313 Toxic Chemical(s): Listed-1993 (De Minimis concentration 0.1%.)

Reportable Quantity (RQ) under DOT (49 CFR) and CERCLA Regulations: 1 lb. (polychlorinated biphenyls) PCBs.

Release of more than 1 (one) pound of PCBs to the environment requires notification to the National Response Center (800-424-8802 or 202-426-2675).

Various state and local regulations may require immediate reporting of PCB spills and may also define spill cleanup levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill cleanup.

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**16. OTHER INFORMATION**

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Reason for revision: Conversion to the 16 section format. Supersedes MSDS dated 10/88.

Therminol® , Aroclor® and Pydraul® are registered trademarks of Monsanto Company  
Pyranol® is a registered trademark of General Electric Company  
Inerteen® is a registered trademark of Westinghouse Electric Corporation

FOR ADDITIONAL NONEMERGENCY INFORMATION, CONTACT:

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Manager, Product & Environmental Safety

Robert G. Kaley, II  
Director, Environmental Affairs

Monsanto Company  
800 North Lindbergh Boulevard  
St. Louis, MO 63167  
(314) 694-3344

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**MSDS** Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.  
222 Red School Lane  
Phillipsburg, NJ 08865



24 Hour Emergency Telephone: 908-859-2151  
CHEMTREC: 1-800-424-9300

National Response in Canada  
CANUTEC: 613-996-6666

Outside U.S. and Canada  
Chemtec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

# TRICHLOROETHYLENE

MSDS Number: T4940 --- Effective Date: 09/14/00

## 1. Product Identification

**Synonyms:** Trichloroethene; TCE; acetylene trichloride; Ethinyl trichloride

**CAS No.:** 79-01-6

**Molecular Weight:** 131.39

**Chemical Formula:** C<sub>2</sub>HCl<sub>3</sub>

**Product Codes:**

J.T. Baker: 5376, 9454, 9458, 9464, 9473, 9474

Mallinckrodt: 8598, 8600, 8633

## 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Trichloroethylene	79-01-6	100%	Yes

## 3. Hazards Identification

### Emergency Overview

**WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. CAUSES SEVERE SKIN**

**IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.**

**J.T. Baker SAF-T-DATA<sup>(tm)</sup> Ratings (Provided here for your convenience)**

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Health Rating: 3 - Severe (Cancer Causing)

Flammability Rating: 1 - Slight

Reactivity Rating: 1 - Slight

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD;  
PROPER GLOVES

Storage Color Code: Blue (Health)

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### **Potential Health Effects**

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#### **Inhalation:**

Vapors can irritate the respiratory tract. Causes depression of the central nervous system with symptoms of visual disturbances and mental confusion, incoordination, headache, nausea, euphoria, and dizziness. Inhalation of high concentrations could cause unconsciousness, heart effects, liver effects, kidney effects, and death.

#### **Ingestion:**

Cases irritation to gastrointestinal tract. May also cause effects similar to inhalation. May cause coughing, abdominal pain, diarrhea, dizziness, pulmonary edema, unconsciousness. Kidney failure can result in severe cases. Estimated fatal dose is 3-5 ml/kg.

#### **Skin Contact:**

Cause irritation, redness and pain. Can cause blistering. Continued skin contact has a defatting action and can produce rough, dry, red skin resulting in secondary infection.

#### **Eye Contact:**

Vapors may cause severe irritation with redness and pain. Splashes may cause eye damage.

#### **Chronic Exposure:**

Chronic exposures may cause liver, kidney, central nervous system, and peripheral nervous system effects. Workers chronically exposed may exhibit central nervous system depression, intolerance to alcohol, and increased cardiac output. This material is linked to mutagenic effects in humans. This material is also a suspect carcinogen.

#### **Aggravation of Pre-existing Conditions:**

Persons with pre-existing skin disorders, cardiovascular disorders, impaired liver or kidney or respiratory function, or central or peripheral nervous system disorders may be more susceptible to the effects of the substance.

---

## **4. First Aid Measures**



**Inhalation:**

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

**Ingestion:**

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.

**Skin Contact:**

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

**Eye Contact:**

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**Note to Physician:**

Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

---

## 5. Fire Fighting Measures

**Fire:**

Autoignition temperature: 420C (788F)

Flammable limits in air % by volume:

lfl: 8; uel: 12.5

**Explosion:**

A strong ignition source, e. g., a welding torch, can produce ignition. Sealed containers may rupture when heated.

**Fire Extinguishing Media:**

Use water spray to keep fire exposed containers cool. If substance does ignite, use CO<sub>2</sub>, dry chemical or foam.

**Special Information:**

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

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## 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting

spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

## 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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## 8. Exposure Controls/Personal Protection

### **Airborne Exposure Limits:**

Trichloroethylene:

-OSHA Permissible Exposure Limit (PEL):

100 ppm (TWA), 200 ppm (Ceiling),

300 ppm/5min/2hr (Max)

-ACGIH Threshold Limit Value (TLV):

50 ppm (TWA) 100 ppm (STEL);

listed as A5, not suspected as a human carcinogen.

### **Ventilation System:**

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

### **Personal Respirators (NIOSH Approved):**

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airtight hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has poor warning properties. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

### **Skin Protection:**

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene is a recommended material for personal protective equipment.

### **Eye Protection:**

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

## 9. Physical and Chemical Properties

**Appearance:**

Clear, colorless liquid.

**Odor:**

Chloroform-like odor.

**Solubility:**

Practically insoluble in water. Readily miscible in organic solvents.

**Specific Gravity:**

1.47 @ 20C/4C

**pH:**

No information found.

**% Volatiles by volume @ 21C (70F):**

100

**Boiling Point:**

87C (189F)

**Melting Point:**

-73C (-99F)

**Vapor Density (Air=1):**

4.5

**Vapor Pressure (mm Hg):**

57.8 @ 20C (68F)

**Evaporation Rate (BuAc=1):**

No information found.

---

## 10. Stability and Reactivity

**Stability:**

Stable under ordinary conditions of use and storage. Will slowly decompose to hydrochloric acid when exposed to light and moisture.

**Hazardous Decomposition Products:**

May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

Strong caustics and alkalis, strong oxidizers, chemically active metals, such as barium, lithium, sodium, magnesium, titanium and beryllium, liquid oxygen.

**Conditions to Avoid:**

Heat, flame, ignition sources, light, moisture, incompatibles

---

## 11. Toxicological Information

**Toxicological Data:**

Trichloroethylene: Oral rat LD50: 5650 mg/kg; investigated as a tumorigen, mutagen, reproductive effector.

**Reproductive Toxicity:**

This material has been linked to mutagenic effects in humans.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Trichloroethylene (79-01-6)	No	Yes	2A

---

## 12. Ecological Information

**Environmental Fate:**

When released into the soil, this material may leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. This material has an experimentally-determined bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.

**Environmental Toxicity:**

The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be slightly toxic to aquatic life.

---

## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

## 14. Transport Information

**Domestic (Land, D.O.T.)**

-----  
**Proper Shipping Name:** TRICHLOROETHYLENE

**Hazard Class:** 6.1

**UN/NA:** UN1710

Packing Group: III  
**Information reported for product/size: 5GL**

**International (Water, I.M.O.)**  
 -----

**Proper Shipping Name:** TRICHLOROETHYLENE  
**Hazard Class:** 6.1  
**UN/NA:** UN1710  
 Packing Group: III  
**Information reported for product/size: 5GL**

**International (Air, I.C.A.O.)**  
 -----

**Proper Shipping Name:** TRICHLOROETHYLENE  
**Hazard Class:** 6.1  
**UN/NA:** UN1710  
 Packing Group: III  
**Information reported for product/size: 5GL**

## 15. Regulatory Information

```

-----\Chemical Inventory Status - Part 1\-----
Ingredient                                     TSCA  EC   Japan  Australia
-----
Trichloroethylene (79-01-6)                   Yes  Yes   Yes    Yes
    
```

```

-----\Chemical Inventory Status - Part 2\-----
Ingredient                                     Korea  DSL   NDSL   Phil.
-----
Trichloroethylene (79-01-6)                   Yes   Yes   No     Yes
    
```

```

-----\Federal, State & International Regulations - Part 1\-----
Ingredient                                     -SARA 302-  -SARA 313-
RQ      TPQ      List  Chemical Catg.
-----
Trichloroethylene (79-01-6)                   No     No     Yes    No
    
```

```

-----\Federal, State & International Regulations - Part 2\-----
Ingredient                                     CERCLA  -RCRA-  -TSCA-
                                     CERCLA  261.33  8 (d)
-----
Trichloroethylene (79-01-6)                   100     U228    No
    
```

Chemical Weapons Convention: No      TSCA 12(b): No      CDTA: No  
 SARA 311/312: Acute: Yes      Chronic: Yes      Fire: No      Pressure: No  
 Reactivity: No      (Pure / Liquid)

**WARNING:**

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

**Australian Hazchem Code:** No information found.

**Poison Schedule:** S6

**WHMIS:**

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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## 16. Other Information

**NFPA Ratings:** Health: 2 Flammability: 1 Reactivity: 0

**Label Hazard Warning:**

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. CAUSES SEVERE SKIN IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

**Label Precautions:**

Do not get in eyes, on skin, or on clothing.

Do not breathe vapor.

Keep container closed.

Use only with adequate ventilation.

Wash thoroughly after handling.

Keep away from heat and flame.

**Label First Aid:**

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician. Note to physician: Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

**Product Use:**

Laboratory Reagent.

**Revision Information:**

MSDS Section(s) changed since last revision of document include: 8, 11.

**Disclaimer:**

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**Prepared by:** Strategic Services Division  
Phone Number: (314) 539-1600 (U.S.A.)

# MATERIAL SAFETY DATA SHEET

Effective Date: 06/01/00

Product: Ozone

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## 1. Product Identification

**Synonyms:** Triatomic oxygen

**CAS No.:** 10028-15-6

**Molecular Weight:** 48.0

**Chemical Formula:** O<sub>3</sub>

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## 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
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Ozone gas	10028-15-6	1 - 15%	Yes

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## 3. Hazards Identification

### Emergency Overview

Highly reactive, can explode on contact with organic substances, especially strong reducing agents.

Ozone is a powerful oxidizing agent and oxidation with ozone evolves more heat and usually starts at a lower temperature than oxidation with oxygen. It reacts with non-saturated organic compounds to produce ozonides, which are unstable and may decompose with explosive violence. Ozone is an unstable gas which, at normal temperatures, decomposes to biatomic oxygen. At elevated temperatures and in the presence of certain catalysts such as hydrogen, iron, copper and chromium, this decomposition may be explosive.

### Potential Health Effects

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**Inhalation:** Causes dryness of the mouth, coughing, and irritates the nose, throat, and chest. May cause difficulty in breathing, headache, and fatigue. The characteristic sharp, irritating odor is readily detectable at low concentrations (0.01 to 0.05 ppm).

**Skin:** Absorption through intact skin is not expected.

**Eye Contact:** Ozone is an irritant to the eyes causing pain, lacrimation, and general inflammation.



**Ingestion:** Not a route of exposure.

**Aggravation of Pre-existing Conditions:**

Ozone may increase sensitivity to bronchoconstrictors including allergens.

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## 4. First Aid Measures

**Inhalation:**

Remove to fresh air; if breathing is difficult a trained person should administer oxygen. If respiration stops, give mouth-to-mouth resuscitation. Get medical attention.

**Ingestion:**

Not an expected route of exposure.

**Skin Contact:**

Wash skin thoroughly with soap and water.

**Eye Contact:**

Immediately flush eyes with large amounts of water for at least 15 minutes, while forcibly holding eyelids apart to ensure flushing of the entire eye surface. If irritation, pain, or other symptoms persist seek medical attention.

**Acute:**

May cause irritation of skin, eyes, and mucous membranes of the respiratory tract. Drowsiness, dizziness, headache, and fatigue have been associated with exposure.

**Chronic:**

Long term health effects are not expected from exposures to ozone. A partial tolerance appears to develop with repeated exposures.

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## 5. Fire Fighting Measures

**Flash Point:**

N/D

**Auto ignition Temperature:**

N/D

**Flammable Limits in air, % by volume - Upper: N/D Lower: N/D**

**Extinguishing Media:**

Use extinguishing media suitable for surrounding fires.

**Unusual Fire and Explosion Hazard:** None expected. Since ozone is highly unstable and decomposes under all conditions and is not encountered except at very small levels in the immediate vicinity where formed.

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## 6. Accidental Release Measures

Evacuate danger area. Consult an expert. Ventilation. If ozone is a liquid or solid, allow material to evaporate and provide sufficient ventilation to dilute and disperse small amounts into the outside atmosphere. Dispose of waste in accordance with Federal, State, and local regulations. Reportable quantity = 1 pound.

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## 7. Handling and Storage

Unstable gas (liquid or solid phases are even more unstable). Ozone should be contained within a chemically compatible piping system.

Ozone is a powerful oxidizing agent and oxidation with ozone evolves more heat and usually starts at a lower temperature than oxidation with oxygen. It reacts with non-saturated organic compounds to produce ozonides, which are unstable and may decompose with explosive violence. Ozone is an unstable gas which, at normal temperatures, decomposes to biatomic oxygen. At elevated temperatures and in the presence of certain catalysts such as hydrogen, iron, copper and chromium, this decomposition may be explosive.

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## 8. Exposure Controls/Personal Protection

### Exposure Guidelines:

#### OSHA PEL:

0.1 ppm PEL/TLV

### Ventilation Requirements:

General exhaust recommended. Avoid working with ozone generating equipment in enclosed spaces.

### Specific Personal Protective Equipment

#### Respiratory:

Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations.

Only appropriate respirators shall be provided and used when the use of respirators is the only means of controlling exposure for routine operations, or during an emergency. (Refer to Table 1 of ANSUI/ASTM E591-77 for appropriate respirator selection ).

Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

**Eye:**

Not necessary

**Gloves:**

Not necessary.

**Other Clothing and Equipment:**

Not necessary.

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## 9. Physical and Chemical Properties

**Appearance:**

Black particulate solid, pellet, or powder.

**Specific Gravity (H<sub>2</sub>O=1):**

2.144 g/L

**Molecular Weight:**

48.00

**Boiling Point:**

-111.9°C

**Melting Point:**

-192.7°C

**Vapor Pressure:**

N/A

**Evaporation Rate (BuAc=1):**

N/A

**Vapor Density (Air=1):**

1.7

**Solubility in H<sub>2</sub>O % by Weight:**

0.49

**Appearance and Odor:**

Colorless to bluish gas with a characteristic pungent odor.

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## 10. Stability and Reactivity

**Stability:**

Ozone spontaneously decomposes under all ordinary conditions, so that it is not encountered except in the

immediate vicinity of where it was formed. The decomposition is speeded by solid surfaces and by many chemical substances.

**Hazardous Decomposition Products:**

Reactive singlet oxygen.

**Hazardous Polymerization:**

Will not occur.

**Incompatibilities:**

Ozone is a powerful oxidizing agent and reacts with all oxidizable materials, both organic and inorganic. Some reactions are highly explosive. Alkenes, benzene and other aromatic compounds, rubber, dicyanogen, bromine diethyl ether, dinitrogen tetroxide, nitrogen trichloride, hydrogen bromide, and tetrafluorohydrazine.

**Conditions to Avoid:**

Incompatibles.

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## 11. Toxicological Information

Ozone is extremely irritating to the upper and lower respiratory tract. The characteristic odor is readily detectable at low concentrations ( 0.02 ppm to 0.05 ppm). Ozone produces local irritation of the eyes and mucous membranes and may cause pulmonary edema at high exposure. Systematically, ozone has been reported to mimic the effects of ionizing radiation, and may cause damage to chromosomal structures. A partial tolerance appears to develop with repeated exposures. Although most effects are acute, the possibility of chronic lung impairment should be considered, based upon animal experimentation.

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## 12. Ecological Information

**Environmental Fate:**

No information found.

**Environmental Toxicity:**

No information found.

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## 13. Disposal Considerations

Do not dispose of ozone off gas to atmosphere without properly designed off gas destruct unit. State and local disposal regulations may differ from federal disposal regulations.

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## 14. Transport Information

**Proper Shipping Name:**

N/A

**Hazard Class:**

N/A

**Identification Number:**

N/A

**Packing Group:**

N/A

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## 15. Regulatory Information

**SARA TITLE III:**

N/A

**TSCA:**

The ingredients of this product are on the TSCA Inventory List.

**OSHA:**

Nonhazardous according to definitions of health hazard and physical hazard provided in the Hazard Communication Standard (29 CFR 1910.1200)

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## 16. Other Information

**Label Hazard Warning:**

HIGHLY REACTIVE. OZONE GAS AFFECTS THE RESPIRATORY SYSTEM.

**Label Precautions:**

Keep away from heat, sparks and flame. Avoid contact with eyes, skin and clothing. Avoid breathing. Use with adequate ventilation.

**Label First Aid:**

If inhaled, remove to fresh air. Get medical attention for any breathing difficulty.

**Product Use:**

Laboratory Reagent.