

# **SUB-PARCEL B11-1 (COKE POINT AREA SOUTH WAREHOUSE) GRADING PLAN**

**AREA B: SUB-PARCEL B11-1  
TRADEPOINT ATLANTIC  
SPARROWS POINT, MARYLAND**

Prepared For:



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Prepared By:



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Respectfully Submitted:

A handwritten signature in black ink, appearing to read "Sarah Lowe".

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Revision 1 – April 17, 2023

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## 1.0 INTRODUCTION

ARM Group LLC (ARM), on behalf of Tradepoint Atlantic (TPA), has prepared this Grading Plan for a portion of Area B designated as Sub-Parcel B11-1 (the Site). The Site comprises approximately 22.46 of the 3,100-acre former plant property located as shown on **Figure 1**. The grading work at Sub-Parcel B11-1 is being completed to support the future construction of the Coke Point Area (CPA) South Warehouse.

The conduct of any environmental assessment and cleanup activities on the Tradepoint Atlantic property, as well as any associated development, is subject to the requirements outlined in the following agreements:

- Administrative Consent Order (ACO) between Tradepoint Atlantic (formerly Sparrows Point Terminal, LLC) and the Maryland Department of the Environment (MDE), effective September 12, 2014; and
- Settlement Agreement and Covenant Not to Sue (SA) between Tradepoint Atlantic (formerly Sparrows Point Terminal, LLC) and the United States Environmental Protection Agency (USEPA), effective November 25, 2014.

The Site remains subject to the requirements of the Multimedia Consent Decree between Bethlehem Steel Corporation, the USEPA, and the MDE (effective October 8, 1997) as documented in correspondence received from the USEPA on September 12, 2014.

An application to enter the full Tradepoint Atlantic property (3,100 acres) into the Maryland Department of the Environment Voluntary Cleanup Program (MDE-VCP) was submitted to the MDE and delivered on June 27, 2014. The property's current and anticipated future use is Tier 3 (Industrial) and plans for the property include demolition and redevelopment over several years.

The Site consists of approximately 22.46 acres currently slated for grading (site preparation) for the northern portion (the Dredged Material Containment Facility [DMCF]) of the future construction of a 1,056,059 square foot warehouse building (the CPA South Warehouse). A Grading Plan will be submitted for the southern portion (Coke Point Landfill [CPLF]) at a future date. The proposed grading plan is included in **Appendix A** and the proposed concept plan for this project is provided in **Appendix B**. This site preparatory work is not intended to be the basis for the issuance of a No Further Action Letter (NFA) or a Certificate of Completion (COC). Future development and construction of the building will be subject to the submission of a separate Response and Development Work Plan (RADWP), which will evaluate the environmental condition of the Site and provide the standard requirements that have been approved for construction projects on the property.



## 2.0 SITE DESCRIPTION AND HISTORY

### 2.1. SITE DESCRIPTION

The Site consists of approximately 22.46 acres within Parcel B11, designated as Sub-Parcel B11-1. The location of the Site within the greater Tradepoint Atlantic property is provided on **Figure 1**. The proposed grading plan is included in **Appendix A** and the proposed concept plan for the Site is provided in **Appendix B**. The Site is currently zoned Manufacturing Heavy-Industrial Major (MH-IM) and is not occupied. All former buildings at the Site have been demolished, and the Site has been cleared of all significant vegetation. There is no groundwater use on-site or within the surrounding Tradepoint Atlantic property.

According to Figure B-2 of the property Stormwater Pollution Prevention Plan (SWPPP) Revision 9 dated September 27, 2021, surface water runoff from the Site flows through National Pollutant Discharge Elimination System (NPDES) permitted Outfall 001 and NPDES Permitted Outfall 016, which discharge to Old Road Bay.

### 2.2. SITE HISTORY

From the late 1800s until 2012, the production and manufacturing of steel was conducted at Sparrows Point. Iron and steel production operations and processes at Sparrows Point included raw material handling, coke production, sinter production, iron production, steel production, and semi-finished and finished product preparation. In 1970, Sparrows Point was the largest steel facility in the United States, producing hot and cold rolled sheets, coated materials, pipes, plates, and rod and wire. The steel making operations at the facility ceased in fall 2012 and the steel mill has since been demolished.

Parcels, B10, B11, and B12 comprise the Coke Point Peninsula, situated in the southwestern portion of TPA Property. The Coke Point Peninsula was the location of previous coking operations from 1940's to the early 1980's. The CPLF occupies approximately 60 acres of the southwestern portion of the peninsula and stores non-hazardous materials. North of the CPLF is the DMCF, a 26-acre area that was constructed to hold material from maintenance dredging operations. The DMCF contains approximately 350,000 cubic yards (CY) of dredged material, from the ground surface to approximately 16.5 feet below ground surface (bgs). Slag, a byproduct of the former steel manufacturing operations, is present immediately below the dredged materials. The DMCF makes up a portion of Sub-Parcel B11-1. The grading will take place within the DMCF in preparation for the CPA South Warehouse. Refer to **Figure 2** for the locations of the DMCF, the CPLF, and the proposed Limit of Disturbance (LOD) for the grading work.

### 3.0 LOCATIONS OF POTENTIAL CONCERN

The scope of development covered by this document is limited to fill material placement and grading activities which will be performed by Construction Workers using heavy equipment. The stripping of phragmites and phragmites root balls from within the DMCF will be conducted prior to the placement of fill material. No utility installations or other excavations will be conducted during this phase of development; any such activities will be covered by a subsequent RADWP to be submitted in the future for the construction of the proposed building. Since ground intrusive work will not be conducted under this Grading Plan, and the proposed fill material placement and grading activities will be performed by Construction Workers inside enclosed vehicle cabs, which mitigates exposure risk, a full human health Screening Level Risk Assessment (SLRA) is not necessary for this proposed work. Although a formal SLRA is not being presented within this Grading Plan, an evaluation of existing data was completed to determine whether any locations of potential concern exist within the proposed LOD.

The purpose of this evaluation was to determine whether any future response actions and/or monitoring are reasonably anticipated to be required to facilitate future use of the Site. This evaluation was based on existing data which were collected during completed investigations on the Tradepoint Atlantic property, including work associated with:

- B11 Phase II Investigation (Revision 0 dated December 22, 2020).
- Coke Point Landfill Semi-Annual Groundwater Monitoring Report (Revision 0 dated March 22, 2023).
- Coke Point Area Corrective Measures Study Investigation Report (Revision 2 dated February 23, 2021).

The relevant soil boring locations from these investigations are included on **Figure 3**. The relevant groundwater sample locations from these investigations are shown on **Figure 4**.

#### 3.1. SUMMARY OF SOIL INVESTIGATIONS

Soil conditions within and surrounding the Site have been characterized by the Parcel B11 Phase II Investigation. Investigation and monitoring reports for this area have been submitted to the Agencies (submittal dates listed above). Relevant soil boring locations from these investigations are shown on **Figure 3**. The data from these investigations were used to assess locations of potential concern within the LOD of the Site. Project Action Limit (PAL) exceedances for inorganics, TPH and O&G, and SVOCs for each of the relevant soil borings are also summarized on **Figures 5, 6, and 7**, respectively. The B11 Phase II Investigation did not identify any VOCs at concentrations above their respective PALs. Three Polynuclear Aromatic Hydrocarbons (PAHs) (benz[a]anthracene, benzo[a]pyrene, and naphthalene) were identified at concentrations above (or equal to) their respective PALs. Benz[a]anthracene was detected equal to its PAL of 21 mg/kg in only one sample (B11-026-SB-1). Benzo[a]pyrene was detected above its PAL of 2.1 mg/kg in 12

samples with a maximum detection of 14 mg/kg in B11-026-SB-1. Naphthalene was detected above its PAL of 8.6 mg/kg in four samples with a maximum detection of 61 mg/kg in B11-026-SB-9. The SVOC PAL exceedances are shown on **Figure 7**.

Lead, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH)/Oil & Grease, and non-aqueous phase liquid (NAPL) are subject to specific requirements as designated by the agencies. Data from within, and in close proximity to, the development area were evaluated to determine presence or absence of any locations of potential concern including: lead concentrations above 10,000 mg/kg, PCB concentrations above 50 mg/kg, TPH/Oil & Grease concentrations above 6,200 mg/kg, and physical evidence of NAPL. There were no soil concentrations of lead, PCBs or gasoline range organics (GRO) above the specified criteria. Oil & Grease exceeded the PAL of 6,200 mg/kg in three soil samples (B11-026-SB-9, B11-026-SB-10, and B11-027-SB-5) with a maximum detection of 24,800 mg/kg in B11-026-SB-9. Diesel range organics (DRO) exceeded the PAL of 6,200 mg/kg in two soil samples (B11-026-SB-9 and B11-026-SB-10) with a maximum detection of 24,500 mg/kg in B11-026-SB-10. The TPH/Oil & Grease PAL exceedances are shown on **Figure 6**.

Physical evidence of NAPL was discerned within Parcel B11 via the observation of product sheen in soil boring B11-026-SB. In accordance with the Parcel B11 Work Plan requirements, a NAPL screening, 2-inch piezometer was installed as B11-026-PZ. After 1 week of equilibration time, 1.85 feet of light NAPL (LNAPL) had accumulated in the piezometer casing. Due to the accumulation of NAPL in B11-026-PZ, three additional delineation piezometers were installed approximately 25 feet to the north (B11-026A-PZ), southwest (B11-026B-PZ), and southeast (B11-026C-PZ) of B11-026-PZ to delineate the extent of potentially mobile NAPL (refer to **Figure 8**). All delineation locations were absent of measurable or trace NAPL immediately after installation and during the 24-hour and 30-day checks. The NAPL impacts in the vicinity of B11-026-PZ were considered to be adequately defined (NAPL Delineation Completion Report, dated April 27, 2021). Soil Boring B11-026-SB is near the proposed grading site, but not within the LOD. No physical evidence of NAPL was observed in any other soil borings completed during the B11 Phase II site investigation. The Utility Excavation NAPL Contingency Plan (**Appendix E**) provides protocols to be followed if NAPL is encountered during the construction activities.

### **3.2. SUMMARY OF GROUNDWATER INVESTIGATIONS**

Groundwater at the Site has been characterized by the most recent Coke Point Landfill Semi-Annual and the CPA CMS Investigation Report. The associated Investigation Reports have been submitted to the Agencies (submittal date listed above). Groundwater locations from the investigations are shown on **Figure 4**. NAPL was not identified in any piezometers or monitoring wells within the LOD but has been observed in monitoring well B11-026-MWS shown on **Figure 8**. Groundwater PAL exceedances are summarized on **Figure 9**. Overall, groundwater PAL exceedances were limited to five VOCs (benzene, chloroform, bromodichloromethane, dibromochloromethane, and methylene chloride), three SVOCs, (1,1-biphenyl, benz[a]anthracene,

and naphthalene), DRO, GRO, Oil & Grease, and six inorganics (arsenic, hexavalent chromium, iron, lead, manganese, and vanadium). Groundwater within the shallow zone is approximately 0.92 to -0.83 feet above mean sea level (AMSL), and the existing grade is roughly 20 feet AMSL, so it is not anticipated that groundwater will be encountered during grading activities, however, if NAPL is encountered, the Utility Excavation NAPL Contingency Plan (**Appendix E**) provides protocols to be followed if NAPL is encountered during the construction activities.

### **3.3. DREDGED MATERIAL CONTAINMENT FACILITY**

In January 2022, a total of 20 composite samples were collected in accordance with the Sampling Plan for Environmental Test Pits (HCEA, January 5, 2022) and shown in **Appendix F**. From each of the 10 test pits, one composite sample was collected from the shallow, dry layer and one composite sample was collected from the deeper, moist layer. The shallow layer consists of dryer dredge material and ranges in depth from the surface to between 6-10 feet bgs, depending on the location. The deeper layer exhibited greater moisture, generally consisted of silt and clay, and ranged in depth from 6-10 feet bgs to 10.5-22 feet bgs. Test pits only extended to the limits of dredge material so that no containment or berm material was sampled.

The excavated material was temporarily stockpiled adjacent to each test pit. Each stockpile was screened in the field for evidence of environmental impacts (i.e., odors, staining, elevated photoionization [PID] readings). Evidence of environmental impact was not detected in any of the dredged material excavated during this investigation. All PID readings were non-detect.

The 20 composite samples were analyzed for PAHs via EPA Method 8270C, Priority Pollutant Metals via EPA Method 6020A, and Manganese and Calcium via Method 6020. In addition, one grab sample was collected from each layer (20 grab samples) and analyzed for TPH-DRO. There is approximately 350,000 CY of dredged material in the DMCF. The results of this assessment (Dredged Material Containment Facility Environmental Test Pits, HCEA, March 10, 2022) were submitted to the MDE. Following Agency review, the DMCF material was classified as Category 2 for Land Use Classification (referenced in **Appendix D**). The DMCF material has been determined safe for reuse.

## 4.0 PROPOSED GRADING PLAN

Tradeport Atlantic is proposing to perform material placement and grading on the designated 22.46 acres of Sub-Parcel B11-1 in preparation for the future construction of the CPA South Warehouse. The proposed future use of the Site is Tier 3 (Industrial).

The scope of development covered by this document is limited to vegetation removal, surcharge material placement and grading activities which will be performed by Construction Workers inside the enclosed vehicle cabs of heavy equipment. Therefore, it is not expected that significant exposures to potentially contaminated soil or groundwater will occur during the work proposed under this Grading Plan. The proposed concept plan is provided in **Appendix B**. No utility installations or other excavations will be conducted during this phase of development; any such activities will be covered by a project specific RADWP. The use of enclosed vehicles mitigates, but does not completely eliminate, potential exposure risks for Construction Workers. General health and safety controls (level D protection) outlined in the property-wide Health and Safety Plan (HASP provided in **Appendix C**) will mitigate any potential incidental risk to Construction Workers during fill material placement and grading activities.

The process of completing the proposed activities at the Site involves the tasks listed below. A final Development Completion Report will be necessary following the construction of the CPA South Warehouse building, as will be specified within the RADWP associated with the proposed development project. Depending on the schedule of subsequent development, the preparatory grading work discussed herein may be incorporated into the final Development Completion Report in lieu of an interim report.

As shown in **Figure 4**, eight existing monitoring wells (CO32-PZM041, CO32-PZM004, CP22-MWI, CP22-MWS, CP23-MWI, CP23-MWS, CP24-MWI, CP24-MWS) are located within Parcel B11. However, they are located outside of the proposed LOD for grading activities, and therefore no wells must be abandoned prior to grading activities.

### 4.1. GRADING AND SITE PREPARATION

Prior to beginning earthwork, erosion and sediment controls will be installed. Stabilized construction entrances will be utilized. Existing vegetation (e.g., *Phragmites* and trees) within the limits of disturbance will be removed and segregated from the area to be excavated. This may result in the removal of 1 to 2 feet of soil from the existing grade of approximately 20-feet AMSL.

An average of 9 feet of surcharge material (approximately 375,000 CY) is expected to be required for grading and compaction of the building pad. Therefore, the proposed work will require importing material to the Site. No excavations, trenching, or other intrusive work are planned to be conducted during this phase of the project. It is not anticipated that unsuitable materials (i.e., poor soils) will be encountered.

Fill material for this project will be processed slag aggregate from the Tradepoint Atlantic property, most likely from the Coke Point Landfill reclamation. The placement of this material will necessitate that the Site will be subject to surface engineering controls (i.e., capping) in the future when the RADWP is prepared for the CPA South Warehouse building. No other fill materials will be used at the Site without regulatory approval. Fill sources shall be free of organic material, frozen material, or other deleterious material.

## **5.0 GRADING IMPLEMENTATION PROTOCOLS**

This plan specifically discusses protocols for the handling of fill materials in association with the planned grading and site preparation activities at the Site. In particular, this plan highlights the minimum standards for construction practices to reduce potential risks to workers and the environment. No utility installations or other excavations will be conducted during this phase of development. On-site grading activities for the development area will consist of fill material placement and subsequent grading by Construction Workers inside the enclosed vehicle cabs of heavy equipment, which mitigates exposure risk. Therefore, it is not expected that significant exposures to potentially contaminated soil or groundwater will occur during the work proposed under this Grading Plan.

### **5.1. EROSION/SEDIMENT CONTROL**

Erosion and sediment controls will be installed prior to commencing work in accordance with the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control as applicable. The erosion and sediment controls will be approved by the regulators. In addition, the following measures will be taken to prevent contaminated soil from exiting the Site:

- Stabilized construction entrance will be placed at site entrance.
- A dry street sweeper will be used as necessary on adjacent roads, and the swept dust will be collected and properly managed.
- Accumulated sediment removed from silt fence, and sediment traps if applicable, shall be periodically removed and returned to the Site.

### **5.2. FILL**

Processed slag aggregate sourced from the Tradeport Atlantic property will be used as the fill / surcharge material for this project. The slag aggregate is likely to come from the Coke Point Landfill reclamation. No other fill materials will be used at the Site without the approval of the regulators. Processed slag aggregate can be used as structural fill under areas to be capped without any additional required testing or approvals. Tradeport Atlantic understands that the placement of slag aggregate at the Site will necessitate that the development area will be subject to a capping requirement when it is evaluated in a subsequent RADWP for construction of the warehouse building, unless separate approvals are received from the regulators following appropriate laboratory testing of the material.

### **5.3. DUST CONTROL**

General construction operations, including grading, will be performed at the Site. These activities are anticipated to be performed in areas of soil impacted with constituents of potential concern (COPCs). Best management practices should be undertaken at the Tradeport Atlantic property as

a whole to prevent the generation of dust which could impact other areas of the property outside of the immediate work zone. To limit worker exposure to contaminants borne in dust and windblown particulates, dust monitoring will be performed during dust-generating activities.

The Environmental Professional (EP) will be responsible for the Site dust monitoring program. At a minimum, this will consist of monitoring for visible dust. If sustained visible dust is observed at the Site, the General Contractor will implement dust suppression methods to address on-site dust levels. Such methods may include an increase in the frequency of water trucks spraying vehicle routes, covering of material piles with plastic sheeting, or decreasing drop heights of material from excavation equipment. If visible dust is sustained at the Site after suppression methods are implemented, real-time dust monitoring equipment may be used.

If real-time dust monitoring is conducted, Met One Instruments, Inc. E-Sampler dust monitors or equivalent real-time air monitoring devices will be utilized. Continuous dust monitoring will be performed in the work area as well as perimeter monitors at upwind and downwind locations based on the prevailing wind direction predicted for that day. The prevailing wind direction will be assessed during the day, and the positions of the perimeter monitors may be adjusted if there is a substantial shift in prevailing wind direction.

The action level for determining the need for implementing additional dust suppression methodologies is 3.0 milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ). The lowest of the site-specific dust action levels, Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL), and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) was selected. If sustained dust concentrations exceed the action level ( $3.0 \text{ mg}/\text{m}^3$ ) at monitoring locations as a result of conditions occurring at the Site, operations will be stopped temporarily until additional dust suppression can be implemented. Operations may resume once monitoring indicates that dust concentrations are below the action level.

Once all dust-generating activities are complete, the dust monitoring program may be discontinued.

#### **5.4. HEALTH AND SAFETY**

A property-wide HASP (provided as **Appendix C**) has been developed and is attached to this plan to present the minimum requirements for worker health and safety protection for the project. The proposed fill material placement and grading activities will be performed by Construction Workers inside enclosed vehicle cabs, which mitigates exposure risk. General health and safety controls (level D protection) will mitigate any potential incidental risk to Construction Workers during fill material placement and grading activities. All contractors working on the Site must prepare their own HASP that provides a level of protection at least as much as that provided by the attached HASP. Alternately, on-site contractors may elect to adopt the HASP provided.

Prior to commencing work, the contractor must conduct a pre-construction safety meeting for all personnel. All personnel must be made aware of the HASP. Although intrusive work is not



anticipated to be required for this grading project, safety information shall be provided to personnel who may have incidental exposures to soils which could be impacted by COPCs. Workers will be responsible for following safety procedures to prevent contact with potentially contaminated soil or groundwater (not anticipated).

## **6.0 PERMITS, NOTIFICATIONS, AND CONTINGENCIES**

The participant and their contractors will comply with all local, state, and federal laws and regulations by obtaining any necessary approvals and permits to conduct the activities contained herein. Any permits or permit modifications from State or local authorities will be provided as addenda to this Grading Plan.

There are no wetlands identified within the project area, so no permits are required from the MDE Water Resources Administration.

Contingency measures will include the following:

1. The regulators will be notified immediately of any previously undiscovered contamination, previously undiscovered storage tanks and other oil-related issues, and citations from regulatory entities related to health and safety practices.
2. Any significant change to the implementation schedule will be noted in the progress reports to regulators.

## 7.0 IMPLEMENTATION SCHEDULE

Progress reports will be submitted to the regulators on a quarterly basis. Each quarterly progress report will include, at a minimum, a discussion of the following information regarding tasks completed during the specified quarter:

- Grading Progress
- Dust Monitoring
- Soil Management (imported materials, stockpiling)
- Notable Occurrences (if applicable)
- Additional Associated Work (if applicable)

The proposed implementation schedule is shown below.

<b>Task</b>	<b>Proposed Completion Date</b>
Anticipated Plan Approval	April 2023
Slag Delivery & Placement	April 2023 (start)

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## **FIGURES**

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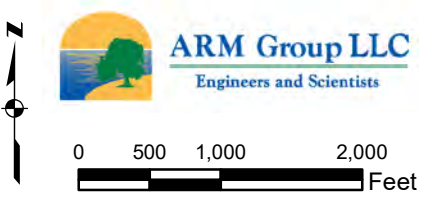

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-  CPA South Warehouse Grading LOD
-  Parcel Boundaries
-  Site Boundary
-  Private Property



P:\EnviroAnalytics Group\150298M\_EAG\_Sparrows Point Area A\GIS\Site-wide Figures.mxd

<p><b>Tradepoint Atlantic Property</b>  <b>Area A and Area B Parcels</b>          March 13, 2023</p>		<p><b>Figure</b>  <span style="font-size: 2em; font-weight: bold;">1</span></p>
		
	Tradepoint Atlantic	
	Sparrows Point	
	Baltimore County, MD	
ARM Project 22010834		





Parcel B10

Dredged Material  
Containment  
Facility Boundary

Coke Oven Area  
South Warehouse  
Grading LOD

Parcel B11

Coke Point  
Landfill  
Boundary

Parcel B12

- CPA South Warehouse Grading LOD
- DMCF Boundary
- Coke Point LF Boundary
- Parcel Boundary

Sub-Parcel B11-1/CPA South Warehouse  
Proposed Limit of Disturbance  
March 14, 2023

Figure  
2







**ARM Group LLC**  
Engineers and Scientists

0 130 260 520  
Feet

Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 20010211







-  Phase II Soil Boring
-  Phase II Soil Boring (Evidence of NAPL)
-  CPA South Warehouse Grading LOD
-  Parcel Boundary


**Sub-Parcel B11-1 /CPA South Warehouse  
Soil Sample Locations**  
March 17, 2023

**Figure  
3**





**ARM Group LLC**  
Engineers and Scientists

0    500    1,000    2,000  
 Feet



Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 200110211





**Sub-Parcel B11-1/CPA South Warehouse  
Groundwater Monitoring Well Locations**  
March 17, 2023

**Figure  
4**

0 500 1,000 2,000 Feet

Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 200110211





Phase II Soil Boring  
 Phase II Soil Boring (Evidence of NAPL)  
 CPA South Warehouse Grading LOD  
 Parcel Boundary

**Parcel B10**

**B11-032-SB-1**  
Manganese: 29,600  
Thallium: 18.1  
**B11-032-SB-5**  
Arsenic: 11.9  
Thallium: 18.7

**B11-033-SB-1**  
Arsenic: 4.1  
Thallium: 14.9  
**B11-033-SB-7**  
Arsenic: 8.8  
Manganese: 36,800  
Thallium: 30.7  
**B11-033-SB-10**  
Arsenic: 6.7  
Thallium: 22.8

**B11-031-SB-1**  
NE  
**B11-031-SB-5**  
Arsenic: 7.0  
**B11-031-SB-10**  
NE

**B11-030-SB-1**  
Thallium: 15.1  
**B11-030-SB-5**  
Thallium: 22.8

**B11-013-SB-1**  
Arsenic: 10.2 J  
**B11-013-SB-4**  
NE

**B11-008-SB-2**  
Arsenic: 4.2  
**B11-008-SB-6**  
Arsenic: 4.3  
Thallium: 19.3 J

**B11-012-SB-2**  
Arsenic: 5.3  
**B11-012-SB-8**  
Arsenic: 4.2

**Parcel B11**

**B11-029-SB-1**  
Thallium: 16.3  
**B11-029-SB-5**  
Manganese: 33,200  
Thallium: 23.0

**B11-026-SB-1**  
Arsenic: 6.5  
**B11-026-SB-9**  
Arsenic: 6.5  
**B11-026-SB-10**  
Arsenic: 9.0

**B11-027-SB-1**  
Arsenic: 14.4  
Lead: 1,080 J  
**B11-027-SB-5**  
Arsenic: 15.0

**B11-014-SB-1**  
Arsenic: 4.3 J  
**B11-014-SB-5**  
Arsenic: 9.0 J  
Manganese: 43,600  
Thallium: 37.0

**B11-003-SB-1**  
Arsenic: 5.5 J  
Thallium: 21.1  
**B11-003-SB-5**  
Arsenic: 10.4 J

**B11-028-SB-1**  
Manganese: 60,200  
Thallium: 35.4  
**B11-028-SB-7.5**  
Thallium: 12.2

**B11-016-SB-1**  
NE  
**B11-016-SB-4**  
NE

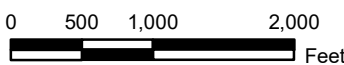
**Parcel B12**

Sub-Parcel B11-1/CPA South Warehouse  
Soil Samples - Inorganic PAL Exceedances

Figure  
**5**

March 17, 2023

Notes:  
 -All Results in mg/kg  
 -NE= No Exceedances  
 -Samples collected from August- October 2020.



Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 200110211





Sub-Parcel B11-1/CPA South Warehouse  
Soil Samples - TPH/O&G PAL Exceedances  
March 17, 2023

Figure  
**6**

Notes:  
 -All Results in mg/kg  
 -NE= No Exceedances  
 -Samples collected from August- October 2020.

**ARM Group LLC**  
Engineers and Scientists

0 500 1,000 2,000 Feet

Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 200110211





Sub-Parcel B11-1/CPA South Warehouse  
Soil Samples - SVOC PAL Exceedances

March 17, 2023

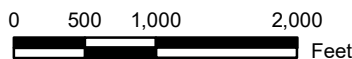
Figure  
**7**

Notes:

- All Results in mg/kg
- NE= No Exceedances
- Samples collected from August- October 2020.



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Engineers and Scientists



Tradepoint Atlantic

Sparrows Point




Baltimore County, MD

ARM Project 200110211



Parcel B11

Parcel B12

-  Monitoring Well (NAPL Observed)
-  Piezometer (No Observed NAPL)
-  Parcel Boundary

B11-026A-PZ



B11-026-PZ



B11-026C-PZ



B11-026B-PZ



Delineation Location




B11-026-SB


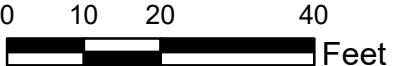
Sub-Parcel B11-1/CPA South Warehouse  
 B11-026-MWS NAPL Delineation

April 17, 2023

Figure 8

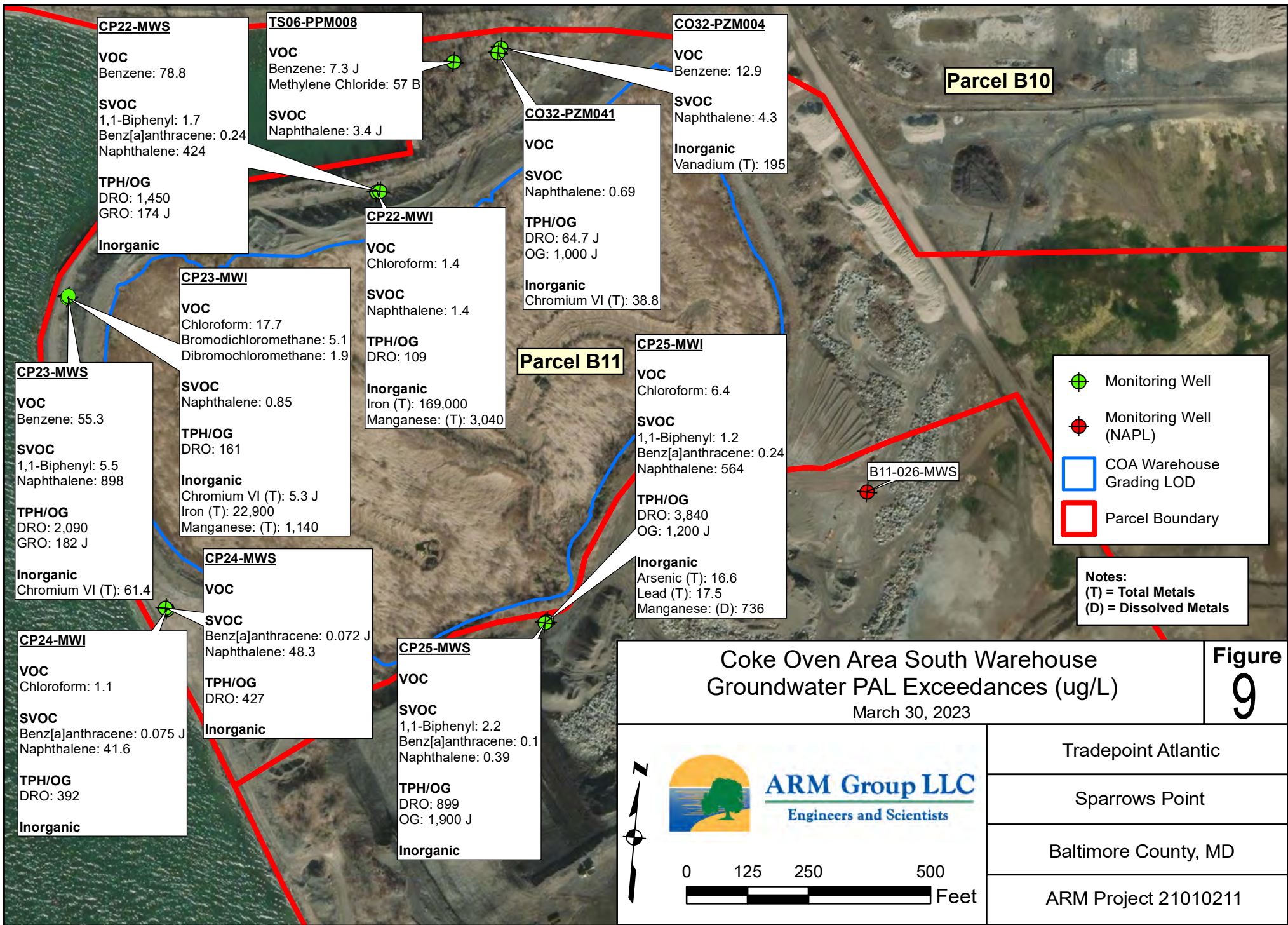


**ARM Group LLC**  
 Engineers and Scientists

0 10 20 40 Feet

Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010211



**CP22-MWS**

**VOC**  
Benzene: 78.8

**SVOC**  
1,1-Biphenyl: 1.7  
Benz[a]anthracene: 0.24  
Naphthalene: 424

**TPH/OG**  
DRO: 1,450  
GRO: 174 J

**Inorganic**

**TS06-PPM008**

**VOC**  
Benzene: 7.3 J  
Methylene Chloride: 57 B

**SVOC**  
Naphthalene: 3.4 J

**CO32-PZM004**

**VOC**  
Benzene: 12.9

**SVOC**  
Naphthalene: 4.3

**Inorganic**  
Vanadium (T): 195

**CO32-PZM041**

**VOC**

**SVOC**  
Naphthalene: 0.69

**TPH/OG**  
DRO: 64.7 J  
OG: 1,000 J

**Inorganic**  
Chromium VI (T): 38.8

**CP22-MWI**

**VOC**  
Chloroform: 1.4

**SVOC**  
Naphthalene: 1.4

**TPH/OG**  
DRO: 109

**Inorganic**  
Iron (T): 169,000  
Manganese: (T): 3,040

**CP23-MWI**

**VOC**  
Chloroform: 17.7  
Bromodichloromethane: 5.1  
Dibromochloromethane: 1.9

**SVOC**  
Naphthalene: 0.85

**TPH/OG**  
DRO: 161

**Inorganic**  
Chromium VI (T): 5.3 J  
Iron (T): 22,900  
Manganese: (T): 1,140

**CP23-MWS**

**VOC**  
Benzene: 55.3

**SVOC**  
1,1-Biphenyl: 5.5  
Naphthalene: 898

**TPH/OG**  
DRO: 2,090  
GRO: 182 J

**Inorganic**  
Chromium VI (T): 61.4

**CP25-MWI**

**VOC**  
Chloroform: 6.4

**SVOC**  
1,1-Biphenyl: 1.2  
Benz[a]anthracene: 0.24  
Naphthalene: 564

**TPH/OG**  
DRO: 3,840  
OG: 1,200 J

**Inorganic**  
Arsenic (T): 16.6  
Lead (T): 17.5  
Manganese: (D): 736

**CP24-MWS**

**VOC**

**SVOC**  
Benz[a]anthracene: 0.072 J  
Naphthalene: 48.3

**TPH/OG**  
DRO: 427

**Inorganic**

**CP24-MWI**

**VOC**  
Chloroform: 1.1

**SVOC**  
Benz[a]anthracene: 0.075 J  
Naphthalene: 41.6

**TPH/OG**  
DRO: 392

**Inorganic**

**CP25-MWS**

**VOC**

**SVOC**  
1,1-Biphenyl: 2.2  
Benz[a]anthracene: 0.1  
Naphthalene: 0.39

**TPH/OG**  
DRO: 899  
OG: 1,900 J

**Inorganic**

- Monitoring Well
- Monitoring Well (NAPL)
- COA Warehouse Grading LOD
- Parcel Boundary

**Notes:**  
(T) = Total Metals  
(D) = Dissolved Metals

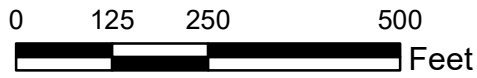
**Coke Oven Area South Warehouse  
Groundwater PAL Exceedances (ug/L)**

March 30, 2023

**Figure  
9**



**ARM Group LLC**  
Engineers and Scientists



Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010211

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## **APPENDIX A**

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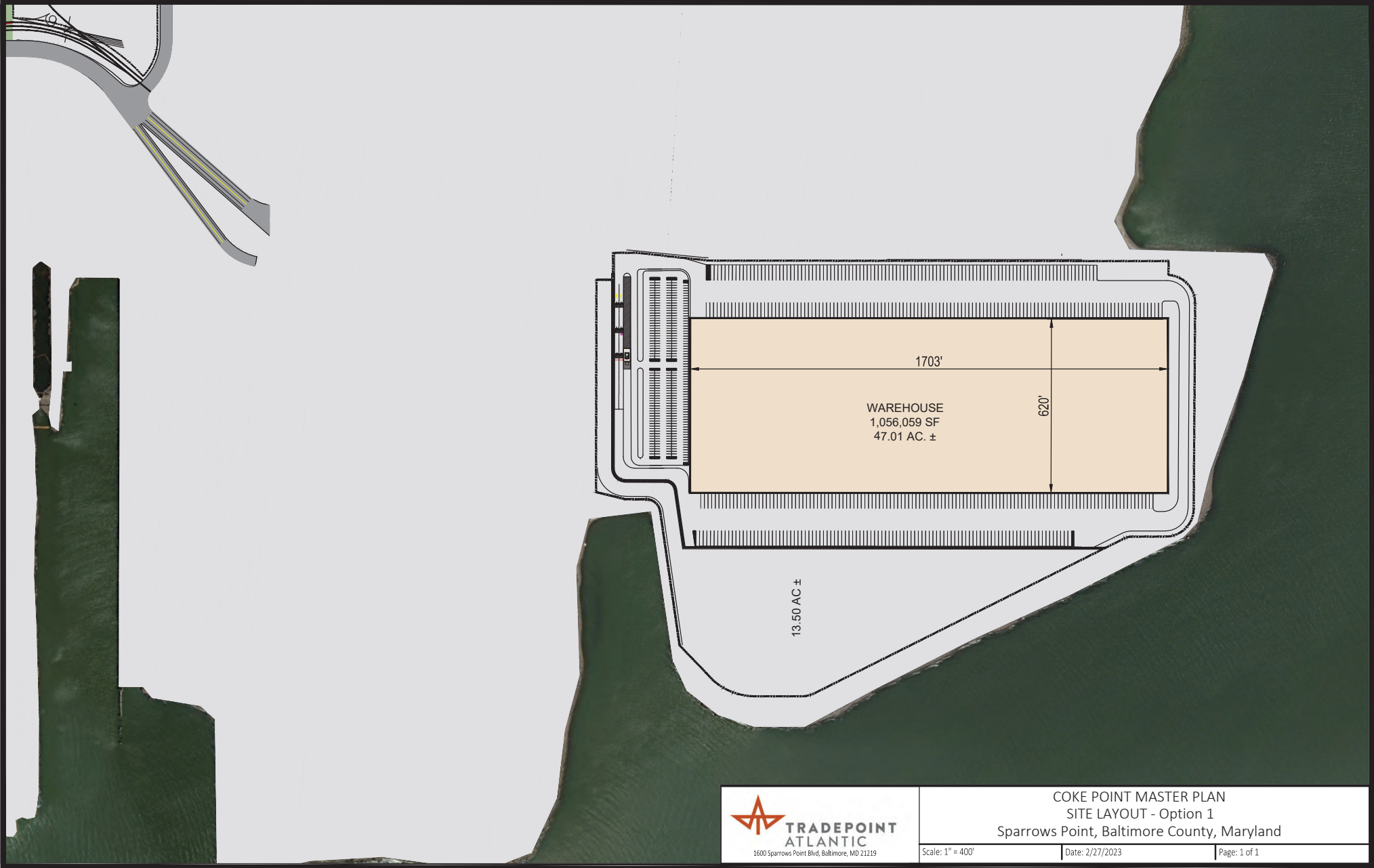
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## **APPENDIX B**

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1600 Sparrows Point Blvd, Baltimore, MD 21219

COKE POINT MASTER PLAN  
SITE LAYOUT - Option 1  
Sparrows Point, Baltimore County, Maryland

Scale: 1" = 400'

Date: 2/27/2023

Page: 1 of 1

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## **APPENDIX C**

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SEPTEMBER 22, 2020  
PROJECT NO. 3774-300-01-14

# HEALTH AND SAFETY PLAN

TRADEPOINT ATLANTIC  
SPARROWS POINT FACILITY

SPARROWS POINT, MARYLAND

PREPARED BY



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## List of Attachments

Attachment A: Acknowledgement Form  
Attachment B: Safety Data Sheets

# 1 INTRODUCTION

---

## 1.1 Background

The Tradepoint Atlantic (TPA) site has previously been utilized as a steel making facility. It is located in Baltimore County, Maryland in the southeast corner of the Baltimore metropolitan area (approximately 9 miles from the downtown area), on the Sparrows Point Peninsula in the Chesapeake Bay watershed. The facility occupies the entire peninsula and is bounded to the west by Bear Creek; to the south by Patapsco River; and to the east by Jones Creek, Old Road Bay and residential areas of Edgemere. The facility is bounded to the north by the Sparrows Point Country Club. The entire facility is approximately 3,100 acres in size.

Pennsylvania Steel built the original furnace at Sparrows Point in 1887 and the first iron was cast in 1889. Bethlehem Steel Corporation (BSC) purchased the facility in 1916 and enlarged it by building additional plating facilities. BSC filed for bankruptcy in 2001. A series of entities have since owned the site: the International Steel Group (ISG), Mittal Steel, ISG Sparrows Point, LLC, Severstal Sparrows Holding LLC, which was renamed to Severstal Sparrows Point, LLC, RG Steel Sparrows Point, LLC, and then a joint venture to Sparrows Point LLC (SP) and HRE Sparrows Point LLC. In 2014, the property and assets were sold to Sparrows Point Terminal LLC (SPT). Environmental liability was retained by SP. In 2016, SPT rebranded into the entity known as Tradepoint Atlantic, LLC (TPA).

The facility has been subdivided into various different parcels and sub-parcels based primarily on the redevelopment potential.

The purpose of this document is to provide a Health and Safety Plan (HASP) for TPA personnel who are engaged in various environmental, maintenance, and rail-related activities performed throughout the facility.

## 1.2 Historic Operations

Steel manufacturing involves handling vast amounts of raw material including coke, iron ore, limestone and scrap steel, as well as recovering byproducts and managing waste materials. The operations listed below either were or are currently performed at the TPA Facility.

- Iron and steel production,
- Coal chemical recovery system,
- Other byproducts recovery systems,
- Wastewater treatment systems,

- Solid waste management, and
- Air pollution control.

The approximately 3,100 acre facility is being redeveloped into various different commercial/industrial land uses on a systematic parcel by parcel basis under the oversight of the Maryland Department of the Environment (MDE) and United States Environmental Protection Agency (USEPA). The redevelopment is proceeding in accordance with remediation plans approved by MDE and USEPA under Maryland's Voluntary Cleanup Program (VCP) and portions of the facility are also governed by the federal Resource Conservation and Recovery Act (RCRA).

Various historical environmental investigations have been performed throughout the site. The data collected from these investigations has been compiled and compared against the applicable Project Action Limits (PALs). Concentrations identified as exceeding PALs must be adequately addressed to the satisfaction of the regulators. The historical environmental data have been compiled in various Phase II Environmental Site Assessment (ESA) Reports and also presented in various documents intended to satisfy VCP requirements, including Response and Development Workplans (RADWP). The RADWP documents are generally specific to each individual sub-parcel being developed as part of the overall redevelopment project.

The historical environmental data has indicated that various constituents are present in either the soil and/or groundwater at concentrations exceeding the PALs, including:

- Various metals;
- Volatile organic compounds (VOCs);
- Semi-volatile organic compounds (SVOCs); and
- Polychlorinated biphenyls (PCBs).

While the construction projects associated with the redevelopment are typically performed by contractors hired by TPA, after the initial construction has been completed, TPA personnel perform various maintenance/repair activities throughout the site. The maintenance activities may involve excavation of impacted soils beneath engineered barriers, such as concrete or asphalt pavement. TPA personnel and their subcontractors may also perform a variety of environmental tasks including field investigations, sampling, system maintenance, and remedial excavations. TPA personnel also regularly perform various tasks related to railroad operations.



Procedures for controlling TPA worker exposure to the above constituents during execution of the various site maintenance and rail operations performed by TPA personnel is presented within this HASP.

## 2 PURPOSE, SCOPE AND ORGANIZATION

---

This section describes the purpose, scope and organization of this HASP and the health and safety responsibilities of TPA employees involved in various on-site environmental, maintenance, and rail-related operations described herein.

### 2.1 Scope

Site maintenance work performed by TPA personnel that could involve intrusive activities in impacted soils may include, but are not limited to:

- Soil regrading;
- Repair of subsurface utility lines, such as storm water piping, domestic water, sanitary lines, and possibly electric, or gas; and
- Repair of on-site sidewalks, driveways, or roadways.

The job tasks associated with rail-related operations on-site are generally performed in accordance with federal regulations found at 49 CFR. TPA personnel involved in rail-related operations include track workers (working in proximity of railroad tracks) and personnel working on the train cars themselves, including engineers and conductors. In general, the activities performed by TPA rail-related personnel covered under this HASP include:

- Track construction/maintenance. These tasks can be performed throughout the TPA facility and involve working with railroad ties, bolts, rails, etc.; and
- Operation of the train cars/engines themselves. These tasks include servicing, switching rail cars throughout the TPA property. The potentially hazardous materials transported in the rail cars includes: propane/butane (liquids), scrap metal (primarily zinc), aggregate, and coal.

Site environmental work includes, but is not limited to:

- Groundwater sampling and monitoring.
- Groundwater and remediation well installation, repair, closure, and abandonment.
- Surface water, pore water, and sediment sampling.
- Soil boring and subsurface soil sampling.
- Soil excavations for remedial purposes.
- Installation and operation of remediation systems for soil, soil vapor, and groundwater.

- Decommissioning and closure of remediation systems.
- Soil excavations for remedial purposes.
- In situ chemical and/or biological injections.
- Recovery of non-aqueous phase liquids (NAPL).

## **2.2 Organization of Document**

This HASP includes health and safety procedures for generally anticipated job tasks related to the above site maintenance and rail-related activities. This HASP also meets the OSHA requirements contained in the CFR, specifically 29 CFR 1926 (Safety and Health Regulations for Construction), by including the following items:

- A description of staff organization, qualifications and responsibilities (Section 2.3);
- Hazard identification (Section 3.0);
- Health hazard information (Section 4.0), including references to applicable Safety Data Sheets (SDS) for materials that may be encountered during work at the TPA facility;
- Personal protective equipment (PPE), including available first aid, emergency, and safety equipment (Section 5.0);
- Employee training and standard safety procedures (Section 6.0);
- Exposure monitoring plan (Section 7.0);
- Site control measures and decontamination (Section 8.0); and
- Emergency response and contingency procedures (section 9.0)

## **2.3 TPA Health and Safety Personnel**

Personnel responsible for implementing this HASP include:

TPA Contacts	
Mr. Pete Haid, Vice President – Environmental	(443) 649-5055 phaid@tradepointatlantic.com
Mr. Matthew Newman, P.E., Environmental Engineer	(410) 649-5063 mnewman@tradepointatlantic.com
Silvio Restivo, Tradepoint Rail General Manager	(443) 528-5697 srestivo@tradepointrail.com
Mike Vogler, Senior Vice President – Operations	(443) 386-3619 mvogler@tradepointatlantic.com
Chad Waskey, Director of Property Management	(443) 865-3722 cwaskey@tradepointpm.com

TPA will identify certain individuals as “Competent Persons” within the meaning of OSHA Standard 29 CFR 1926.32 (f). Within this context, a “Competent Person” is defined as “one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt action to eliminate them.”

A “Competent Person” is typically identified by virtue of education, training, and experience, or a combination and shall possess the skill of observation and the knowledge of the subject, including the applicable regulatory guidelines as to ensure that safety and health of the public, workers, and the environment.

## 3 HAZARD IDENTIFICATION

---

This section outlines the potential hazards associated with various jobs listed above in Section 2.1.

### 3.1 Hazard Analysis

The various jobs related to site environmental, maintenance, and rail operations may pose potential health and safety hazards for site workers. This section describes the hazards associated with these operations. Detailed hazard information is provided in Section 4.0 (Health Hazard Information).

Hazards to which workers may be exposed to as a result of the above-listed activities may generally include: potential chemical exposures, lacerations, excessive noise, thermal stress, lifting of excessive weight or bulk, hand tools and heavy equipment, and slips, trips and falls.

#### 3.1.1 Chemical Hazard

Potential exposures to chemicals in the soil or groundwater include the possibility of dermal exposure (contact and/or absorption), inhalation of chemical contamination that may be encountered during site maintenance or rail work, or ingestion of contaminants, if good personal hygiene practices are not followed.

Various metals, VOCs, SVOCs, and PCBs are the primary contaminants that have been identified in site soil and/or groundwater during previous environmental investigations at the site at concentrations exceeding Project Action Limits (PALs). The appropriate Safety Data Sheets (SDS) will be reviewed that apply to the various job tasks being conducted. Applicable SDS are located in **Attachment B**. A SDS for slag, which has been utilized for structural fill and could be encountered during excavation activities, is also included in **Attachment B**. Creosote is a chemical commonly used to preserve wood railroad ties and could also be encountered by TPA workers performing maintenance on railroad tracks. Finally, propane, butane, and coal are commonly transported in rail cars. Therefore, a SDS for these materials is also included in **Attachment B**.

Note that this is a dynamic document: should any additional chemicals be introduced or discovered during environmental, site maintenance or rail-related activities, the SDS will be added to **Attachment B**, as necessary. Further, some of the SDS apply to a pure form of the various compounds detected in the soils at the site. The actual concentrations of these chemicals in the site soil is substantially lower.

### **3.1.2 Physical Hazards**

The potential physical hazards associated with site maintenance and rail-related activities include:

- Slips, trips, and falls;
- Exposure to extreme outside temperatures and weather;
- Equipment hazards;
- Noise;
- Dust and fumes;
- Injury from tools, equipment, rotating parts;
- Electrical hazards;
- Buried and overhead hazards;
- Railroad-specific hazards; and
- Driving to, from, and around the site (including working in trafficked areas).

It is possible that additional hazards may be encountered based on the various tasks at hand. It will be the responsibility of TPA's management to identify and address additional hazards on a "per task or job" basis. If a new job or task not mentioned in this HASP is required, then a job safety analysis (JSA) may need to be conducted prior to the start of various tasks. Safety meetings will be conducted with all staff in attendance, before the start of any new task, or when any significant personnel or other changes (such as a swift change in weather, for example) occur. Updated information relating to physical hazards will be presented during these meetings to familiarize the crew with potential hazards, discuss new situations, and assess how the associated risks can be managed. Further, good housekeeping practices will be employed to manage other risks potentially resulting from clutter and inattention to detail. In addition, internal field audits may be randomly conducted to document adherence to procedures described herein.

### **3.1.3 Biological Hazards**

Biological hazards that may be encountered when conducting the planned maintenance and rail-related activities include the following:

- Poisonous snakes and spiders;
- Ticks and tick-borne diseases;

- Stinging insects such as chiggers, bees, wasps, etc.;
- Various viruses and diseases spread via animal to human contact, such as West Nile Virus or rabies;
- Various viruses and diseases spread via human to human contact, such as colds or the flu;
- Dermal contact with poison ivy, oak, and/or sumac; and
- Blood borne pathogens when administering first aid.

First aid kits will be available on-site. It is crucial to note that any site personnel who has significant allergies should communicate that information to the operations team they are working with, along with the location of their auto-injector pen (such as an Epi-Pen) for use in case of going into anaphylactic shock from something that would cause such a reaction (like a bee sting, for example). Personnel who suffer from such allergies are responsible for providing their own auto-injector devices, as those are typically prescription based, as well as specific to their particular allergy.

## 4 HEALTH HAZARD INFORMATION

---

The following section provides a discussion of the health hazards for workers associated with the site environmental work, maintenance work, and rail-related work. Occupational hazards associated with the components of the chemicals of concern present in the soil may exist, along with physical and biological hazards related to the environmental work, maintenance work, and rail-related operations work, which are also discussed in this section.

### 4.1 Chemical Hazards

Exposure to chemicals through inhalation, ingestion, or skin contact may result in health hazards to site workers. Hazards associated with exposure will be evaluated using OSHA Permissible Exposure Limits (PELs) and the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). Each of these values are 8-hour, time-weighted averaged (TWAs) above which an employee cannot be exposed. TPA may also use the National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs) where applicable. Although the OSHA PELs are the only exposure limits enforceable by law, the most stringent of exposure limits will be used as the TPA-enforced exposure criteria during work-related activities covered by this HASP.

The following is a summary of the potential hazards created by the compounds that may be encountered during TPA's environmental, maintenance and/or rail-related activities. Contaminants of concern may include various metals, semi-volatile compounds [i.e., polycyclic aromatic hydrocarbons (PAHs)], volatile organic compounds, and PCBs. Table 4-1 below contains chemical information and exposure limits for various chemicals that could be present at concentrations exceeding Project Action Limits (PALs) during future maintenance and/or rail-related work activities. It is possible that carbon monoxide may also be encountered from the use of various internal combustion engines (vehicular or otherwise); however, it is anticipated that since any such engine will be used outdoors, it is not expected that concentrations of concern will accumulate. With the use of any such engine, the engine should be positioned such that personnel are upwind of the engine exhaust.

If other chemicals are encountered during the course of TPA's work activities, the SDS must be made available and added to **Attachment B**. Personnel must be trained in the hazards and use of chemicals. This training will be primarily accomplished through the review of this HASP.



**Table 4-1, Chemical Contaminants of Potential Concern**

<b>Chemical Name Synonyms (trade name)</b>	<b>Exposure Limits</b>	<b>Characteristics</b>	<b>Route of Exposure</b>	<b>Symptoms of Exposure</b>
Polycyclic aromatic hydrocarbons (PAHs) (coal tar pitch volatiles) (65996-93-2)	PEL: 0.2mg/m <sup>3</sup> REL: 0.1mg/m <sup>3</sup> TLV: 0.2 mg/m <sup>3</sup> STEL: N/A IDLH: 80mg/m <sup>3</sup> (CA) Skin: NO	The pitch of coal tar is black or dark brown amorphous residue that remains after the predistillation process. LEL: N/A UEL: N/A IP: VARIES VP: VARIES	INH CON	Direct contact or exposure to vapors may be irritating to the eyes. Direct contact can be highly irritating to the skin and produce dermatitis. Exposure to vapors may cause nausea and vomiting. A potential human carcinogen.
Arsenic (inorganic)	PEL: 0.01mg/m <sup>3</sup> REL: NONE TLV: 0.5 mg/m <sup>3</sup> STEL: N/A IDLH: 5mg/m <sup>3</sup> (CA) Skin: NO	Silver-gray or tin-white brittle odorless solid. Air odor threshold: N/D.	INH ABS CON ING	Symptoms include ulceration of nasal septum, gastrointestinal disturbances, respiratory irritation and peripheral neuropathy. Potential occupational carcinogen.
Barium	PEL: 0.5 mg/m <sup>3</sup> STEL: 8 mg/m <sup>3</sup>  IDLH: 50 mg/m <sup>3</sup>	White, odorless solid. Air odor threshold: N/D	ING INH CON	Irritated eyes, skin, upper respiratory system, skin burns, gastroenteritis, muscle spasm, slow pulse, cardiac arrhythmia
Chromium (III) Compounds (as Cr)	PEL: 0.5mg/m <sup>3</sup> REL: 0.5mg/m <sup>3</sup> TLV: 0.5mg/m <sup>3</sup> STEL: N/A IDLH: 25mg/m <sup>3</sup> Skin: NO	Varies, depending on specific compound	INH ING CON	Eye irritation, sensitivity, dermatitis
Cadmium (elemental)	PEL: 0.005mg/m <sup>3</sup> REL: CA TLV: 0.01mg/m <sup>3</sup> STEL: N/A IDLH: 9mg/m <sup>3</sup> (CA) Skin: NO	Silver-white, blue-tinged lustrous, odorless solid. Air odor threshold: N/D.	INH ING	Symptoms include pulmonary edema, cough, tight chest, head pain, chills, muscle aches, vomiting and diarrhea. Potential occupational carcinogen.
Chromium (Metal)	PEL: 1.0mg/m <sup>3</sup> REL: 0.5mg/m <sup>3</sup> TLV: 0.5mg/m <sup>3</sup> STEL: N/A IDLH: 250mg/m <sup>3</sup> Skin: NO	Blue-white to steel-gray lustrous, brittle, hard odorless solid. Air odor threshold: N/D.	INH ING CON	Symptoms may include irritated eyes and skin, lung fibrosis.
Copper	PEL: 1mg/m <sup>3</sup> REL: 1mg/m <sup>3</sup> TLV: 1mg/m <sup>3</sup> STEL: N/A IDLH: 100mg/m <sup>3</sup> Skin: NO	Reddish, lustrous, malleable, odorless solid	INH ING CON	Irritation of eyes, nose, pharynx, nasal septum perforations, metallic taste, dermatitis

Chemical Name Synonyms (trade name)	Exposure Limits	Characteristics	Route of Exposure	Symptoms of Exposure
Lead (Elemental & Inorganic as Pb)	PEL: 0.05mg/m <sup>3</sup> REL: 0.1mg/m <sup>3</sup> TLV: 0.05mg/m <sup>3</sup> STEL: N/A IDLH: 100mg/m <sup>3</sup> Skin: NO	A heavy, ductile soft gray solid. Air odor threshold: N/D.	INH ING CON	Accumulative poison may cause weakness, insomnia, facial pallor, anorexia, malnutrition, constipation, abdominal pain, anemia, gingival lead line, paralysis of wrists and ankles, hypertension and kidney disease.
Manganese	PEL: 5 mg/m <sup>3</sup> TLV: 0.2 mg/m <sup>3</sup>	Gray metallic solid in various forms, odorless	INH SKIN EYES	Irritation. Chronic exposure to high levels may result in syndrome called manganism, which typically begins with feelings of weakness and lethargy and progresses to other symptoms such as gait disturbances, clumsiness, tremors, speech disturbances, a mask-like facial expression and psychological disturbances.
Nickel	PEL: 1 mg/m <sup>3</sup> REL: 0.015 mg/m <sup>3</sup> (Ca) TLV: 0.1 mg/m <sup>3</sup> STEL: N/A IDLH: 10 mg/m <sup>3</sup> Skin: NO	Lustrous, silvery, odorless solid. Air odor threshold: N/A VP: 0mm	INH CON ING	Sensitivity dermatitis, allergic asthma, pneumonitis
Vanadium Oxide	PEL: 0.5 mg/m <sup>3</sup> , respirable TLV: 0.05 mg/m <sup>3</sup>	Yellow-orange or dark gray in color	SKIN EYE INH ING	Repeated exposure may result in greenish discoloration of tongue.
Zinc oxide	PEL: 5mg/m <sup>3</sup> REL: 5mg/m <sup>3</sup> TLV: 2mg/m <sup>3</sup> STEL: 10mg/m <sup>3</sup> IDLH: 500mg/m <sup>3</sup> Skin: NO	White, lustrous solid	INH	Metal fume fever, chills, muscular ache, nausea, fever, dry throat, cough, weakness, metallic taste, headache, blurred vision, low back pain, vomiting, fatigue, malaise
Trichloroethene	PEL: 100 mg/m <sup>3</sup> IDLH: 1,000 mg/m <sup>3</sup>	Colorless liquid (unless dyed blue) with chloroform-like odor LEL: 8% UEL: 10.5%	ING INH ABS SKIN EYE	Eye, skin irritation, headache, visual disturbance, weakness, exhaustion, dizziness, tremor, drowsiness, nausea, vomiting, dermatitis, cardiac arrhythmias
Benzene	PEL – 1 ppm STEL – 5 ppm IDLH – 500 ppm STEL – 1 ppm (NIOSH)	Colorless to light-yellow liquid with aromatic odor LEL: 1.2% UEL: 7.8% IP: 8.76 EV VP: 7mm Fl.Pt.: 55 deg F	ING INH CON	Irritation of eyes, skin, nose, respiratory system, giddiness, headache, nausea, fatigue, anorexia, dermatitis, bone marrow depression

Chemical Name Synonyms (trade name)	Exposure Limits	Characteristics	Route of Exposure	Symptoms of Exposure
Ethylbenzene	PEL: 100PPM REL: 100PPM TLV: 100PPM STEL: 125PPM IDLH: 800PPM Skin: NO	Colorless liquid with an aromatic odor. LEL: 0.85 UEL: 6.7% IP: 8.76EV VP: 7mm Fl.P: 55°F	INH ING CON	Irritation of eyes, skin, mucous membranes, headache, dermatitis
1,4-dichlorobenzene	PEL: 75 mg/m3 IDLH: 150 mg/m3	Colorless or white crystalline solid with a mothball-like odor LEL: 2.5% UEL: unknown	INH ABS ING SKIN EYE	Eye irritation, swelling, periorbital (situated around eye), profuse rhinitis, headache, anorexia, nausea, vomiting, weight loss, jaundice
1,1 dichloroethane	PEL: 100PPM REL: 100PPM TLV: 100PPM STEL: NA IDLH: 3000PPM Skin: NO	Colorless, oily liquid with a chloroform-like odor. LEL: 6.2% UEL: 16% IP: 11.05EV Vp: 64mm Fl.P: 56°F	INH ING CON	Irritation of eyes, CNS depression, liver, kidney, lung damage
1,2-dibromo-3-chloropropane	PEL: 0.001 mg/m3	Colorless liquid, with pungent odor	INH SKIN ING	Eye, skin, and respiratory irritation, lowered consciousness
Phenol	PEL: 5PPM REL: 5PPM, 15.6PPM (C) TLV: 5PPM STEL: NA IDLH 250PPM Skin: YES	Colorless to light pink crystalline solid with a sweet, acrid odor. LEL: 1.8% UEL: 5.9% IP: 8.12EV Vp: 0.08mm Fl.P: 175°F	INH ING CON ABS	Irritated eyes, nose, throat, anorexia, weakness, muscular ache, pain, dark urine, cyanosis, liver, kidney damage, skin burns, dermatitis, tremor, convulsions, twitch
Naphthalene	PEL: 10PPM REL: 10PPM TLV: 10PPM STEL: 15PPM IDLH: 250PPM Skin: YES	Colorless to brown solid with an odor of mothballs LEL: 0.9% UEL: 5.9% IP: 8.12EV Vp: 0.08mm Fl.P: 174°F	INH ABS ING CON	Irritation of eyes, headache, confusion, excitement, malaise, nausea, vomiting, abdominal pain, irritated bladder, profuse sweating, jaundice, hematuria, renal shutdown, dermatitis, optical neuritis, corneal damage
Styrene	PEL: 100PPM, 200PPM (C) REL: 50PPM TLV: 20PPM STEL: 40PPM IDLH: 700PPM Skin: NO	Colorless to yellow, oily liquid with a sweet, floral odor. LEL: 0.9% UEL: 6.8% IP: 8.40eV VP: 5MM Fl.P: 88°F	INH ABS ING CON	Irritated eyes, nose, respiratory system, headache, fatigue, dizziness, confusion, malaise, drowsiness, weakness, narcosis, dermatitis
Toluene	PEL: 200PPM, 300PPM (C) REL: 100PPM TLV: 20PPM STEL: 150PPM IDLH: 500PPM Skin: YES	Colorless liquid with a sweet, pungent benzene-like odor. LEL: 1.1% UEL: 7.1% IP: 8.82EV VP: 21MM Fl.P: 40°F	INH ABS ING CON	Irritation of eyes, nose, fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation, nervousness, muscle fatigue, insomnia, dermatitis, liver, kidney damage

Chemical Name Synonyms (trade name)	Exposure Limits	Characteristics	Route of Exposure	Symptoms of Exposure
Xylenes	PEL: 100PPM REL: 100PPM TLV: 100PPM STEL: 150PPM IDLH: 900PPM Skin: NO	Colorless liquid with an aromatic odor. LEL: 0.9% UEL: 6.7% IP: 8.40EV VP: 5MM Fl.P: 88°F	INH ABS ING CON	Irritated eyes, nose, respiratory system, headache, fatigue, dizziness, confusion, malaise, drowsiness, incoherence, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis
Polychlorinated biphenyls (PCBs)	PEL: 1 mg/m <sup>3</sup> (42% concn.) PEL: 0.5 mg/m <sup>3</sup> (54% concn.)	Clear to light yellow oils, viscous liquids, or sticky resin, may have mild hydrocarbon odor.	INH ABS ING	Short-term or acute health effects include skin, eye, and throat irritation, breathing difficulties, nausea and vomiting, loss of weight, and stomach pain.
<b>Gases</b>				
Carbon Monoxide	PEL: 50PPM REL: 35PPM TLV: 25PPM STEL: 200PPM (C) IDLH: 1200PPM Skin: NO	Colorless, odorless gas LEL: 12.5% UEL: 74% IP: 14.01eV VP: >35atm Fl.P: N/A	INH	Headache, rapid breathing, nausea, tiredness, dizziness, confusion

**NOTES:**

- OSHA PEL Occupational Safety and Health administration Final Rule Limits, Permissible Exposure Limit for an eight-hour, time-weighted average
- ACGIH TLV American Conference of Governmental Industrial Hygienists, Threshold Limit Value for eight-hour, time-weighted average.
- STEL Short-term Exposure Limit for a 15-minute, time-weighted average
- NIOSH IDLH National Institute for Occupational Safety and Health, Immediately Dangerous to Life or Health concentration
- PPM Part of vapor or gas per millions parts of air by volume at 25°Celsius and 760mm Hg mg/m<sup>3</sup> (milligram of substance per cubic meter of air)
- CA NIOSH has identified numerous chemicals that it recommends to be treated as potential or confirmed human carcinogens.
- (C) The (ceiling) concentration that should not be exceed during any part of the working exposure.
- Skin Refers to the potential contribution to the overall exposure by the cutaneous (absorption) route, including mucous membranes and eye, either by airborne or more particularly by direct contact with the substance.
- UEL Upper Explosive Limit – the highest concentration of a material in air that produces an explosion in fire or ignites when it contacts an ignition source.
- LEL Lower Explosive Limit – the lowest concentration of the material in air that can be detonated by spark, shock, fire, etc.
- INH Inhalation
- ABS Skin absorption
- ING Ingestion
- CON Skin and/or eye contact

## 4.2 Physical Hazards

TPA workers may be exposed to a number of physical hazards during execution of site environmental, maintenance, and rail-related operations job tasks. Physical hazards that may be encountered include the following:

- Heat and cold stress,
- Lifting hazards,
- Slips, trips and falls,
- Working around heavy equipment,
- Drilling hazards,
- Excavation hazards,
- Noise,
- Use of hand and power tools,
- Buried hazards,
- Electrical hazards,
- Underground and overhead utilities,
- Railroad-specific hazards; and
- Travel to and from site.

The following sections provide additional discussion concerning each of the above potential physical hazards.

### 4.2.1 Heat Stress

Depending upon the time of year, local weather conditions may produce an environment that will require restricted work schedules in order to protect employees from heat stress. Supervisors will observe workers for any potential symptoms of heat stress. Adaptation of work schedules and training on recognition of heat stress conditions should help prevent heat-related illnesses from occurring. Heat stress controls will be started at 70°F for personnel in protective clothing and at 90°F for personnel in regular work clothing. Heat stress prevention controls include:

- Allow workers to become acclimated to heat (three to six days);
- Provide rest breaks in a shaded or air-conditioned break area;
- Provide sun screen to prevent sun burn;

- Provide drinking water and/or electrolyte-replenishing fluids; and
- Keep ice readily available to rapidly cool site workers.

The following Heat Stress Index should be used as a guide to evaluate potential heat stress situations. If the Heat Stress exceeds 105 degrees Fahrenheit, contact TPA management prior to conducting work for detailed guidance.

<b>Heat Stress Index</b>									
Temp. °F	Relative Humidity								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
105	98	104	110	120	132				
102	97	101	108	117	125				
100	95	99	105	110	120	132			
98	93	97	101	106	110	125			
96	91	95	98	104	108	120	128		
94	89	93	95	100	105	111	122		
92	87	90	92	96	100	106	114	122	
90	85	88	90	92	96	100	106	114	122
88	82	86	87	89	93	95	100	106	115
86	80	84	85	87	90	92	96	100	109
84	78	81	83	85	86	89	91	95	99
82	77	79	80	81	84	86	89	91	95
80	75	77	78	79	81	83	85	86	89
78	72	75	77	78	79	80	81	83	85
76	70	72	75	76	77	77	77	78	79
74	68	70	73	74	75	75	75	76	77

**NOTES: Add 10° F when protective clothing is being used; Add 10° F when in direct sunlight**

HSI Temp	Category	Injury Threat
Above 130° F	Extreme Danger	No work unless emergency exists. Contact TPA senior management prior to proceeding. Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
105° to 130° F	Danger	Contact TPA senior management prior to proceeding. Requires strict adherence to ACGIH Heat Stress Guidelines. Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
90° to 105° F	Extreme Caution	Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
80° to 90° F	Caution	Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
Below 80° F	Normal Range	Typical conditions for time of year. Little or no danger under normal circumstances. As always, anticipate problems and work safely.

## 4.2.2 Cold Stress

Frostbite and hypothermia are two types of cold injury that personnel must be protected against during the performance of field duties. The objective is to prevent the deep body temperature from falling below 96.8° F and to prevent cold injury to body extremities. Two factors influence the development of a cold injury: the ambient temperature and wind velocity. Reduced body temperature will very likely result in reduced mental alertness, reduction in rational decision making, and/or loss of consciousness with the threat of death.

Use appropriate cold weather clothing when temperatures are at or below 40° F as exposed skin surfaces must be protected. These protective items can include facemask, hand wear, and foot wear. Personnel will wear protective clothing appropriate for the level of cold and planned physical activity. The objective is to protect all parts of the body, with emphasis on the hands and feet. Eye protection against glare and ultraviolet light should be worn in snowy and icy conditions.

The work rate should not be so great as to cause heavy sweating that could result in wet clothing. If heavy work must be done, opportunities for rest breaks will be provided where workers have the opportunity to change into dry clothing. Conversely, plan work activities to minimize time spent sitting or standing still. Rest breaks should be taken in a warm, dry area. Windbreaks can also be used to shield the work area from the cooling effects of wind.

If extreme cold-related weather conditions occur, TPA field personnel will take the following precautions:

- Wear adequate insulated clothing when the air temperature drops below 40°F;
- Reduce work periods in extreme conditions to allow adequate rest periods in a warm area;
- Change clothes when work clothes become wet; and
- Avoid caffeine (which has diuretic and circulatory effects).

## 4.2.3 Lifting Hazards

Field personnel may be exposed to injury caused by lifting heavier objects and various pieces of large or unwieldy equipment. All TPA employees will be trained in the proper methods for lifting heavy and/or large equipment and are cautioned against lifting objects that are too heavy or too big for one person. Proper lifting techniques include the following:

- Keep feet approximately shoulder width apart;
- Bend at the knees;
- Tighten abdominal muscles;

- Lift with the legs;
- Keep the load close to the body;
- Keep the back upright; and
- Use the buddy system for larger or heavy pieces of equipment.

#### **4.2.4 Slips, Trips and Falls**

The most common hazards encountered for workers outside vehicle cabs during site environmental, maintenance or rail-related activities is expected to be slips, trips and falls. TPA workers are trained to use common sense to avoid these hazards such as using work boots/safety shoes with nonskid soles. When working on slippery surfaces, tasks will be planned to decrease the risk of slipping via avoiding the slippery areas, if possible, or utilizing engineering controls. Engineering controls may involve the placement of supplemental material such as boards, gravel, or ice melt may be utilized to mitigate slippery conditions. Other engineering controls may involve the use of footgear traction control devices. TAP workers will avoid slippery surfaces, use engineering controls as appropriate, not hurry, and maintain good housekeeping.

#### **4.2.5 Buried Hazards**

Whenever the ground surface is penetrated, the potential for contacting buried hazards exists. During the planning/mobilization phase, prior to excavation activities, TPA personnel will establish the location of underground utility lines (gas, electrical, telephone, fiber optic cable, etc.) and/or substructures or other potential buried hazardous items. This may be conducted by review of historic utility and substructure maps, private utility locates, ground penetrating radar, or other technologies. If there is any evidence of utilities or subsurface objects/structures, excavation activities will either need to be relocated or excavation should proceed carefully. If activities cannot be offset, measures will be taken to remove, disconnect, and/or protect the utilities and/or subsurface structures and/or objects. Every reasonable effort will be made to clear the area of intrusive work prior to initiation of excavation activities.

#### **4.2.6 Electrical Hazards**

It may be possible that overhead power lines will be in proximate locations during environmental, maintenance or rail-related activities. At least a 20 foot clearance must be maintained from overhead power lines. No equipment such as dump trucks should be moved while buckets are in the upright position. Field personnel performing electrical work are required to be appropriately trained to work on the electrical systems in question prior to start of work. Authorization from



project management personnel is required prior to any electrical work or work near overhead power lines.

When using extension cords, all workers will ensure that they are in good working condition, are correctly rated for use, and do not contain abrasions such that bare wires could be exposed to the environment. Extension cords will not be used in wet areas without plugging the extension cord into a ground fault circuit interrupter (GFCI). GFCIs will detect a short circuit and cut power.

#### **4.2.7 Heavy Equipment Operations**

Heavy equipment must be operated in a safe manner and be properly maintained such that operators and ground personnel are protected.

##### Requirements for Operators

- Only qualified, trained, and authorized operators are allowed to operate equipment;
- Seat belts will be used at all times in all equipment and trucks;
- If ground personnel are endangered by equipment, operators will temporarily stop work whenever ground personnel or other equipment enter their work area; work will resume only when the area has been cleared;
- No personnel may ride on equipment other than the Authorized Operator;
- No personnel may be carried or lifted in the buckets or working “arms” of the equipment; and
- Spotters will be used when ground personnel are in the vicinity of heavy equipment work areas and/or when an operator is backing equipment near other structures or congested area.

##### Requirements for Ground Personnel

- All ground personnel must wear hi-visibility orange or green protective vests, shirts, jackets, or equivalent in work areas with any operating heavy equipment;
- Ground personnel will stay outside of the swing zone or work area of any operating equipment;
- Ground personnel may only enter the swing or work area of any operating equipment when:
  - They have attracted the operators attention and made eye contact;
  - The operator has idled the equipment down and grounded all extensions; and
  - The operator gives the ground personnel permission to approach.

- Ground personnel shall never walk or position themselves between any fixed object and running equipment or between two running pieces of equipment.

### Equipment

- Maintain operations manuals at the site for each piece of equipment that is present and in use;
- Ensure operators are familiar with the manual for the equipment and operate the equipment within the parameters of the manual;
- Ensure all equipment is provided with roll-over protection systems;
- Verify that seatbelts are present and functional in all equipment;
- Prohibit the use of equipment that has cab glass which is broken or missing;
- Ensure that backup alarms are functional on all trucks and equipment;
- Require all extensions such as buckets, blades, forks, etc. to be grounded when not in use; and
- Require brakes to be set and wheels chocked (when applicable) when not in use.

Daily inspections of equipment will be performed. Equipment deemed to be unsafe as a result of daily inspection will not be used until required repairs or maintenance occurs. During maintenance/repair, ensure that motors are turned off, all extensions are grounded or securely blocked, controls are in a neutral position, and the brakes are set.

### **4.2.8 Drilling Safety**

Prior to any intrusive work, as previously mentioned above, the location of underground utilities, such as sewer, telephone, gas, water and electric lines must be determined and plainly staked. Necessary arrangements must be made with the utility company or owner for the protection, removal or relocation of the underground utilities. In such circumstances, excavation will be done in a manner that does not endanger the field personnel engaged in the work or the underground utility. Utilities left in place will be protected by barricading, shoring, suspension or other measures, as necessary.

The use of unsafe or defective equipment is not permitted. Equipment must be inspected regularly. If found to be defective, equipment must be immediately removed from use and either repaired or replaced prior to resuming work with that equipment. Field personnel will be familiar with the location of first-aid kits and fire extinguishers. Telephone numbers for emergency assistance must be prominently posted and kept current.

Good housekeeping conditions will be observed in and around the work areas. Suitable storage places will be provided for all materials and supplies. Pipe, drill rods, etc. must be securely stacked on solid, level sills. Work surfaces, platforms, stairways, walkways, scaffolding, and access ways will be kept free of obstructions. All debris will be collected and stored in piles or containers for removal and disposal.

The area of the site to undergo intrusive activity must be walked over with the drillers and/or heavy equipment operators to identify all work locations, as well as verifying all marked utilities are seen by those doing the intrusive work.

In areas where utilities have been identified or may be suspected, pre-drilling clearance such as hand augering, hand excavation (with shovels or post-hole diggers), or air-knifing to a depth of at least 5' below ground surface (BGS) may be required. Project management will provide guidance in those instances on what has been determined as an acceptable means of clearing drilling locations. It should be noted that if the soil lithology changes to gravel within those 5 feet, that may be an indication of a utility trench and extreme caution should be taken OR the drilling location should be offset 5 horizontal feet from the original location. Should three consecutive attempts be made without success to offset a particular drilling location, the field personnel should stop and contact management for further instruction.

Special precaution must be taken when using a drill rig on a site within the vicinity of electrical power lines and other overhead utilities. Electricity can shock, burn and cause death. When overhead electrical power lines exist at or near a drilling site, all wires will be considered dangerous. A check will be made for sagging power lines before a site is entered. Power lines will not be lifted to gain entrance. The appropriate utility company will be contacted and a request will be made that it lift or raise, or cut off power to the lines.

The area around the drill rig will be inspected before the drill rig mast is raised at a site in the vicinity of power lines. The minimum distance from any point on the drill rig to the nearest power line will be measured when the mast is raised or is being raised. The mast will not be raised and the drill rig will not be operated if this distance is less than 20 feet, because hoist lines and overhead power lines can be moved toward each other by the wind.

Before the mast is raised, personnel will be cleared from the immediate area, with the exception of the operator and a helper, when necessary. A check will be made to ensure safe clearance from energized power lines or equipment (minimum 20-foot clearance). Unsecured equipment must be removed from the mast and cables, mud lines and catline ropes must be adequately secured to the mast before raising. After it is raised, the mast must be secured to the rig in an upright position with steel pins.

#### **4.2.9 Excavation Safety**

Prior to excavating, the location of underground utilities, such as sewer, telephone, gas, water and electric lines must be identified and plainly marked. Necessary arrangements must be made with the utility company or owner for the protection, removal or relocation of the underground utilities. In such circumstances, excavation will be done in a manner that does not endanger the field personnel engaged in the work or the underground utility. Utilities left in place will be protected by barricading, shoring, suspension or other measures, as necessary.

The use of unsafe or defective equipment is not permitted. Equipment must be inspected regularly. If found to be defective, equipment must be immediately removed from use and either repaired or replaced prior to resuming work with that equipment. Field personnel will be familiar with the location of first-aid kits and fire extinguishers. Telephone numbers for emergency assistance must be prominently posted and kept current.

The area of the site to undergo intrusive activity must be walked over with the heavy equipment operators to identify all work locations, as well as verifying all marked utilities are seen by those doing the intrusive work.

While the material being excavated is generally not expected to exhibit noticeable signs of impact in the field, if the material being excavated or graded exhibits any of the following characteristics, then TPA personnel shall stop excavation/grading activities within the immediate area and contact the TPA Environmental Department, so that the proper management procedures can be established:

- Visible staining;
- Visible free product; or
- Unusual odors emanating from the excavation are detected in vicinity of the excavation.

The TPA Environmental Department will determine the appropriate course of action, with regard to the visibly impacted material. If additional air monitoring is warranted, the air monitoring procedures are described below in Section 7.

#### **4.2.10 Use of Hand Tools and Portable Power Tools**

Hand tools will be kept in good repair and used only for their designed purposes. Proper protective eyewear will be worn when using hand tools and portable power tools. Unguarded sharp-edged or pointed tools will not be carried in field personnel's pockets. The use of tools with mushroomed heads, split or defective handles, worn parts, or other defects will not be permitted. Inspect all tools prior to start-up or use to identify any defects. Tools that have become unsafe will be

reconditioned before reissue or they will be discarded and replaced. Throwing or dropping of tools from one level to another will not be permitted; rather, containers and hand lines will be used for transporting tools from one level to another if working at heights.

Non-sparking tools will be used in atmospheres where sources of ignition may cause fire or explosion. Electric-powered shop and hand tools will be of the double-insulated, shockproof type, or they will be effectively grounded. Power tools will be operated only by designated personnel who are familiar and trained with their use. When not in use, tools will not be left on scaffolds, ladders or overhead working surfaces.

#### **4.2.11 Noise**

Exposure to high levels of noise may occur when working near heavy equipment. Also, depending upon where the work is being performed, local equipment (e.g., airports, factory machines, etc.) may produce high levels of noise. A good indication of the need for hearing protection is when verbal communication is difficult at a distance of 2-3 feet. Personnel will be provided with ear plugs and/or earmuffs when exposed to noise levels in excess of the 8-hour Permissible Exposure Limit (PEL) of 90 decibels.

#### **4.2.12 Railroad-Specific Hazards**

Working in close proximity to railroad facilities is inherently hazardous. In addition to the guidelines set forth herein, TPA personnel working in or near rail lines will follow all Federal Railroad Administration Rules.

The following safety rules will apply when working near railway tracks:

- Personnel shall be alert to train movement and shall expect the movement of trains, engines, cars, or other movable equipment at any time, on any track, and in any direction, even cars that appear to be stationary or in storage. Stay at least 50 feet away from the ends of stationary cars when crossing the track, and never climb on, under or between cars. To cross tracks, personnel shall look both ways, and if the tracks are clear, walk at a right angle across the tracks.
- Personnel shall not rely on others to protect them from train movement. The responsibility is theirs for safety on the railway.
- Personnel shall not stand on the track in front of an approaching engine, car or other equipment.
- Personnel shall be aware of the location of structures or obstructions where clearances are close.

- Personnel should not stand or walk on railroad tracks, either between the rails or on the ends of ties unless absolutely necessary. Personnel shall stay clear of tracks whenever possible.
- No work activities or processes are allowed within 50 feet of the track centerline while trains are passing through the work site, unless specifically authorized. Personnel shall always, where possible, stand at least 20 feet back from the track(s), to prevent injury from flying debris or loose rigging. Also, personnel shall observe the train as it passes and be prepared to take evasive action in the event of an emergency.
- Personnel shall not remain in a vehicle that is within 50 feet of a passing train, and shall not drive near moving trains. Personnel shall move vehicles away from the tracks at least 50 feet unless specifically authorized, or park the vehicle away from the tracks and walk to a safe distance whenever trains pass.
- Personnel shall not stand on or between adjacent tracks in multiple track territory when a train is passing. Personnel shall be especially alert in yards and terminal areas as engines may be pushing cars, cars may be moving without any engine attached and engines/cars change tracks often.
- Personnel shall not walk, stand or sit on the rails. As the rail surface can be extremely slippery, personnel must step over the rails when crossing tracks. Personnel shall also be aware railway ties can also be slippery and that railway ballast can shift while walking on top of it.

#### **4.2.13 Work Zone Traffic Control**

Personnel will exercise caution when working near areas of vehicular traffic. Work zones will be identified by the use of delineators (traffic cones, flags, vehicles, DOT approved devices, temporary or permanent fencing, and/or safety barrier tape). Personnel will wear high visibility vests, shirts, jackets, or equivalent when working in these areas. Depending on frequency, proximity, and nature of traffic, a flag person may also be utilized.

#### **4.2.14 Vehicle Use**

Personnel must use caution when driving to, from, and across the site, paying special attention to other site traffic, as well as weather and road conditions. Heavy equipment should be transported during non-rush hour traffic.

### **4.3 Biological Hazards**

Site environmental, maintenance and rail-related operations may expose workers working outside vehicle cabs to other hazards such as poisonous plants, insects, animals, and indigenous pathogens. Protective clothing and possibly respiratory protection, and being capable of identifying poisonous

plants, animals, and insects, can greatly reduce the chances of exposure. Thoroughly washing any exposed body parts, clothing, and equipment will also protect against infections. Avoiding contact with biological hazards is the best way to prevent potential adverse health effects. Recognition of potential hazards is essential. When avoidance is impractical or impossible, PPE, personal hygiene, good general health and awareness must be used to prevent adverse effects. If working in wooded/grassy areas, use appropriate insect repellants (containing DEET and/or Permethrin) and apply them per the manufacturers' directions. The following is a list of biological hazards that may possibly be encountered while performing site environmental, maintenance and rail-related job tasks:

BIOLOGICAL HAZARD and LOCATION	CONTROL MEASURES
<p><b>Snakes</b> typically are found in underbrush and tall grassy areas.</p>	<p>If a snake is encountered, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. <b>DO NOT</b> apply ice, cut the wound or apply a tourniquet. Carry the victim or have him/her walk slowly if the victim must be moved. Try to identify the snake: note color, size, patterns and markings.</p>
<p><b>Poison ivy, poison oak and poison sumac</b> typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas.</p>	<p>Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.</p>
<p>Exposure to <b>blood borne pathogens</b> may occur when rendering first aid or CPR, or when coming into contact with medical or other potentially infectious material or when coming into contact with landfill waste or waste streams containing such infectious material.</p>	<p>Training is required before a task involving potential exposure is performed. Exposure controls and personal protective equipment (PPE) area required. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.</p>
<p><b>Bees, spiders and other stinging insects</b> may be encountered almost anywhere and may present a serious hazard particularly to people who are allergic.</p>	<p>Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past and inform the TPA management and/or the buddy. If a stinger is present, remove it carefully with tweezers. Watch for allergic reaction; seek medical attention if a reaction develops.</p>

BIOLOGICAL HAZARD and LOCATION	CONTROL MEASURES
<p><b>Ticks</b> typically are in wooded areas, bushes, tall grass and brush. Ticks are black, black and red or brown and can be up to one-quarter inch in size.</p>	<p>Avoid tick areas. Wear tightly woven, light-colored clothing with pants tucked into boots or socks. Spray outside of clothing with insect repellent containing permethrin. Check yourself for ticks often. If bitten, carefully remove tick with tweezers. Report the bite to TPA management. Look for symptoms of Lyme disease that include a rash that looks like a bullseye and chills, fever, headache, fatigue, stiff neck or bone pain. If symptoms appear, seek medical attention.</p>

As long as community spread of the COVID-19 virus is deemed a concern by state and local public health officials, to protect against this spread, if site workers must work within close proximity of other workers, face mask coverings must be utilized while working within the TPA facility. Further, TPA workers shall regularly wash hands with soap or utilize hand sanitizer during the course of the work day.



## 5 PERSONAL PROTECTIVE EQUIPMENT

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Personal protective equipment (PPE) ensembles will be used to protect TPA workers from potential contamination hazards. Level D PPE is expected to be used for most activities that do not involve direct prolonged exposure to impacted soils. However, Modified Level D may be applicable if TPA workers are performing intrusive environmental or maintenance work within impacted soils for extended time periods. For purposes of this HASP, “intrusive maintenance work” is defined as work performed by TPA workers entering a trench or excavation that subsequently involves direct contact with impacted soils. Intrusive maintenance work does not include grading/excavation work performed by workers outside a trench or excavation/grading work inside enclosed vehicle/equipment cabs.

### 5.1 Level D Protection

When the atmosphere contains no known hazards and work functions preclude splashes, immersions or the potential for unexpected inhalation of or contact with hazardous levels of chemicals, Level D protection may be used. Level D PPE will be applicable for all job tasks performed by workers that are typically inside enclosed vehicle cabs and if the workers leave the cabs and remain in the operational area. The basic Level D does not provide respiratory protection and only provides minimal dermal protection. The Level D ensemble consists of the following:

- Work clothes that may consist of a short or long-sleeved cotton shirt and cotton pants, cotton overalls;
- Sturdy, high-ankle work boots, appropriate for the assigned tasks;
- Safety glasses with side shields;
- Hearing protection, as necessary;
- Hand protection, as appropriate;
- Hard hat will be required at all times for all personnel outside of vehicles cabs unless pre-authorized not to wear a hard hat due to operational difficulties; and
- Hi-visibility vests, shirts, jackets, or the equivalent will be required at all times for all personnel.

## 5.2 Modified Level D Protection

As mentioned above, construction activities involving intrusive environmental work as defined above may be performed by workers in upgraded Modified Level D PPE. If required, Modified Level D protection consists of the following:

- Disposable overalls such as polyethylene-coated Tyvek™;
- Latex, vinyl, or nitrile inner gloves;
- Nitrile outer gloves (taped to outer suit);
- Chemical-protective over-boots (taped to outer suit). However, if chemical-protective over-boots create increased slip/trip/fall hazards, then standard leather or rubber work boots could be used, but visible soils from the sides and bottoms of the boots must be removed immediately after working with impacted soils;
- Steel toe/steel shank, high-ankle work boots, appropriate for the assigned tasks;
- Hard hat;
- Safety glasses with side shields or goggles;
- Hearing protection, as necessary; and
- Dust mask.

## 5.3 Level C Protection

No activities requiring Level C protection will be performed by TPA personnel. If such an activity is contemplated, a full JSA and PPE review will be performed, and an appropriate PPE program will be implemented under a modified HASP.

## 5.4 First Aid, Emergency and Safety Equipment

The following first aid, emergency and safety equipment will be maintained in easily accessible areas throughout the TPA facility:

- A portable eye wash;
- Fire extinguishers as enforced by OSHA in 29 CFR 1926 Subpart F;
- Industrial first-aid kit (one 16-unit that complies with American National Standards Institute (ANSI) Z308A for every 25 persons or less);
- Blood borne pathogen precaution kit with CPR mouth shield;
- Instant cold packs;

- Soap or waterless hand cleaner and towels; and
- American Red Cross First Aid and CPR Instruction Manuals.

## **6 PERSONNEL TRAINING AND STANDARD SAFETY PROCEDURES**

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A safety orientation will be conducted for all TPA employees. The training will involve review of this HASP (and documenting completion of review) prior to initiation of work tasks for all employees and regular safety tailgate meetings during the course of regular operations. An Acknowledgement Form for documenting completion of the initial training activities is included in **Attachment A**.

In addition to the training requirements presented in this HASP, TPA employees involved in rail-related operations will be required to receive the applicable training specified in 49 CFR, which includes regular training on an annual to tri-annual basis.

### **6.1 Standard Safety Procedures**

This section describes the standard safety procedures that TPA requires all onsite personnel to follow during site activities.

#### **6.1.1 General Safety Work Practices**

All TPA employees will observe the following general safety work practices:

- Health and safety tailgate briefings will occur to introduce new activities, any new safety issues, and emergency egress routes for work areas; any significant change (added personnel, change in scope, or change in field conditions) will trigger a second (or more) tailgate meeting to address whatever change occurred;
- No food, drink, or tobacco products will be allowed near impacted soils;
- Loose clothing, hair, and/or jewelry will not be permitted around moving or rotating equipment;
- The “buddy system” will be implemented as necessary whereby a pair of co-workers watches out for each other while in proximity of potential physical work hazards; and
- Good housekeeping of all work areas will be maintained on an ongoing basis.

#### **6.1.2 Hand Safety**

This standard is intended to protect TPA employees from activities that may expose them to injury. This standard provides information on recognizing those conditions that require personal protective equipment (PPE) or specific work practices to reduce the risk of hand injury.

Appropriate gloves must be worn when persons work with materials or equipment that presents the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc.

Guidelines for Working With and Around Equipment (Hand Tools, Portable Powered Equipment):

- Employees should be trained in the use of all tools.
- Keep hand and power tools in good repair and use them only for the task for which they were designed.
- Inspect tools before use and remove damaged or defective tools from service.
- Operate tools in accordance with manufacturer's instructions.
- Do not remove or bypass a guarding device for any reason.
- Keep surfaces and handles clean and free of excess oil to prevent slipping.
- Wear proper PPE, including gloves, as necessary.
- Do not carry sharp tools in pockets.
- Clean tools and return to the toolbox or storage area upon completion of a job.
- Before applying pressure, ensure that wrenches have a good bite.
- Brace yourself by placing your body in the proper position so you will not fall if the tool slips.
- Make sure hands and fingers have sufficient clearance in the event the tool slips.
- Always pull on a wrench, never push.
- When working with tools overhead, place tools in a holding receptacle when not in use.
- Do not throw tools from place to place or from person to person, or drop tools from heights.
- Inspect all tools prior to start-up or use to identify any defects.
- Powered hand tools should not be capable of being locked in the ON position.
- Require that all power-fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.
- Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.



- Do not use cheater pipes.
- Make provisions to prevent machines from restarting through proper lockout/tag out.

#### Guidelines for Cutting Tools:

- Always use the specific tool for the task. Tubing cutters, snips, self-retracting knives, concealed blade cutters, and related tools are task-specific and minimize the risk of hand injury.
- Fixed open-blade knives are prohibited from use. Examples of fixed open-blade knives include pocket knives, multi-tools, hunting knives, and standard utility knives.

When utilizing cutting tools, personnel will observe the following precautions to the fullest extent possible:

- Use the correct tool and correct size tool for the job.
- Cut in a direction away from yourself and not toward other workers in the area.
- Maintain the noncutting hand and arm toward the body and out of the direction of the cutting tool if it were to slip out of the material being cut.
- Ensure that the tool is sharp and clean; dirty and dull tools typically cause poor cuts and more hazard than a sharp, clean cutting tool.
- Store these tools correctly with covers in place or blades retracted, as provided by the manufacturer.
- On tasks where cutting may be very frequent or last all day, consider Kevlar® gloves in the PPE evaluation for the project.
- Do not remove guards on paper cutters.

### **6.1.3 Respiratory Protection**

If an upgrade to Level C PPE is required, a full JSA and PPE review will be performed, and an appropriate PPE program will be implemented under a modified HASP. The action levels that would trigger upgraded respiratory protection are presented in Section 7 below.

### **6.1.4 Personal Hygiene Practices**

TPA employees must pay strict attention to sanitation and personal hygiene requirements to adequately control personal contamination. The following instructions will be discussed and must be followed:

- During work activities, never put anything in the mouth, including fingers;
- All employees must wash their hands, forearms, face, and neck before eating, drinking, smoking or using the restroom. A foot pump handwashing station containing soap/paper towels will be located on site and available to workers. Alternatively, wet wipes could be utilized for washing;
- Smoking is prohibited, except in designated areas; and
- At the end of the day, all employees should shower upon leaving work.

## **6.1.5 Other Standard Safety Procedures**

### *6.1.5.1 Fire Safety*

All flammable liquids will be used only for their intended purpose and stored and handled only in approved containers. Portable containers must be the approved red safety containers equipped with flame arresters and self-closing lids. All transfers of flammable liquids must be made with the containers grounded or bonded. Also, gasoline containers will be clearly labeled and storage areas (if applicable) will be posted with “No Smoking” signs. Fire extinguishers will be installed in all areas that contain flammable liquids.

### *6.1.5.2 Illumination*

All work is planned for daylight hours. No special requirements are anticipated. However, should any work take place outdoors after daylight hours, suitable lighting will be required.

### *6.1.5.3 Sanitation*

Adequate water and toilet facilities will be provided near the work areas in compliance with the OSHA 1926.51 standard. Any container used to distribute drinking water shall be clearly marked and not used for any other purpose. Single drinking cups will be supplied, both a sanitary container for the unused cups and a receptacle for disposal of the used cups will also be provided.

## 7 CONTINGENT EXPOSURE MONITORING PLAN

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### 7.1 Contingent Air Monitoring for Volatiles and Combustible Gases

If conditions in certain work area(s) warrant, the following surveillance/monitoring program will be employed to ensure the adequacy of the level of TPA worker protection. The site conditions that would warrant air monitoring are listed above in Section 4.2.9, and include:

- Visible soil staining;
- Visible free product in subsurface soil; or
- Unusual odors emanating from the excavation are detected in vicinity of the excavation.

If air monitoring is warranted, an Environmental Professional (EP) will monitor the work site for combustible gas concentrations and organic vapors. Calibration of all monitoring equipment will be performed in accordance with the manufacturers' procedures by trained personnel. The appropriate TPA supervisor(s) will be notified immediately of any contaminant levels that could trigger an upgrade in PPE or cause a suspension of work activities.

One or more of the following direct-reading instruments may be used to aid in this evaluation. Photoionization Detectors (PID) and Flame Ionization Detectors (FID) will measure non-specific organic gases and vapors. Combustible Gas Indicators (CGI) will detect explosive atmospheres. Oxygen (O<sub>2</sub>) meters will detect fluctuations in oxygen concentrations. These instruments should be calibrated or bump tested regularly and whenever the measurements may be erratic.

#### 7.1.1 Combustible Gas and Oxygen Deficiency / Excess Monitoring

Explosive gas concentrations are not expected to exceed 10% of the lower explosive limit (LEL). Should the need be indicated for air monitoring, action guidance for the CGI/O<sub>2</sub> meter responses is contained in **Table 7-1** below.

**Table 7-1**

<b>CGI/Oxygen Meter Action Levels</b>	
<b>Meter Response</b>	<b>Action</b>
CGI response 0%-10% LEL	Continue normal operations
CGI initial response >10% and <20% LEL	Eliminate all sources of ignition from the work area; temporarily retreat from work area for 15-30 minutes and then monitor area again
CGI response after 15-30 min. >10% and <20% LEL	Retreat from work area; notify TPA management
CGI response >20%	Discontinue operations; retreat from work area
Oxygen level <19.5%	Retreat from work area; notify TPA management
Oxygen level >23.5%	Retreat from work area; notify TPA management

## 7.1.2 Organic Vapor Concentrations

If warranted due to non-standard emergency conditions, real-time monitoring for organic vapor concentrations in the breathing zone will be conducted during field operations with a PID equipped with a 10.2 or 11.7-electron volt (eV) probe. Measurements will be made where ground intrusive work is being performed. The instrument will be calibrated using ultra-high purity air and isobutylene vapor of known concentration before each use. Air calibration measurements will be documented in writing and filed appropriately. Action guidance for PID responses is contained in **Table 7-2** below.

**Table 7-2**

<b>PID Action Levels for General Site Work</b>	
<b>Meter Response in Breathing Zone (sustained concen., for minimum of 3 minutes)</b>	<b>Action Required</b>
<5 ppm above background	Use Level D or Modified Level D PPE
>5 ppm above background	Cease work, notify supervisor and investigate source.
>50 ppm above background	Stop work

If air concentrations of organic vapors are greater than 5 ppm above background in the breathing zone continuously for a 3-minute period, personnel will stop work, retreat from the area, and allow time (at least 15 minutes) for vapors to dissipate. If subsequent monitoring indicates that concentrations still consistently exceed 5 ppm, workers will stop work and retreat from the area. TPA supervision will investigate the source and establish next steps.

These action levels are based on the assumption that the major volatile constituents of concern are benzene and naphthalene, which are the most common volatile constituents previously identified in the soils at the TPA facility.

## 7.2 Physical Conditions Monitoring

Site workers will be monitored by TPA management for signs of weather-related symptoms from exposure to excessive heat or cold.

Whenever the air temperature exceeds 70°F for personnel wearing chemical protective clothing or 90°F for personnel wearing regular work clothes, TPA management will assess conditions that may cause heat stress in site workers.

## 8 SITE CONTROL MEASURES

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To provide for the protection of public health and safety and minimize the possibility of transferring impacted soils from the site, contaminant control procedures are required. These procedures will consist of site control measures (i.e., delineation of work zones, communications, and site security) and decontamination procedures. Decontamination may be necessary for both personnel and equipment, if regular contact with visibly impacted soils and/or groundwater occurs during the course of site environmental work. Contaminants that may be uncovered during environmental soil re-grading operations must not be transferred outside the project area unless properly containerized, and must be removed from clothing, personnel, and equipment prior to relocation.

### 8.1 Environmental Site Control Measures

Site control can be achieved by delineating the appropriate work zones, providing appropriate communication, and establishing site security.

#### 8.1.1 Environmental Work Zone Delineation

To control the transfer of hazardous substances from the work sites and allow for proper protection of TPA environmental employees and subcontractors, work zones will be established. The work zones will include:

- Exclusion Zone (EZ);
- Contamination Reduction Zone (CRZ); and
- Support Zone (SZ).

A description of each of the above work zones is presented below.

#### **Exclusion Zone (EZ)**

Contamination does or could exist in this zone. Only properly authorized and trained individuals (refer to Section 6.0) wearing appropriate PPE will be allowed to enter and work in this zone. Workers and others entering the EZ must wear, at a minimum, Level D protection. An entry and exit point for personnel and equipment will be established at the periphery of the EZ (between the EZ and the CRZ) to adequately regulate the flow of personnel and equipment.

#### **Contamination Reduction Zone (CRZ)**

Between the EZ and the SZ will be the CRZ, which will provide a transition between the potentially contaminated EZ and unimpacted SZ. The CRZ (located upwind of the EZ, if possible) will be a corridor leading from the EZ and will serve as a buffer to further reduce the probability of the SZ

becoming contaminated. Exit from the EZ will only be allowed through this CRZ. The CRZ will provide additional assurance that the physical transfer of contaminating substances on people, equipment, and/or in the air will be limited through a combination of decontamination and zone restrictions. Within this zone, TPA environmental employees and subcontractors may perform personal decontamination (e.g., face and hand washing), and certain PPE and small equipment decontamination. Buckets or wash basins for boot washing and equipment decontamination will be stationed on a sheet of plastic, the boundaries of which will constitute the CRZ.

### **Support Zone (SZ)**

The Support Zone will be considered a non-contaminated area. The location of support facilities in the SZ will be upwind of the EZ (where possible) and readily accessible to the nearest road. The field office/support facilities, equipment vehicles, a first aid station and a visitors/personnel entry and exit log for the work site will be located in this zone. Potentially contaminated personal clothing, equipment and samples are not permitted in this zone unless properly containerized.

### **8.1.2 Environmental Decontamination Procedures**

Decontamination of environmental TPA employees, contractors, and equipment leaving the EZ will be performed to control human exposure to hazardous substances and to minimize the spread of contamination to surrounding areas. The primary purpose of the CRZ is to provide a set location for performing limited personnel decontamination and certain PPE and small equipment decontamination.

#### *8.1.2.1 Environmental Personnel Decontamination*

Persons leaving the EZ must pass through the CRZ and follow decontamination procedures before entering the SZ. Hand tools and other sampling equipment used in the EZ and reusable PPE (boots, safety glasses, etc.) will be appropriately cleaned prior to removal from the site each day. The step-by-step sequence for personnel decontamination is as follows:

- Remove boot covers (if applicable) at the boot washing station and place in the disposal container provided;
- Wash outer gloves and chemical resistant boots (if used) at the boot washing station;
- Remove wrist tape (if applicable) and outer gloves and place in appropriate container;
- Remove ankle tape (if applicable) and disposable coveralls (if applicable) and place in the appropriate container;
- Remove respirator (if applicable) and place in designated location in the CRZ;



- Remove inner gloves and discard to the appropriate container; and
- Wash hands and face before proceeding to the SZ.

Respirators (if worn) must be decontaminated after each use by the personnel who previously wore them. All TPA employees and subcontractors are required to take a thorough soap and water shower at the end of each workday. If monitoring or a general exposure assessment indicates that an employee has become contaminated, the employee or subcontractor will notify the TPA management as soon as the contaminated state has been discovered.

#### *8.1.2.2 Environmental Equipment Decontamination*

Equipment leaving the EZ must be decontaminated either within the CRZ or at the central decontamination area. Small equipment, such as hand tools, will be thoroughly decontaminated within the CRZ before being placed in the SZ. The field tools may be scrubbed visually clean using a detergent solution (Alconox/Liquinox) with water and a stiff, long-bristled scrub brush. Following the solution scrubbing, the tools may be rinsed with distilled water or isopropyl alcohol. Vehicles working in an EZ will be decontaminated prior to leaving the site. The vehicle will be cleaned by sweeping excess soil and debris off the wheels. A high-pressure sprayer will then be used to wash the wheels, if necessary.

Each piece of equipment will be inspected after cleaning for soil remaining on the tires or elsewhere. Vehicles will be cleaned to the satisfaction of the appropriate TPA supervisor prior to entering the SZ or leaving the site. TPA employees or subcontractors performing decontamination shall wear the appropriate level of PPE (refer to Section 5.0 above).

#### *8.1.2.3 Environmental Waste Management Procedures*

TPA management will be responsible for overseeing the containerization and disposal of any field derived wastes from environmental activities. Contaminated or suspected contaminated field derived wastes shall be disposed of in accordance with all local, state, and/or federal regulations. Field derived wastes include decontamination rinse waters and other related decontamination generated wastes.

Soils and groundwater expected to be encountered during sampling or intrusive work found not to be contaminated, based on existing data, may be discharged to the ground surface in the immediate vicinity of the monitoring well. However, any known or suspected to be contaminated soil (in small quantities) or groundwater will be containerized for future removal, likely in 55-gallon drums or other approved storage vessels. Depending on the suspected contaminants, the recovered groundwater may be sent through one of the onsite groundwater treatment units. However, the treatment unit must be designed to address the contaminants of concern in the

groundwater being treated. Otherwise, the liquid must be staged onsite for eventual offsite disposal at an approved facility.

Impacted soil, if in drums, will be staged in an area designated by TPA management for eventual disposal. For larger excavations, where excavated soil is stockpiled, it may be necessary to place soils on plastic and cover with plastic to control potential leachable runoff. The appropriate TPA supervisor(s) will provide the proper guidance necessary for handling bulk soil piles.

Any NAPL recovered via remediation systems or manual recovery efforts will be properly containerized and either disposed of offsite as a recyclable material, if possible, or as a hazardous waste. The receiving facility must be an approved facility.

## **8.2 Communications**

A loud and clear form of communication should be made available for TPA personnel to communicate with other appropriate personnel during work. Site communication may be in the form of hand signals, voice, or other communication devices. All forms of communication should be understood by all workers on the Site prior to starting work. Offsite communications may be conducted with mobile phones or walkie-talkies only if the atmosphere has been deemed non-explosive, or inside the cab of a stationary vehicle.

## **8.3 Site Security**

Access to the various work areas will be controlled with fencing or other physical barriers. No site visitors will be allowed to travel unescorted by TPA or their representative around the project area.

## 9 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

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The objective of emergency response and contingency procedures is to ensure that effective actions are implemented in a timely manner to minimize or control the effects of adverse events (e.g., potential chemical exposures, personal injuries, fires/explosions, and spills/releases). The following subsections describe the basic emergency responses required, should an emergency take place during the various environmental, maintenance or rail-related tasks performed by TPA personnel.

### 9.1 Emergency Phone Numbers

Emergency telephone numbers are listed in table below.

**Table 9-1  
Emergency Telephone Numbers and Agencies**

Agency	Telephone Number
Security (Sparrows Point facility)	(410) 388-7761
Ambulance	911
Fire	911
Occupational Health Clinic (Concentra Medical Center)	(410) 633-3600
Hospital (Johns Hopkins Bayview Hospital)	(410) 550-0100 (general) (410) 550-0350 (emergency)
National Response Center	(800) 424-8802
Poison Control Center – Maryland	(800) 222-1222
TPA Main Contacts	
Peter Haid, Vice President – Environmental	(443) 649-5055 phaid@tradepointatlantic.com
Matthew Newman, P.E., Environmental Engineer	(410) 709-1289 mnewman@tradepointatlantic.com

### 9.2 Injury/Illness Treatment

In the event of illness or injury to a TPA employee, the following steps will be taken:

- Evaluate the extent of injuries or seriousness of illness.
- When TPA staff require urgent medical attention, call for emergency assistance. First aid should be administered while awaiting an ambulance or paramedics. All emergency medical treatment, other than first aid, will be administered by the local paramedics.

**Table 9-1** above lists site emergency telephone numbers. Critical injuries must be immediately referred for professional medical attention.

- For a non-critical injury/illness, first aid will be administered by onsite personnel. Anyone sustaining a non-critical injury/illness who continues to work will be monitored by TPA management for signs of worsening condition, if it is deemed that the person can return to work. Injured personnel who later suffer a worsening change in status are to immediately notify TPA management.

### **9.3 Occupational Health Clinic and Hospital Information**

#### **9.3.1 Occupational Health Clinic**

The Concentra Medical Center, located at 1833 Portal Street, Baltimore, MD, is the closest occupational health clinic, just over 6 miles away. A map to the clinic is provided as **Figure 9-1** below. The clinic should be used for non-emergency injuries and illnesses.

Directions:

From Sparrow's Point Road, turn left onto Wharf Road;

Turn left onto MD-158 W/Bethlehem Blvd. (0.4 mile);

Turn right onto MD-157 N/Peninsula Expy. (2.7 miles);

Turn slight left onto Merritt Ave. (0.1 mile);

Merritt Ave. becomes Sollers Point Rd. (0.3 mile);

Turn left to stay on Sollers Point Rd (0.6 mile);

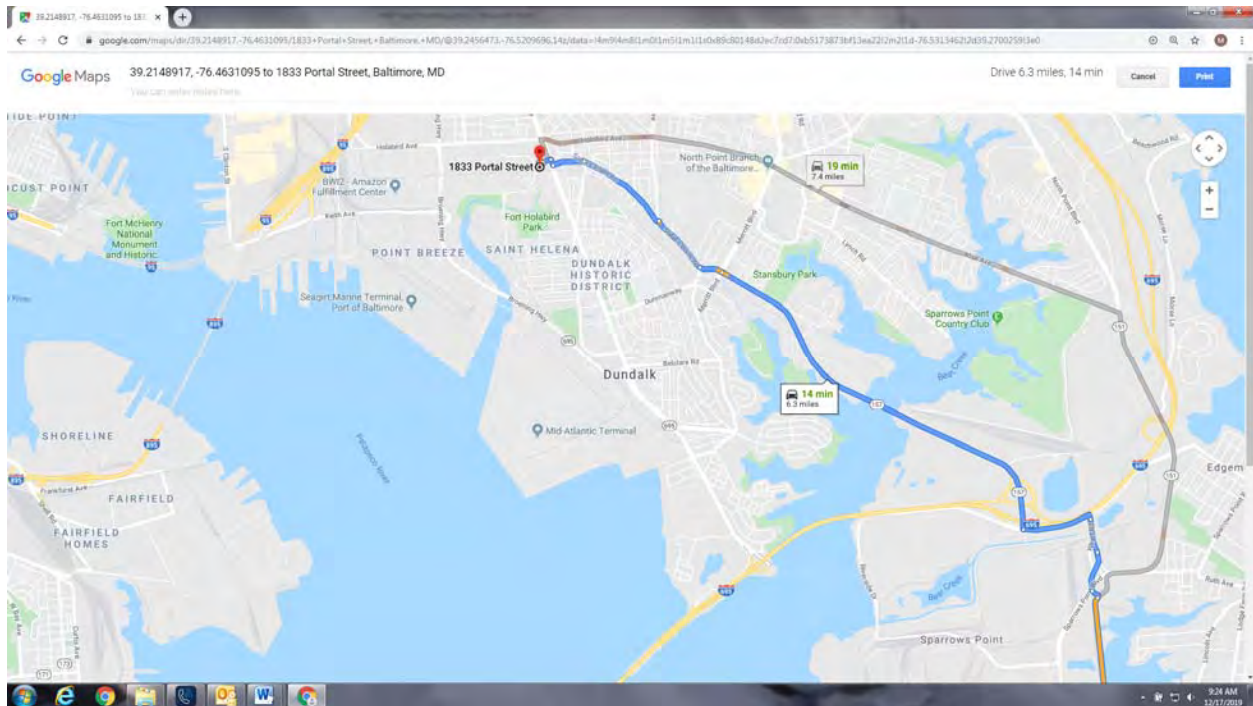
Turn left onto Williams Ave. (0.2 mile);

Turn right onto Dundalk Ave. (<0.1 miles);

Turn left onto Chandlery St. (0.1 mile);

Turn left onto Portal St.

**Figure 9-1: Health Clinic (Non-Emergency) Map**



### 9.3.2 Hospital

The Johns Hopkins Bayview Hospital is the closest emergency facility, just over 9 miles away. The hospital is located at 4940 Eastern Avenue in Baltimore, MD. **Figure 9-2** below is a map to this hospital.

#### Directions:

From the Sparrows Point Industrial Complex, go north on Route 151 for approximately one mile.

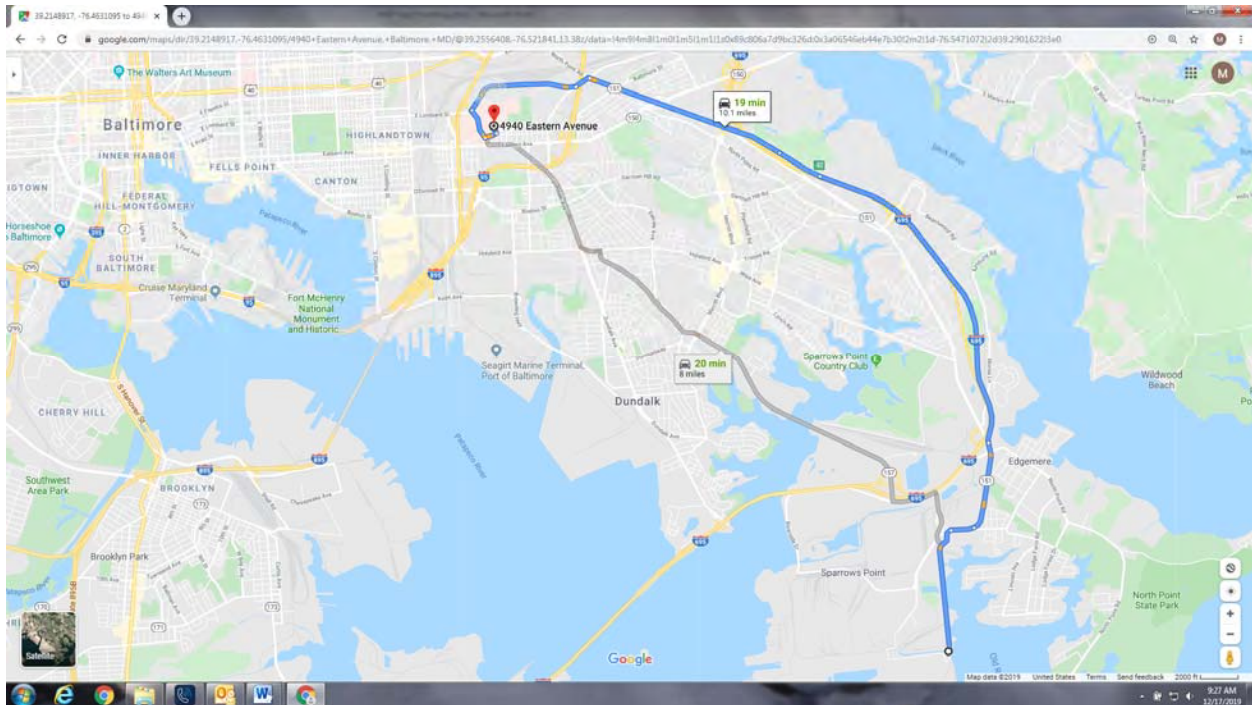
Take ramp (right) onto I-695 towards I-695/Essex.

At exit 40, take ramp (right) onto Route 151/North Point Boulevard North/MD 150;

Take ramp (right) onto Route 150 (Eastern Avenue).

Continue on Eastern Avenue to hospital on right.

Figure 9-2: Hospital Map



#### 9.4 Accident and Emergency Medical Response

All TPA employees will be aware of the location of first aid kits kept onsite. All vehicles used to transport injured persons to an offsite medical facility will be provided with directions and a map to the medical facility.

If treatment beyond first aid is required, emergency response personnel will be contacted for assistance and transport. Before beginning site activities, the TPA employee's supervisor will ensure that each site worker knows where the nearest emergency medical facilities are and how to get there. The closest hospital will be used in cases of life-threatening emergencies. The telephone numbers of the local emergency services will be available at the project site, and TPA's management will brief workers on the procedures for calling for help in an emergency.

TPA employees will inform TPA management of any medications, allergies, or other medical information that may be applicable for their medical treatment. The employee's supervisor will supply this information to emergency response personnel, and will accompany the victim to the hospital, if possible.

### 9.4.1 Chemical Exposure

In case of accidental overexposure to a hazardous material, guidelines shown in the table below will be followed.

**Table 9-2  
Chemical Exposure Guidelines**

Type of Overexposure	First Aid Guidelines
Skin Contact	Skin: Wash/rinse the affected area thoroughly with copious amounts of soap and water.
	Eyes: Eyes should be rinsed for at least 15 minutes following chemical contamination.
	Contact emergency response personnel if required, or transport victim to the hospital.
Inhalation	Move the victim to fresh air.
	Contact emergency response personnel if required, or transport victim to the hospital.
Ingestion	Contact Poison Control Center.
	Contact emergency response personnel, or transport victim to the hospital.

In the event of an incident with rail cars where potentially hazardous materials are released to the environment, TPA employees shall not be involved in the active cleanup of the hazardous materials. Rather, TPA employees should immediately notify the appropriate local authorities by calling 911. The local authorities with specific training and experience in hazardous materials emergency response and cleanup will handle the cleanup of the hazardous materials that may have been released to the environment.

### 9.4.2 Decontamination During a Medical Emergency

For minor medical problems or injuries, regular decontamination procedures will be followed. If emergency, life-saving first aid and/or medical treatment are required, regular decontamination procedures may need to be abbreviated or omitted:

- Do not attempt to wash or rinse an unresponsive victim unless the victim has been contaminated with an extremely toxic or corrosive chemical that may cause injury or loss of life to emergency response personnel;
- Outer garments can be removed if it does not cause a delay, interfere with treatment, or aggravate the problem;
- PPE can be cut away and respiratory protective equipment must always be removed; and



- If contaminated clothing cannot be safely removed, then the victim should be wrapped in a blanket or plastic sheeting to prevent contamination to the inside of the ambulance and/or emergency response personnel.

The TPA employee's supervisor will advise the medical staff as to the type of contamination possibly involved.

#### **9.4.3 Small or Incipient Fire**

A small fire is defined as a fire that can be extinguished with an available type ABC fire extinguisher. An incipient fire is a fire that is small because it has just started. In the event of a small or incipient fire, the following minimum actions will be taken:

- Evacuate nearby personnel from the area, if possible, to an upwind location or to an area not affected by smoke or hazardous decomposition products if an upwind location is not feasible;
- Attempt to extinguish fire using portable fire extinguisher or by smothering;
- Contact emergency response personnel, as needed, for any injuries or exposures to hazardous decomposition products, or if fire cannot be put out; and
- After the fire has been extinguished, or emergency response personnel have been contacted, notify the appropriate TPA management.

#### **9.4.4 Large Fire or Explosion**

An explosion, large fire or a small fire which cannot be extinguished is beyond the first line capabilities of TPA personnel. Professional emergency response personnel would be needed to provide emergency assistance for these types of incidents. In the event of a large fire, explosion or a small fire that cannot be extinguished, the following minimum actions will be taken:

- Evacuate all personnel from the site, if possible, to an upwind location, or to an area not affected by smoke or hazardous decomposition products if an upwind location is not feasible;
- Perform a quick roll call to account for all site personnel;
- Contact the fire department;
- Contact emergency response personnel, as needed, for any injuries or exposures to hazardous decomposition products; and

- After emergency response personnel have been contacted, notify the appropriate TPA management.

#### 9.4.5 Adverse Weather Conditions

In the event of adverse weather conditions, TPA's management will determine if work can continue without sacrificing the health and safety of TPA employees. Threatening weather conditions will be monitored by the TPA management via radio, television, internet, and/ or calls to the National Weather Service. Some of the conditions to be considered include:

- Potential for heat or cold stress,
- Limited visibility,
- Electrical storms, and
- Treacherous weather-related working conditions (i.e., heavy rainfall, icy conditions causing slippery footing hazards, etc.).

#### 9.4.6 First Aid for Heat Stress/Cold Stress

First aid treatment for heat **cramps** includes shade, rest and fluid replacement. If available, the individual should drink electrolyte replacement fluids (e.g., Gatorade, Sqwincher or 10-K). The individual should recover within half an hour.

First aid treatment for **heat exhaustion** includes cooling the victim, elevating the feet and fluid replacement. If the individual has not recovered within half an hour, then transport the victim to the hospital for medical attention.

**Heat stroke** is a medical emergency, requiring the immediate cooling of the victim and transport to the hospital for medical treatment immediately.

First aid treatment for **frost nip** and **frostbite** includes covering the affected area with warmth and retreating to a warm area. If the individual has not recovered within half an hour, then transport the victim to the hospital for medical attention immediately.

First aid treatment for **severe hypothermia** includes handling the victim very gently; rough handling may set off of an irregular heartbeat. **DO NOT** attempt to re-warm the severely hypothermic victim; re-warming may cause the development of an irregular heartbeat.

**Frozen tissue** is a medical emergency and the victim must receive medical attention immediately. Contact emergency response personnel immediately or transport the victim to the hospital.

First aid treatment of **mild hypothermia** includes using heat to raise the individual's body temperature. Heat may be applied to the victim in the form of heat packs, hot water bottles and blankets. If the individual has not recovered within half an hour, then transport the victim to the hospital for medical attention.

#### **9.4.7 Snake Bites**

If bitten, lower the extremity below the heart to reduce the poison's dissemination through the body. Remain calm, try to keep the heart rate reduced and seek medical attention immediately. Do not cut the wound or attempt to suck out the venom. Note any physical features (e.g., shape of head and color or pattern on body) of the snake.

#### **9.4.8 Animal Bites**

All bites should be treated as contaminated soft tissue injuries. Bites should be washed immediately with large amounts of soap and water. If soap is not available, flush the wound with water. The severity and onset of any infection is dependent upon the number of organisms (viruses or bacteria) introduced into the wound. Washing saliva out of the wound immediately will reduce the number of bacteria or viruses that can enter the tissue. Medical attention must be sought if rabies is suspected or the individual has not had a recent tetanus booster.

#### **9.4.9 Insect Bites and Stings**

Emergency care for insect bites and stings depends on the individual's reaction. To treat a sting that results in a minor reaction, remove the stinger by gently scraping it off the skin. Do not try to grasp the sac or stinger, because this forces the remaining venom into the skin. Once the stinger has been removed, clean the wound and surrounding area. Apply cold packs to slow the absorption of the venom and reduce pain and swelling. The treatment for a severe reaction to insect stings includes the following:

- Confirm with the victim whether they are highly allergic to the insect that stung them,
- If victim has gone into anaphylactic shock, retrieve their epi pen or other auto-injector and administer per the directions as hastily as possible,
- Assuming the victim remains conscious, ask them to refrain from moving around, and to lie down,
- Immobilize the injured area immediately,
- If an extremity is involved, remove any rings or watch,
- Keep the affected part low, below the level of the heart,

- Apply cold compresses to the affected area,
- If possible, try to identify the type of insect that inflicted the sting,
- Transport the victim to a medical facility immediately, continuing supportive measures en route, and
- All TPA workers must report severe reactions to insect stings prior to the beginning of work to TPA management.

#### 9.4.10 Poisonous Plants

**Decontamination:** Wash the skin immediately after contact with the plant. Proper washing may not be practical, but a product such as Technu or a small wash-up kit with prepackaged, alcohol-based cleansing tissues can be effective. Employees and subcontractors should not forget to wash contaminated clothing and clean up contaminated equipment prior to re-use.

**Treatment:** Options are as follows:

- Home treatment: Calamine lotion and an oatmeal bath (one cup to a tub full of water) can help relieve itching. To prevent secondary skin infection, scratching is not helpful and the fingernails should be cut to avoid damage to the skin. Over-the-counter hydrocortisone cream can decrease inflammation and itching; however, the label should be read and the cream used according to directions.
- When to see the doctor: Severe cases may require further treatment. A physician should be seen if the rash appears infected, is on the face or other sensitive body areas, or is too extensive to be easily treated at home.

#### 9.4.11 Ticks

To remove an attached tick:

- Use fine-tipped tweezers or a “tick tool” to grasp the tick at the surface of the skin,
- If tweezers are not available, use a tissue to protect the fingers (exposure to the tick's body fluid may lead to transmission of disease),
- With a steady motion, pull the tick straight out,
- Disinfect the bite site and the tweezers. Wash your hands thoroughly with soap and water. Save the tick if you can by placing it in a Ziploc bag; this may help with diagnosis in the future, and

- If flu-like symptoms such as fatigue, headache, neck-stiffness or jaw discomfort begin following a tick bite, seek medical attention.

**ATTACHMENT A**  
**ACKNOWLEDGEMENT AGREEMENT**

**HEALTH AND SAFETY PLAN  
Tradepoint Atlantic  
Sparrows Point, MD**

**ACKNOWLEDGEMENT FORM**

I \_\_\_\_\_, have received and/or reviewed Health & Safety Plan for the above referenced operation.

I understand TPA reserves the right to change or amend this HASP at any time.

I understand any violation to the Plan policies or procedures will be cause for disciplinary action up to and including termination.

\_\_\_\_\_  
TPA Employee Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
TPA Management Signature

\_\_\_\_\_  
Date



**ATTACHMENT B**  
**SAFETY DATA SHEETS (SDS)**



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# 1,1-Dichloroethane

**Synonyms & Trade Names** Asymmetrical dichloroethane; Ethylidene chloride; 1,1-Ethylidene dichloride

**CAS No.** 75-34-3

**RTECS No.**  
**KI0175000**  
([/niosh-rtecs/KI2AB98.html](http://www.niosh-rtecs/KI2AB98.html))

**DOT ID & Guide** 2362 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

**Formula** CHCl<sub>2</sub>CH<sub>3</sub>

**Conversion** 1 ppm  
= 4.05 mg/m<sup>3</sup>

**IDLH** 3000 ppm  
See: [75343 \(/niosh/idlh/75343.html\)](http://www.niosh.gov/IDLH/75343.html)

### Exposure Limits

**NIOSH REL** : TWA 100 ppm (400 mg/m<sup>3</sup>) [See Appendix C \(nengapdx.html\)](#) (Chloroethanes)

**OSHA PEL** : TWA 100 ppm (400 mg/m<sup>3</sup>)

### Measurement Methods

**NIOSH 1003** ([/niosh/docs/2003-154/pdfs/1003.pdf](http://www.niosh.gov/docs/2003-154/pdfs/1003.pdf));  
**OSHA 7**

(<http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html>)

(<http://www.cdc.gov/Other/disclaimer.html>)

See: [NMAM \(/niosh/docs/2003-154/\)](http://www.niosh.gov/docs/2003-154/) or [OSHA Methods](http://www.osha.gov/dts/sltc/methods/index.html)

(<http://www.osha.gov/dts/sltc/methods/index.html>)   
'[disclaimer.html](http://www.cdc.gov/Other/disclaimer.html)'

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### Phys

**MW:**  
99.0

**BP:**  
135°F

**FRZ:**  
-143°F

**Sol:**  
0.6%

**VP:** 182 mmHg

**IP:** 11.06 eV

**Sp.Gr:**  
1.18

**Fl.P:**  
2°F

**UEL:**  
11.4%

**LEL:**  
5.4%

**Class IB Flammable Liquid:** Fl.P. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities** Strong oxidizers, strong caustics

**Exposure Routes** inhalation, ingestion, skin and/or eye contact

**Symptoms** irritation skin; central nervous system depression; liver, kidney, lung damage

**Target Organs** Skin, liver, kidneys, lungs, central nervous system

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

**Skin:** Prevent skin contact

**Eyes:** Prevent eye contact

**Wash skin:** When contaminated

**Remove:** When wet (flammable)

**Change:** No recommendation

**First Aid** (See [procedures \(firstaid.html\)](#))

**Eye:** Irrigate immediately

**Skin:** Soap flush promptly

**Breathing:** Respiratory support

**Swallow:** Medical attention immediately

**Respirator Recommendations****NIOSH/OSHA**

Up to 1000 ppm:  
(APF = 10) Any supplied-air respirator

Up to 2500 ppm:  
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

Up to 3000 ppm:  
(APF = 50) Any self-contained breathing apparatus with a full facepiece  
(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:  
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode  
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:  
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister  
Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0249 \(/niosh/ipcsneng/nengo249.html\)](#)

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# p-Dichlorobenzene

**Synonyms & Trade Names** p-DCB; 1,4-Dichlorobenzene; para-Dichlorobenzene; Dichlorocide

<b>CAS No.</b> 106-46-7	<b>RTECS No.</b> <a href="/niosh-rtecs/CZ456D70.html">CZ4550000 (/niosh-rtecs/CZ456D70.html)</a>	<b>DOT ID &amp; Guide</b>
<b>Formula</b> C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>	<b>Conversion</b> 1 ppm = 6.01 mg/m <sup>3</sup>	<b>IDLH</b> Ca [150 ppm] See: <a href="/niosh/idlh/106467.html">106467 (/niosh/idlh/106467.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : Ca <a href="#">See Appendix A (nengapdx.html)</a> <b>OSHA PEL</b> † ( <a href="#">nengandx.html</a> ) : TWA 75 ppm <small>Endpoint Security by Bitdefender</small> <small>This page is safe</small>		<b>Measurement Methods</b> <b>NIOSH 1003</b>  ( <a href="/niosh/docs/2003-154/pdfs/1003.pdf">/niosh/docs/2003-154/pdfs/1003.pdf</a> ); <b>OSHA 7</b> <a href="http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html">http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html</a> <a href="#">er/disclaimer.html</a> <a href="#">2003-154/</a> ) or <b>OSHA Methods</b> <a href="#">http://www.osha.gov/dts/sltc/methods/index.html</a>  <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a>

**Physical Description** Colorless or white crystalline solid with a mothball-like odor. [insecticide]

<b>MW:</b> 147.0	<b>BP:</b> 345°F	<b>MLT:</b> 128°F	<b>Sol:</b> 0.008%	<b>VP:</b> 1.3 mmHg	<b>IP:</b> 8.98 eV
<b>Sp.Gr:</b> 1.25	<b>Fl.P:</b> 150°F	<b>UEL:</b> ?	<b>LEL:</b> 2.5%		

Combustible Solid, but may take some effort to ignite.

**Incompatibilities & Reactivities** Strong oxidizers (such as chlorine or permanganate)

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; in animals: liver, kidney injury; [potential occupational carcinogen]

**Target Organs** Liver, respiratory system, eyes, kidneys, skin

**Cancer Site** [in animals: liver & kidney cancer]

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact  
 Eyes: Prevent eye contact  
 Wash skin: When contaminated/Daily  
 Remove: When wet or contaminated  
 Change: Daily  
 Provide: Eyewash, Quick drench

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately  
 Skin: Soap wash  
 Breathing: Respiratory support  
 Swallow: Medical attention immediately

**Respirator Recommendations****NIOSH**

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0037](#)

([/niosh/ipcsneng/neng0037.html](#)) See MEDICAL TESTS: [0073 \(/niosh/docs/2005-110/nmed0073.html\)](#)

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## Chlorodiphenyl (42% chlorine)

**Synonyms & Trade Names** Aroclor® 1242, PCB, Polychlorinated biphenyl**CAS No.** 53469-21-9**RTECS No.**  
TQ1356000 (</niosh-rtecs/TQ14BoEo.html>)**DOT ID & Guide** 2315 171  
(<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=171>)   
(<http://www.cdc.gov/Other/disclaimer.html>)**Formula** C<sub>6</sub>H<sub>4</sub>ClC<sub>6</sub>H<sub>3</sub>Cl<sub>2</sub>  
(approx)**Conversion****IDLH** Ca [5 mg/m<sup>3</sup>]  
See: [53469219 \(/niosh/idlh/53469219.html\)](/niosh/idlh/53469219.html)**Exposure Limits****NIOSH REL** \*: Ca TWA 0.001 mg/m<sup>3</sup> See [Appendix A \(nengapdx.html\)](#) [\*Note: The REL also applies to other PCBs.]**OSHA PEL** : TWA 1 mg/m<sup>3</sup> [skin]

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**Measurement Methods****NIOSH 5503** (</niosh/docs/2003-154/pdfs/5503.pdf>);**OSHA PV2089**(<http://www.osha.gov/dts/sltc/methods/partial/t-t-pv2089-01-8812-ch.html>)   
</Other/disclaimer.html>)([http://www.osha.gov/dts/sltc/methods/partial/t-t-pv2089-01-8812-ch.html](/docs/2003-154/)) or **OSHA****Methods**(<http://www.osha.gov/dts/sltc/methods/index.html>) (<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.**MW:** 258  
(approx)**BP:** 617-  
691°F**FRZ:**  
-2°F**Sol:**  
Insoluble**VP:** 0.001 mmHg**IP:** ?**Sp.Gr(77°F):**  
1.39**Fl.P:** NA**UEL:**  
NA**LEL:** NA

Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans &amp; chlorinated dibenzo-p-dioxins.

**Incompatibilities & Reactivities** Strong oxidizers**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]

**Target Organs** Skin, eyes, liver, reproductive system

**Cancer Site** [in animals: tumors of the pituitary gland & liver, leukemia]

**Personal Protection/Sanitation** ([See protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

Provide: Eyewash, Quick drench

**First Aid** ([See procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

#### Respirator Recommendations

#### NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See **MEDICAL TESTS: 0175** ([/niosh/docs/2005-110/nmedo175.html](#))

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## Chlorodiphenyl (54% chlorine)

**Synonyms & Trade Names** Aroclor® 1254, PCB, Polychlorinated biphenyl**CAS No.** 11097-69-1**RTECS No.**[TQ1360000 \(/niosh-rtecs/TQ14Co80.html\)](/niosh-rtecs/TQ14Co80.html)**DOT ID & Guide** 2315 171<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=171>   
<http://www.cdc.gov/Other/disclaimer.html>**Formula** C<sub>6</sub>H<sub>3</sub>Cl<sub>2</sub>C<sub>6</sub>H<sub>2</sub>Cl<sub>3</sub>  
(approx)**Conversion****IDLH** Ca [5 mg/m<sup>3</sup>]See: [IDLH INDEX \(/idlh/intridl4.html\)](/idlh/intridl4.html)**Exposure Limits****NIOSH REL** \*: Ca TWA 0.001 mg/m<sup>3</sup> See [Appendix A \(nengapdx.html\)](#) [\*Note: The REL also applies to other PCBs.]**OSHA PEL** : TWA 0.5 mg/m<sup>3</sup> [skin]

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**Measurement Methods****NIOSH 5503** (</niosh/docs/2003-154/pdfs/5503.pdf>);**OSHA PV2088**<http://www.osha.gov/dts/sltc/methods/partial/t-pv2088-01-8812-ch/t-pv2088-01-8812-ch.html>   
<http://www.cdc.gov/Other/disclaimer.html>sh/docs/2003-154/) or **OSHA**<http://www.osha.gov/dts/sltc/methods/index.html> <http://www.cdc.gov/Other/disclaimer.html>**Physical Description** Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor.**MW:** 326  
(approx)**BP:** 689-  
734°F**FRZ:**  
50°F**Sol:**  
Insoluble**VP:** 0.00006 mmHg**IP:** ?**Sp.Gr(77°F):**  
1.38**Fl.P:** NA**UEL:**  
NA**LEL:** NA

Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins.

**Incompatibilities & Reactivities** Strong oxidizers**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]



Chlorodiphenyl

**Target Organs** Skin, eyes, liver, reproductive system

**Cancer Site** [in animals: tumors of the pituitary gland & liver, leukemia]

**Personal Protection/Sanitation** (See protection codes (protect.html))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

Provide: Eyewash, Quick drench

**First Aid** (See procedures (firstaid.html))

Eye: Irrigate immediately

Skin: Soap wash immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

#### Respirator Recommendations

#### NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0939](#)

[\(/niosh/ipcsneng/nengo939.html\)](#) See MEDICAL TESTS: [0176 \(/niosh/docs/2005-110/nmed0176.html\)](#)

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## Arsenic (inorganic compounds, as As)

**Synonyms & Trade Names** Arsenic metal: Arsenia

Other synonyms vary depending upon the specific As compound. [Note: OSHA considers "Inorganic Arsenic" to mean copper acetoarsenite and all inorganic compounds containing arsenic except ARSINE.]

<b>CAS No.</b> 7440-38-2 (metal)	<b>RTECS No.</b> <a href="#">CG0525000 (metal)</a> (/niosh-rtecs/CG802C8.html)	<b>DOT ID &amp; Guide</b> 1558 152 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) (metal) 1562 152 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=152</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) (dust)
<b>Formula</b> As (metal)	<b>Conversion</b>	<b>IDLH</b> Ca [5 mg/m <sup>3</sup> (as As)] See: <a href="#">7440382 (/niosh/idlh/7440382.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : Ca C 0.002 mg/m <sup>3</sup> [15-minute] See <a href="#">Appendix A (nengapdx.html)</a> <b>OSHA PEL</b> : [1910.1018] TWA 0.010 mg/m <sup>3</sup>  Endpoint Security by Bitdefender This page is safe		<b>Measurement Methods</b> <b>NIOSH 7300</b> ( <a href="#">/niosh/docs/2003-154/pdfs/7300.pdf</a> ), <b>7301</b> ( <a href="#">/niosh/docs/2003-154/pdfs/7301.pdf</a> ), <b>7303</b> ( <a href="#">/niosh/docs/2003-154/pdfs/7303.pdf</a> ), <b>7900</b> ( <a href="#">/niosh/docs/2003-154/pdfs/7900.pdf</a> ), <b>9102</b> ( <a href="#">/niosh/docs/2003-154/pdfs/9102.pdf</a> ); <a href="#">:/sltc/methods/inorganic/id105/id105.html</a> ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="#">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

**Physical Description** Metal: Silver-gray or tin-white, brittle, odorless solid.

<b>MW:</b> 74.9	<b>BP:</b> Sublimes	<b>MLT:</b> 1135°F (Sublimes)	<b>Sol:</b> Insoluble	<b>VP:</b> 0 mmHg (approx)	<b>IP:</b> NA
<b>Sp.Gr:</b> 5.73 (metal)	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame.

**Incompatibilities & Reactivities** Strong oxidizers, bromine azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]

**Exposure Routes** inhalation, skin absorption, skin and/or eye contact, ingestion

**Symptoms** Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]

**Target Organs** Liver, kidneys, skin, lungs, lymphatic system

**Cancer Site** [lung & lymphatic cancer]

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))  
**Skin:** Prevent skin contact  
**Eyes:** Prevent eye contact  
**Wash skin:** When contaminated/Daily  
**Remove:** When wet or contaminated  
**Change:** Daily  
**Provide:** Eyewash, Quick drench

**First Aid** (See [procedures \(firstaid.html\)](#))  
**Eye:** Irrigate immediately  
**Skin:** Soap wash immediately  
**Breathing:** Respiratory support  
**Swallow:** Medical attention immediately

**Respirator Recommendations**  
 (See [Appendix E \(nengapdx.html\)](#))

#### NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0013 \(/niosh/ipcsneng/neng0013.html\)](#)  
 See [MEDICAL TESTS: 0017 \(/niosh/docs/2005-110/nmed0017.html\)](#)

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## Barium chloride (as Ba)

## Synonyms &amp; Trade Names Barium dichloride

<b>CAS No.</b> 10361-37-2	<b>RTECS No.</b> CQ8750000 ( <a href="/niosh-rtecs/CQ8583Bo.html">/niosh-rtecs/CQ8583Bo.html</a> )	<b>DOT ID &amp; Guide</b> 1564 154 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) (barium compound, n.o.s.)
<b>Formula</b> BaCl <sub>2</sub>	<b>Conversion</b>	<b>IDLH</b> 50 mg/m <sup>3</sup> (as Ba) See: <a href="/idlh/intridl4.html">IDLH INDEX (/idlh/intridl4.html)</a>

## Exposure Limits

**NIOSH REL** \*: TWA 0.5 mg/m<sup>3</sup> [\*Note: The REL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]

**OSHA PEL** \*: TWA 0.5 mg/m<sup>3</sup> [\*Note: The PEL also applies to other soluble barium compounds (as Ba) except Barium sulfate.]

## Measurement Methods

**NIOSH 7056** (</niosh/docs/2003-154/pdfs/7056.pdf>), **7303** (</niosh/docs/2003-154/pdfs/7303.pdf>);

**OSHA ID121**

(<http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html>) (<http://www.cdc.gov/Other/disclaimer.html>)

See: **NMAM** (</niosh/docs/2003-154/>) or **OSHA Methods** (<http://www.osha.gov/dts/sltc/methods/index.html>) (<http://www.cdc.gov/Other/disclaimer.html>)

## Physical Description White, odorless solid.

<b>MW:</b> 208.2	<b>BP:</b> 2840°F	<b>MLT:</b> 1765°F	<b>Sol:</b> 38%	<b>VP:</b> Low	<b>IP:</b> ?
<b>Sp.Gr:</b> 3.86	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

## Noncombustible Solid

## Incompatibilities &amp; Reactivities Acids, oxidizers

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**Symptoms** irritation eyes, skin, respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia

## Target Organs Eyes, skin, respiratory system, heart, central nervous system

Personal Protection/Sanitation (See [protection codes \(protect.html\)](protect.html))

**Skin:** Prevent skin contact  
**Eyes:** Prevent eye contact

First Aid (See [procedures \(firstaid.html\)](firstaid.html))

**Eye:** Irrigate immediately  
**Skin:** Water flush immediately  
**Breathing:** Respiratory support

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

Breathing: Respiratory support

Swallow: Medical attention immediately

### Respirator Recommendations

#### NIOSH/OSHA

Up to 5 mg/m<sup>3</sup>:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 12.5 mg/m<sup>3</sup>:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 25 mg/m<sup>3</sup>:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m<sup>3</sup>:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0614 \(/niosh/ipcsneng/nengo614.html\)](#)

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## Benzene

Synonyms &amp; Trade Names Benzol, Phenyl hydride

CAS No. 71-43-2	RTECS No. CY1400000 ( <a href="http://www.niosh-rtecs/CY155CCo.html">/niosh-rtecs/CY155CCo.html</a> )	DOT ID & Guide 1114 130 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
Formula C <sub>6</sub> H <sub>6</sub>	Conversion 1 ppm = 3.19 mg/m <sup>3</sup>	IDLH Ca [500 ppm] See: 71432 ( <a href="http://www.niosh/idlh/71432.html">/niosh/idlh/71432.html</a> )
<b>Exposure Limits</b> NIOSH REL : Ca TWA 0.1 ppm ST 1 ppm See Appendix A ( <a href="http://www.niosh/nengapdx.html">nengapdx.html</a> ) OSHA PEL : [1910.1028] TWA 1 ppm ST 5 ppm See Appendix F ( <a href="http://www.niosh/nengapdx.html">nengapdx.html</a> )		<b>Measurement Methods</b> NIOSH 1500 ( <a href="http://www.niosh/docs/2003-154/pdfs/1500.pdf">/niosh/docs/2003-154/pdfs/1500.pdf</a> ), 1501 ( <a href="http://www.niosh/docs/2003-154/pdfs/1501.pdf">/niosh/docs/2003-154/pdfs/1501.pdf</a> ), 3700 ( <a href="http://www.niosh/docs/2003-154/pdfs/3700.pdf">/niosh/docs/2003-154/pdfs/3700.pdf</a> ), 3800 ( <a href="http://www.niosh/docs/2003-154/pdfs/3800.pdf">/niosh/docs/2003-154/pdfs/3800.pdf</a> ); OSHA 12 ( <a href="http://www.osha.gov/dts/sltc/methods/organic/org012/org012.html">http://www.osha.gov/dts/sltc/methods/organic/org012/org012.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ), 1005 ( <a href="http://www.osha.gov/dts/sltc/methods/validated/1005/1005.html">methods/validated/1005/1005.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">disclaimer.html</a> ) or: NIOSH 1005 ( <a href="http://www.niosh/docs/2003-154/">/niosh/docs/2003-154/</a> ) or OSHA Methods ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

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Physical Description Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42°F.]

MW: 78.1	BP: 176°F	FRZ: 42°F	Sol: 0.07%	VP: 75 mmHg	IP: 9.24 eV
Sp.Gr: 0.88	Fl.P: 12°F	UEL: 7.8%	LEL: 1.2%		

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

Incompatibilities &amp; Reactivities Strong oxidizers, many fluorides &amp; perchlorates, nitric acid

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]

Target Organs Eves. skin. respiratory system. blood. central nervous system. bone marrow

**Cancer Site** [leukemia]**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact  
 Eyes: Prevent eye contact  
 Wash skin: When contaminated  
 Remove: When wet (flammable)  
 Change: No recommendation  
 Provide: Eyewash, Quick drench

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately  
 Skin: Soap wash immediately  
 Breathing: Respiratory support  
 Swallow: Medical attention immediately

**Respirator Recommendations**(See [Appendix E \(nengapdx.html\)](#))**NIOSH**

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0015 \(/niosh/ipcsneng/nengo015.html\)](#) See MEDICAL TESTS: [0022 \(/niosh/docs/2005-110/nmed0022.html\)](#)

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# SAFETY DATA SHEET

## N-Butane

### Section 1. Identification

<b>GHS product identifier</b>	: N-Butane
<b>Chemical name</b>	: butane
<b>Other means of identification</b>	: n-BUTANE; Methylethylmethane; Diethyl; Butyl hydride; normal-Butane; butane, pure
<b>Product type</b>	: Gas.
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: n-BUTANE; Methylethylmethane; Diethyl; Butyl hydride; normal-Butane; butane, pure
<b>SDS #</b>	: 001007
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>24-hour telephone</b>	: 1-866-734-3438

### Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas

#### GHS label elements

##### Hazard pictograms



##### Signal word

: Danger

##### Hazard statements

: Extremely flammable gas.  
May form explosive mixtures with air.  
Contains gas under pressure; may explode if heated.  
May displace oxygen and cause rapid suffocation.

#### Precautionary statements

##### General

: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

##### Prevention

: Never Put cylinders into unventilated areas of passenger vehicles. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use and store only outdoors or in a well ventilated place.

##### Response

: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

##### Storage

: Protect from sunlight. Store in a well-ventilated place.

##### Disposal

: Not applicable.

##### Hazards not otherwise classified

: In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

## Section 3. Composition/information on ingredients

<b>Substance/mixture</b>	: Substance
<b>Chemical name</b>	: butane
<b>Other means of identification</b>	: n-BUTANE; Methylene methane; Diethyl; Butyl hydride; normal-Butane; butane, pure
<b>Product code</b>	: 001007

### CAS number/other identifiers

**CAS number** : 106-97-8

Ingredient name	%	CAS number
N-Butane	100	106-97-8

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

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

## Section 4. First aid measures

### Description of necessary first aid measures

<b>Eye contact</b>	: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.
<b>Inhalation</b>	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
<b>Skin contact</b>	: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
<b>Ingestion</b>	: As this product is a gas, refer to the inhalation section.

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

<b>Eye contact</b>	: No known significant effects or critical hazards.
<b>Inhalation</b>	: No known significant effects or critical hazards.
<b>Skin contact</b>	: No known significant effects or critical hazards.
<b>Frostbite</b>	: Try to warm up the frozen tissues and seek medical attention.
<b>Ingestion</b>	: As this product is a gas, refer to the inhalation section.

#### Over-exposure signs/symptoms

<b>Eye contact</b>	: No specific data.
<b>Inhalation</b>	: No specific data.
<b>Skin contact</b>	: No specific data.
<b>Ingestion</b>	: No specific data.

### Indication of immediate medical attention and special treatment needed, if necessary

<b>Notes to physician</b>	: Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
<b>Specific treatments</b>	: No specific treatment.

## Section 4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

- For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

- Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

### Methods and materials for containment and cleaning up

- Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
- Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

## Section 7. Handling and storage

### Precautions for safe handling

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Use only non-sparking tools. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.

**Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

Ingredient name	Exposure limits
N-Butane	<p><b>NIOSH REL (United States, 10/2016).</b>            TWA: 1900 mg/m<sup>3</sup> 10 hours.            TWA: 800 ppm 10 hours.</p> <p><b>OSHA PEL 1989 (United States, 3/1989).</b>            TWA: 1900 mg/m<sup>3</sup> 8 hours.            TWA: 800 ppm 8 hours.</p> <p><b>ACGIH TLV (United States, 3/2017).</b>            STEL: 1000 ppm 15 minutes.</p>

**Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

### Individual protection measures

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.



## Section 8. Exposure controls/personal protection

- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Gas. [Compressed gas.]
- Color** : Colorless.
- Odor** : Odorless.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -138°C (-216.4°F)
- Boiling point** : -0.5°C (31.1°F)
- Critical temperature** : 151.85°C (305.3°F)
- Flash point** : Closed cup: -60°C (-76°F)
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- Lower and upper explosive (flammable) limits** : Lower: 1.8%  
Upper: 8.4%
- Vapor pressure** : 16.3 (psig)
- Vapor density** : 2.1 (Air = 1)
- Specific Volume (ft<sup>3</sup>/lb)** : 6.435
- Gas Density (lb/ft<sup>3</sup>)** : 0.1554
- Relative density** : Not applicable.
- Solubility** : Not available.
- Solubility in water** : 0.06 g/l
- Partition coefficient: n-octanol/water** : 2.89
- Auto-ignition temperature** : 365°C (689°F)
- Decomposition temperature** : Not available.

## Section 9. Physical and chemical properties

<b>Viscosity</b>	: Not applicable.
<b>Flow time (ISO 2431)</b>	: Not available.
<b>Molecular weight</b>	: 58.14 g/mole
<b>Aerosol product</b>	
<b>Heat of combustion</b>	: -45384912 J/kg

## Section 10. Stability and reactivity

<b>Reactivity</b>	: No specific test data related to reactivity available for this product or its ingredients.
<b>Chemical stability</b>	: The product is stable.
<b>Possibility of hazardous reactions</b>	: Under normal conditions of storage and use, hazardous reactions will not occur.
<b>Conditions to avoid</b>	: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.
<b>Incompatible materials</b>	: Oxidizers
<b>Hazardous decomposition products</b>	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
<b>Hazardous polymerization</b>	: Under normal conditions of storage and use, hazardous polymerization will not occur.

## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
N-Butane	LC50 Inhalation Vapor	Rat	658000 mg/m <sup>3</sup>	4 hours

#### Irritation/Corrosion

Not available.

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

#### Reproductive toxicity

Not available.

#### Teratogenicity

Not available.

#### Specific target organ toxicity (single exposure)

Not available.

#### Specific target organ toxicity (repeated exposure)

Not available.

## Section 11. Toxicological information

### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

- Eye contact** : No known significant effects or critical hazards.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : No known significant effects or critical hazards.
- Ingestion** : As this product is a gas, refer to the inhalation section.

### Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : No specific data.
- Inhalation** : No specific data.
- Skin contact** : No specific data.
- Ingestion** : No specific data.

### Delayed and immediate effects and also chronic effects from short and long term exposure

#### Short term exposure

- Potential immediate effects** : Not available.
- Potential delayed effects** : Not available.

#### Long term exposure

- Potential immediate effects** : Not available.
- Potential delayed effects** : Not available.

### Potential chronic health effects

Not available.

- General** : No known significant effects or critical hazards.
- Carcinogenicity** : No known significant effects or critical hazards.
- Mutagenicity** : No known significant effects or critical hazards.
- Teratogenicity** : No known significant effects or critical hazards.
- Developmental effects** : No known significant effects or critical hazards.
- Fertility effects** : No known significant effects or critical hazards.

### Numerical measures of toxicity

#### Acute toxicity estimates

Not available.

## Section 12. Ecological information

### Toxicity

Not available.

### Persistence and degradability

Not available.

## Section 12. Ecological information

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
N-Butane	2.89	-	low

### Mobility in soil






Soil/water partition coefficient (K<sub>oc</sub>) : Not available.

Other adverse effects : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

## Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1011	UN1011	UN1011	UN1011	UN1011
UN proper shipping name	BUTANE	BUTANE	BUTANE	BUTANE	BUTANE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

### Additional information

**DOT Classification** : **Limited quantity** Yes.  
**Quantity limitation** Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.  
**Special provisions** 19, T50

**TDG Classification** : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).  
**Explosive Limit and Limited Quantity Index** 0.125  
**ERAP Index** 3000  
**Passenger Carrying Ship Index** Forbidden  
**Passenger Carrying Road or Rail Index** Forbidden  
**Special provisions** 29

**IATA** : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

## Section 14. Transport information

**Special precautions for user** : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL and the IBC Code** : Not available.

## Section 15. Regulatory information

**U.S. Federal regulations** : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined  
**Clean Air Act (CAA) 112 regulated flammable substances:** butane

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not listed

**Clean Air Act Section 602 Class I Substances** : Not listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

### SARA 302/304

#### Composition/information on ingredients

No products were found.

**SARA 304 RQ** : Not applicable.

### SARA 311/312

**Classification** : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

### State regulations

**Massachusetts** : This material is listed.

**New York** : This material is not listed.

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

### International regulations

#### Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

#### Montreal Protocol (Annexes A, B, C, E)

Not listed.

#### Stockholm Convention on Persistent Organic Pollutants

Not listed.

#### Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

#### UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

### Inventory list

**Australia** : This material is listed or exempted.

**Canada** : This material is listed or exempted.

## Section 15. Regulatory information

<b>China</b>	: This material is listed or exempted.
<b>Europe</b>	: This material is listed or exempted.
<b>Japan</b>	: <b>Japan inventory (ENCS)</b> : This material is listed or exempted. <b>Japan inventory (ISHL)</b> : This material is listed or exempted.
<b>Malaysia</b>	: This material is listed or exempted.
<b>New Zealand</b>	: This material is listed or exempted.
<b>Philippines</b>	: This material is listed or exempted.
<b>Republic of Korea</b>	: This material is listed or exempted.
<b>Taiwan</b>	: This material is listed or exempted.
<b>Thailand</b>	: Not determined.
<b>Turkey</b>	: This material is listed or exempted.
<b>United States</b>	: This material is listed or exempted.
<b>Viet Nam</b>	: Not determined.

## Section 16. Other information

### Hazardous Material Information System (U.S.A.)

Health	/	1
Flammability		4
Physical hazards		3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas	Expert judgment Expert judgment

### History

<b>Date of printing</b>	: 1/6/2020
<b>Date of issue/Date of revision</b>	: 1/6/2020
<b>Date of previous issue</b>	: 10/5/2018



## Section 16. Other information

**Version** : 2.01

**Key to abbreviations** : ATE = Acute Toxicity Estimate  
BCF = Bioconcentration Factor  
GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
IATA = International Air Transport Association  
IBC = Intermediate Bulk Container  
IMDG = International Maritime Dangerous Goods  
LogPow = logarithm of the octanol/water partition coefficient  
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)  
UN = United Nations

**References** : Not available.

### Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



## Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

## Cadmium dust (as Cd)

**Synonyms & Trade Names** Cadmium metal: Cadmium  
Other synonyms vary depending upon the specific cadmium compound.

<b>CAS No.</b> 7440-43-9 (metal)	<b>RTECS No.</b> EU9800000 (metal) ( <a href="http://www.niosh-rtecs/EU958940.html">/niosh-rtecs/EU958940.html</a> )	<b>DOT ID &amp; Guide</b> 2570 154 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=154</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) (cadmium compound)
<b>Formula</b> Cd (metal)	<b>Conversion</b>	<b>IDLH</b> Ca [9 mg/m <sup>3</sup> (as Cd)] See: <a href="http://www.niosh.gov/idlh/7440439.html">7440439 (/niosh/idlh/7440439.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> *: Ca <a href="#">See Appendix A (nengapdx.html)</a> [*Note: The REL applies to all Cadmium compounds (as Cd).] <b>OSHA PEL</b> *: [1010 1027] TWA 0.005 mg/ <b>Cadm</b> Endpoint Security by Bitdefender This page is safe		<b>Measurement Methods</b> NIOSH <a href="#">7048 (/niosh/docs/2003-154/pdfs/7048.pdf)</a> , <a href="#">7300 (/niosh/docs/2003-154/pdfs/7300.pdf)</a> , <a href="#">7301 (/niosh/docs/2003-154/pdfs/7301.pdf)</a> , <a href="#">7303 (/niosh/docs/2003-154/pdfs/7303.pdf)</a> , <a href="#">9102 (/niosh/docs/2003-154/pdfs/9102.pdf)</a>  <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> , <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html">ID121 (/niosh/docs/2003-154/pdfs/9102.pdf)</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> , <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html">ID125G (/niosh/docs/2003-154/pdfs/9102.pdf)</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> , <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id189/id189.html">ID189 (/niosh/docs/2003-154/pdfs/9102.pdf)</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> , <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html">ID206 (/niosh/docs/2003-154/pdfs/9102.pdf)</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> See: <a href="#">NMAM (/niosh/docs/2003-154/)</a> or <a href="#">OSHA Methods (/niosh/docs/2003-154/)</a> <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a>

**Physical Description** Metal: Silver-white, blue-tinged lustrous, odorless solid.

<b>MW:</b> 112.4	<b>BP:</b> 1409°F	<b>MLT:</b> 610°F	<b>Sol:</b> Insoluble	<b>VP:</b> 0 mmHg (approx)	<b>IP:</b> NA
<b>Sp.Gr:</b> 8.65 (metal)	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

**Metal:** Noncombustible Solid in bulk form, but will burn in powder form.

**Incompatibilities & Reactivities** Strong oxidizers; elemental sulfur, selenium & tellurium

**Exposure Routes** inhalation, ingestion

**Symptoms** pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]

**Target Organs** respiratory system, kidneys, prostate, blood

**Cancer Site** [prostatic & lung cancer]

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: No recommendation

Eyes: No recommendation

Wash skin: Daily

Remove: No recommendation

Change: Daily

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash

Breathing: Respiratory support

Swallow: Medical attention immediately

**Respirator Recommendations**

(See [Appendix E \(nengapdx.html\)](#))

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0020](#)

[\(/niosh/ipcsneng/neng0020.html\)](#) See MEDICAL TESTS: [0035 \(/niosh/docs/2005-110/nmed0035.html\)](#)

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## Search the Pocket Guide

Enter search terms separated by spaces.

## Chromium metal

## Synonyms &amp; Trade Names Chrome, Chromium

<b>CAS No.</b> 7440-47-3	<b>RTECS No.</b> <a href="/niosh-rtecs/GB401640.html">GB4200000 (/niosh-rtecs/GB401640.html)</a>	<b>DOT ID &amp; Guide</b>
<b>Formula</b> Cr	<b>Conversion</b>	<b>IDLH</b> 250 mg/m <sup>3</sup> (as Cr) See: <a href="/niosh/idlh/7440473.html">7440473 (/niosh/idlh/7440473.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : TWA 0.5 mg/m <sup>3</sup> See <a href="#">Appendix C (nengapdxc.html)</a> <b>OSHA PEL</b> *: TWA 1 mg/m <sup>3</sup> See <a href="#">Appendix C (nengapdxc.html)</a> [*Note: The PEL also applies to insoluble chromium salts.]		<b>Measurement Methods</b> <b>NIOSH</b> <a href="/niosh/docs/2003-154/pdfs/7024.pdf">7024 (/niosh/docs/2003-154/pdfs/7024.pdf)</a> , <a href="/niosh/docs/2003-154/pdfs/7300.pdf">7300 (/niosh/docs/2003-154/pdfs/7300.pdf)</a> , <a href="/niosh/docs/2003-154/pdfs/7301.pdf">7301 (/niosh/docs/2003-154/pdfs/7301.pdf)</a> , <a href="/niosh/docs/2003-154/pdfs/7303.pdf">7303 (/niosh/docs/2003-154/pdfs/7303.pdf)</a> , <a href="/niosh/docs/2003-154/pdfs/9102.pdf">9102 (/niosh/docs/2003-154/pdfs/9102.pdf)</a> ; <b>OSHA ID121</b> <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html">http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> , <b>ID125G</b> <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html">http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> See: <b>NMAM</b> ( <a href="/niosh/docs/2003-154/">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a>

## Physical Description Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.

<b>MW:</b> 52.0	<b>BP:</b> 4788°F	<b>MLT:</b> 3452°F	<b>Sol:</b> Insoluble	<b>VP:</b> 0 mmHg (approx)	<b>IP:</b> NA
<b>Sp.Gr:</b> 7.14	<b>Fl.P:</b>	<b>HRL:</b> NA	<b>LEL:</b> NA		
Noncombustible. Rapidly oxidizes if heated in a flame.					

## Incompatibilities &amp; Reactivities Strong oxidizers (such as hydrogen peroxide), alkalis

## Exposure Routes inhalation, ingestion, skin and/or eye contact

## Symptoms irritation eyes, skin; lung fibrosis (histologic)

## Target Organs Eyes, skin, respiratory system

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: No recommendation  
 Eyes: No recommendation  
 Wash skin: No recommendation  
 Remove: No recommendation  
 Change: No recommendation

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately  
 Skin: Soap wash  
 Breathing: Respiratory support  
 Swallow: Medical attention immediately

**Respirator Recommendations****NIOSH**

Up to 2.5 mg/m<sup>3</sup>:

(APF = 5) Any quarter-mask respirator.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

Up to 5 mg/m<sup>3</sup>:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

(APF = 10) Any supplied-air respirator\*

Up to 12.5 mg/m<sup>3</sup>:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode\*

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.\*

Up to 25 mg/m<sup>3</sup>:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 250 mg/m<sup>3</sup>:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

**Emergency or planned entry into unknown concentrations or IDLH conditions:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](/niosh/npg/pgintrod.html) See ICSC CARD: [0029 \(/niosh/ipcsneng/neng0029.html\)](/niosh/ipcsneng/neng0029.html)

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Content source: [National Institute for Occupational Safety and Health \(NIOSH\)](#) Education and Information Division

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Enter search terms separated by spaces.

# Chromium(III) compounds (as Cr)

**Synonyms & Trade Names** Synonyms vary depending upon the specific Chromium(III) compound. [Note: Chromium(III) compounds include soluble chromic salts.]

<b>CAS No.</b>	<b>RTECS No.</b>	<b>DOT ID &amp; Guide</b>
	<b>Conversion</b>	<b>IDLH</b> 25 mg/m <sup>3</sup> [as Cr(III)] See: <a href="/niosh/idlh/cr3m3.html">cr3m3 (/niosh/idlh/cr3m3.html)</a>

<p><b>Exposure Limits</b>  <b>NIOSH REL</b> : TWA 0.5 mg/m<sup>3</sup> See <a href="#">Appendix C (nengapdx.html)</a>  <b>OSHA PEL</b> : TWA 0.5 mg/m<sup>3</sup> See <a href="#">Appendix C (nengapdx.html)</a></p>	<p><b>Measurement Methods</b>                  NIOSH <a href="/niosh/docs/2003-154/pdfs/7024.pdf">7024</a>  (<a href="/niosh/docs/2003-154/pdfs/7024.pdf">/niosh/docs/2003-154/pdfs/7024.pdf</a>), <a href="/niosh/docs/2003-154/pdfs/7300.pdf">7300</a>  (<a href="/niosh/docs/2003-154/pdfs/7300.pdf">/niosh/docs/2003-154/pdfs/7300.pdf</a>), <a href="/niosh/docs/2003-154/pdfs/7301.pdf">7301</a>  (<a href="/niosh/docs/2003-154/pdfs/7301.pdf">/niosh/docs/2003-154/pdfs/7301.pdf</a>), <a href="/niosh/docs/2003-154/pdfs/7303.pdf">7303</a>  (<a href="/niosh/docs/2003-154/pdfs/7303.pdf">/niosh/docs/2003-154/pdfs/7303.pdf</a>), <a href="/niosh/docs/2003-154/pdfs/9102.pdf">9102</a>  (<a href="/niosh/docs/2003-154/pdfs/9102.pdf">/niosh/docs/2003-154/pdfs/9102.pdf</a>)                  ;                  OSHA <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html">ID121</a> (<a href="http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html">http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html</a>)   (<a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a>), <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html">ID125G</a> (<a href="http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html">http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html</a>)   (<a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a>)                  See: <a href="/niosh/docs/2003-154/">NMAM (/niosh/docs/2003-154/)</a> or <a href="http://www.osha.gov/dts/sltc/methods/index.html">OSHA Methods</a> (<a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a>)   <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a></p>
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**Physical Description** Appearance and odor vary depending upon the specific compound.

<p><b>Properties</b> vary depending upon the specific compound.</p>	<p>Endpoint Security by Bitdefender                  This page is safe</p>
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**Incompatibilities & Reactivities** Varies

**Exposure Routes** inhalation, ingestion, skin and/or eye contact

**Symptoms** irritation eyes; sensitization dermatitis

**Target Organs** Eyes, skin

**Personal**

**Protection/Sanitation** (See [protection codes](#) ([protect.html](#)))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: No recommendation

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Water flush promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

**Respirator Recommendations**

NIOSH/OSHA

Up to 2.5 mg/m<sup>3</sup>:

(APF = 5) Any quarter-mask respirator.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

Up to 5 mg/m<sup>3</sup>:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

(APF = 10) Any supplied-air respirator\*

Up to 12.5 mg/m<sup>3</sup>:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode\*

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.\*

Up to 25 mg/m<sup>3</sup>:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-

contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See [MEDICAL TESTS: 0052 \(/niosh/docs/2005-110/nmed0052.html\)](#)

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## Search the Pocket Guide

Enter search terms separated by spaces.

## Coal tar pitch volatiles

**Synonyms & Trade Names** Synonyms vary depending upon the specific compound (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene & benzo(a)pyrene). [Note: NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products.]

<b>CAS No.</b> 65996-93-2	<b>RTECS No.</b> <a href="#">GF8655000 (/niosh-rtecs/GF841098.html)</a>	<b>DOT ID &amp; Guide</b> 2713 153 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) (acridine)
	<b>Conversion</b>	<b>IDLH</b> Ca [80 mg/m <sup>3</sup> ] See: <a href="#">65996932 (/niosh/idlh/65996932.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : Ca TWA 0.1 mg/m <sup>3</sup> (cyclohexane-extractable fraction) <a href="#">See Appendix A (nengapdx.html)</a> <a href="#">See Appendix C (nengapdx.html)</a> <b>OSHA</b> (ben [1910.1002] <a href="#">See Appendix C (nengapdx.html)</a> )		<b>Measurement Methods</b> <b>OSHA 58</b> <a href="http://www.osha.gov/dts/sltc/methods/organic/org058/org058.html">http://www.osha.gov/dts/sltc/methods/organic/org058/org058.html</a> ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="#">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> <a href="#">ethods/index.html</a> ) <a href="#">imer.html</a> )

**Physical Description** Black or dark-brown amorphous residue.

Properties vary depending upon the specific compound.				

**Combustible Solids**

**Incompatibilities & Reactivities** Strong oxidizers

**Exposure Routes** inhalation, skin and/or eye contact

**Symptoms** dermatitis, bronchitis, [potential occupational carcinogen]

**Target Organs** respiratory system, skin, bladder, kidneys

**Cancer Site** [lung, kidney & skin cancer]

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: Daily

Remove: No recommendation

Change: Daily

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

#### Respirator Recommendations

#### NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [1415](#)

[\(/niosh/ipcsneng/neng1415.html\)](#) See MEDICAL TESTS: [0054 \(/niosh/docs/2005-110/nmed0054.html\)](#)

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# Safety Data Sheet

Coal, Bituminous

**CAROLINA**<sup>®</sup>  
www.carolina.com

## Section 1 Product Description

**Product Name:** Coal, Bituminous  
**Recommended Use:** Science education applications  
**Synonyms:** Washed Coal, Clean Coal, Soft Coal  
**Distributor:** Carolina Biological Supply Company  
2700 York Road, Burlington, NC 27215  
1-800-227-1150  
**Chemical Information:** 800-227-1150 (8am-5pm (ET) M-F)  
**Chemtrec:** 800-424-9300 (Transportation Spill Response 24 hours)

## Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200;

**WARNING**



Causes eye irritation. May cause damage to organs through prolonged or repeated exposure.

**GHS Classification:**

Serious Eye Damage/Eye Irritation Category 2B, Specific Target Organ Systemic Toxicity (STOT) - Repeated Exposure Category 2

## Section 3 Composition / Information on Ingredients

<u>Chemical Name</u>	<u>CAS #</u>	<u>%</u>
Coal, Bituminous	RR-14976-8	100

## Section 4 First Aid Measures

**Emergency and First Aid Procedures**

**Inhalation:** In case of accident by inhalation: remove casualty to fresh air and keep at rest.  
**Eyes:** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.  
**Skin Contact:** After contact with skin, wash immediately with plenty of water.  
**Ingestion:** If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

## Section 5 Firefighting Procedures

**Extinguishing Media:** Use dry chemical, CO2 or appropriate foam.  
**Fire Fighting Methods and Protection:** Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.  
**Fire and/or Explosion Hazards:** Avoid Dusting. May become explosive when dispersed in air.  
**Hazardous Combustion Products:** Carbon dioxide, Carbon monoxide

## Section 6 Spill or Leak Procedures



# Safety Data Sheet

## Steps to Take in Case Material Is Released or Spilled:

Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill. Avoid the generation of dusts during clean-up. Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation. Avoid creating dusts. Eliminate ignition sources. If a vacuum is used, ensure that the material is wetted or otherwise treated so an explosive dust atmosphere is not created within the vacuum.

## Section 7 Handling and Storage

**Handling:** Do not breathe dust/fume/gas/mist/vapors/spray. Wash thoroughly after handling. Keep away from sources of ignition - No smoking. Do not breathe dust.

**Storage:** Suitable for any general chemical storage.

**Storage Code:** Green - general chemical storage

## Section 8 Protection Information

Chemical Name	ACGIH		OSHA PEL	
	(TWA)	(STEL)	(TWA)	(STEL)
No data available	N/A	N/A	N/A	N/A

### Control Parameters

#### Engineering Measures:

No exposure limits exist for the constituents of this product. General room ventilation might be required to maintain operator comfort under normal conditions of use.

#### Personal Protective Equipment (PPE):

Lab coat, apron, eye wash, safety shower.

#### Respiratory Protection:

No respiratory protection required under normal conditions of use.

#### Eye Protection:

Wear chemical splash goggles when handling this product. Have an eye wash station available.

#### Skin Protection:

Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

#### Gloves:

No information available

## Section 9 Physical Data

**Formula:** N/A

**Molecular Weight:** N/A

**Appearance:** Lumps

**Odor:** Mild

**Odor Threshold:** No data available

**pH:** No data available

**Melting Point:** 399 C

**Boiling Point:** No data available

**Flash Point:** 260 C

**Flammable Limits in Air:** N/A

**Vapor Pressure:** N/A

**Evaporation Rate (BuAc=1):** N/A

**Vapor Density (Air=1):** N/A

**Specific Gravity:** 1.2

**Solubility in Water:** Practically Insoluble

**Log Pow (calculated):** No data available

**Autoignition Temperature:** No data available

**Decomposition Temperature:** No data available

**Viscosity:** No data available

**Percent Volatile by Volume:** N/A

## Section 10 Reactivity Data

#### Reactivity:

Not generally reactive under normal conditions.

#### Chemical Stability:

Stable under normal conditions.

#### Conditions to Avoid:

Sparks, open flame, other ignition sources, and elevated temperatures.

#### Incompatible Materials:

Strong oxidizing agents

#### Hazardous Polymerization:

Will not occur

## Section 11 Toxicity Data

**Routes of Entry** Inhalation.

# Safety Data Sheet

**Symptoms (Acute):** Respiratory disorders  
**Delayed Effects:** No data available

## Acute Toxicity:

Chemical Name	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
No data available	RR-14976-8	Not determined	Not determined	Not determined

## Carcinogenicity:

Chemical Name	CAS Number	IARC	NTP	OSHA
No data available	RR-14976-8	Not listed	Not listed	Not listed

## Chronic Effects:

**Mutagenicity:** No evidence of a mutagenic effect.  
**Teratogenicity:** No evidence of a teratogenic effect (birth defect).  
**Sensitization:** No evidence of a sensitization effect.  
**Reproductive:** No evidence of negative reproductive effects.  
**Target Organ Effects:**  
**Acute:** No information available  
**Chronic:** Certain components or species of this product are considered potential carcinogens.

## Section 12 Ecological Data

**Overview:** This material is not expected to be harmful to the ecology.  
**Mobility:** No data  
**Persistence:** No data  
**Bioaccumulation:** No data  
**Degradability:** No data  
**Other Adverse Effects:** No data

Chemical Name	CAS Number	Eco Toxicity
N/A	RR-14976-8	

## Section 13 Disposal Information

**Disposal Methods:** Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.  
**Waste Disposal Code(s):** Not Determined

## Section 14 Transport Information

**Ground - DOT Proper Shipping Name:** Not regulated for transport by DOT  
**Air - IATA Proper Shipping Name:** Not regulated for air transport by IATA.

## Section 15 Regulatory Information

**TSCA Status:** A component (or components) of this product is not listed on the TSCA Inventory of Existing Chemical Substances. Product is for research and development use only.

Chemical Name	CAS Number	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
No data available	RR-14976-8	No	No	No	No	No

**California Prop 65:** No California Proposition 65 ingredients

## Section 16 Additional Information

# Safety Data Sheet

Revised: 08/21/2018

Replaces: 06/15/2018

Printed: 08-25-2018

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

## Glossary

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
CAS	Chemical Abstract Service Number	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
DOT	U.S. Department of Transportation	ppm	Parts per million
IARC	International Agency for Research on Cancer	RCRA	Resource Conservation and Recovery Act
N/A	Not Available	SARA	Superfund Amendments and Reauthorization Act
		TLV	Threshold Limit Value
		TSCA	Toxic Substances Control Act
		IDLH	Immediately dangerous to life and health



## Search the Pocket Guide

Enter search terms separated by spaces.

## Copper (dusts and mists, as Cu)

## Synonyms &amp; Trade Names Copper metal dusts, Copper metal fumes

<b>CAS No.</b> 7440-50-8	<b>RTECS No.</b> <a href="/niosh-rtecs/GL5140C8.html">GL5325000 (/niosh-rtecs/GL5140C8.html)</a>	<b>DOT ID &amp; Guide</b>
<b>Formula</b> Cu	<b>Conversion</b>	<b>IDLH</b> 100 mg/m <sup>3</sup> (as Cu) See: <a href="/niosh/idlh/7440508.html">7440508 (/niosh/idlh/7440508.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> *: TWA 1 mg/m <sup>3</sup> [*Note: The REL also applies to other copper compounds (as Cu) except Copper fume.] <b>OSHA PEL</b> *: TWA 1 mg/m <sup>3</sup> [*Note: The PEL also applies to other copper compounds (as Cu) except copper fume.]		<b>Measurement Methods</b> <b>NIOSH 7029</b> ( <a href="/niosh/docs/2003-154/pdfs/7029.pdf">/niosh/docs/2003-154/pdfs/7029.pdf</a> ), <b>7300</b> ( <a href="/niosh/docs/2003-154/pdfs/7300.pdf">/niosh/docs/2003-154/pdfs/7300.pdf</a> ), <b>7301</b> ( <a href="/niosh/docs/2003-154/pdfs/7301.pdf">/niosh/docs/2003-154/pdfs/7301.pdf</a> ), <b>7303</b> ( <a href="/niosh/docs/2003-154/pdfs/7303.pdf">/niosh/docs/2003-154/pdfs/7303.pdf</a> ), <b>9102</b> ( <a href="/niosh/docs/2003-154/pdfs/9102.pdf">/niosh/docs/2003-154/pdfs/9102.pdf</a> ) ; <b>OSHA ID121</b> ( <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html">http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ), <b>ID125G</b> ( <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html">http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="/niosh/docs/2003-154/">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

## Physical Description Reddish, lustrous, malleable, odorless solid.

<b>MW:</b> 63.5	<b>BP:</b> 4703°F	<b>MLT:</b> 1981°F	<b>Sol:</b> Insoluble	<b>VP:</b> 0 mmHg (approx)	<b>IP:</b> NA
<b>Sp.Gr:</b> 8.94	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

Noncombustible Solid in bulk form, but powdered form may ignite.

<b>In cor</b>	Endpoint Security by Bitdefender This page is safe	ene
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Exposure Routes inhalation, inge and/or eye contact

Symptoms irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; in animals: lung, liver, kidney damage; anemia

Target Organs Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)

**Personal Protection/Sanitation** ([See protection codes \(protect.html\)](#))  
 Skin: Prevent skin contact  
 Eyes: Prevent eye contact  
 Wash skin: When contaminated  
 Remove: When wet or contaminated  
 Change: Daily

**First Aid** ([See procedures \(firstaid.html\)](#))  
 Eye: Irrigate immediately  
 Skin: Soap wash promptly  
 Breathing: Respiratory support  
 Swallow: Medical attention immediately

#### Respirator Recommendations

##### NIOSH/OSHA

Up to 5 mg/m<sup>3</sup>:

(APF = 5) Any quarter-mask respirator.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

Up to 10 mg/m<sup>3</sup>:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.\*

(APF = 10) Any supplied-air respirator\*

Up to 25 mg/m<sup>3</sup>:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode\*

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.\*

Up to 50 mg/m<sup>3</sup>:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 100 mg/m<sup>3</sup>:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0240](#)

[\(/niosh/ipcsneng/nengo240.html\)](#) See MEDICAL TESTS: [0057\(/niosh/docs/2005-110/nmedo057.html\)](#)

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Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA  
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - Contact CDC-INFO





## Safety Data Sheet

**Material Name: CREOSOTE - PETROLEUM PRESSURE TREATED WOOD**

**SDS ID: 00230493**

### Section 1 - PRODUCT AND COMPANY IDENTIFICATION

#### Material Name

CREOSOTE - PETROLEUM PRESSURE TREATED WOOD

#### Product Use

Used for industrial wood products, specifically Railroad ties.

#### Restrictions on Use

Creosote treated wood is intended for exterior/outdoor uses and only those applications approved by the American Wood Protection Association (AWPA) Use Category System as set forth in the most current edition of the AWPA Book of Standards. Refer to preservative label for more details.

#### Details of the supplier of the safety data sheet

KOPPERS INC.

436 Seventh Avenue

Pittsburgh, PA 15219-1800

Mfg Contact: 412-227-2001 (SDS Requests: 866-852-5239)

CHEMTREC: 800-424-9300 (Outside USA: +1 703-527-3887)

Emergencies: (Medical in USA): 877-737-9047

Emergencies: (Medical Outside of USA): 651-632-9269

E-mail: naorgmsds@koppers.com

### Section 2 - HAZARDS IDENTIFICATION

#### Classification in accordance with paragraph (d) of 29 CFR 1910.1200.

Combustible Dust

Acute Toxicity - Inhalation - Dust/Mist - Category 4

Skin Corrosion/Irritation - Category 2

Serious Eye Damage/Eye Irritation - Category 2A

Respiratory Sensitization - Category 1

Skin Sensitization - Category 1

Carcinogenicity - Category 1A

Specific target organ toxicity - Single exposure - Category 3 ( respiratory system )

#### GHS Label Elements

##### Symbol(s)



##### Signal Word

Danger

##### Hazard Statement(s)

May form combustible dust concentrations in air (during handling or processing).

Harmful if inhaled.

Causes skin irritation.

Causes serious eye irritation.

May cause allergy or asthma symptoms or breathing difficulties if inhaled.



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May cause an allergic skin reaction.  
May cause cancer.  
May cause respiratory irritation.

### Precautionary Statement(s)

#### Prevention

Avoid breathing dust.  
Wash thoroughly after handling.  
Wear respiratory protection.  
Contaminated work clothing should not be allowed out of the workplace.  
Use only outdoors or in a well-ventilated area.  
Wear protective gloves/clothing and eye/face protection.  
Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.

#### Response

IF exposed or concerned: Get medical advice/attention.  
IF INHALED: Remove person to fresh air and keep comfortable for breathing.  
Call a POISON CENTER or doctor/physician if you feel unwell.  
If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.  
IF ON SKIN: Wash with plenty of soap and water.  
If skin irritation or rash occurs: Get medical advice/attention.  
Take off contaminated clothing and wash before reuse.  
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.  
Continue rinsing.  
If eye irritation persists: Get medical advice/attention.

#### Storage

Store in a well-ventilated place.  
Store locked up.

#### Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

#### Statement(s) of Unknown Acute Toxicity

Inhalation 84% of the mixture consists of ingredient(s) of unknown acute toxicity.

#### Other Hazards

None known.

### Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

CAS	Component Name	Percent
Not Available	WOOD DUST, HARDWOODS	<85
8001-58-9	COAL TAR CREOSOTE	<13
64741-59-9	Petroleum distillates, light catalytic cracked	<3

#### Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Wood dusts hard wood, Wood dusts (birch, mahogany, teak, walnut), Wood dusts (all other wood dusts), Wood dust, western red cedar, Wood dust, all soft and hard woods, Particulates not otherwise classified (PNOC), Creosotes, Aromatic hydrocarbons, polycyclic (130489-29-2).



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### Section 4 - FIRST AID MEASURES

#### Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

#### Skin

Take off contaminated clothing. Wash with plenty of soap and water. Thoroughly clean and dry contaminated clothing and shoes before reuse. Skin contact causes photosensitization which can last for 36-72 hours after exposure. Keep out of direct sunlight for the next two to three days to avoid sunburn to the photosensitized skin areas. Use a broad spectrum blockout cream to protect against UV alpha ray exposure. Get medical attention, if needed.

#### Eyes

DO NOT rub eyes. Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Then get immediate medical attention.

#### Ingestion

If swallowed, get medical attention.

#### Most Important Symptoms/Effects

##### Acute

harmful if inhaled, respiratory tract irritation, skin irritation, eye irritation, allergic reactions

##### Delayed

allergic reactions, nasal cancer, skin cancer

#### Indication of any immediate medical attention and special treatment needed

For inhalation, consider oxygen.

### Section 5 - FIRE FIGHTING MEASURES

#### Extinguishing Media

##### Suitable Extinguishing Media

water stream, water spray or fog

##### Unsuitable Extinguishing Media

Do not scatter spilled material with high-pressure water streams.

#### Special Hazards Arising from the Chemical

Slight fire hazard. Avoid generating dust.

#### Hazardous Combustion Products

Oxides of carbon, oxides of nitrogen

#### Fire Fighting Measures

Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Keep unnecessary people away, isolate hazard area and deny entry.

#### Special Protective Equipment and Precautions for Firefighters

Wear full protective firefighting gear including self-contained breathing apparatus (SCBA) for protection against possible exposure.

### Section 6 - ACCIDENTAL RELEASE MEASURES

#### Personal Precautions, Protective Equipment and Emergency Procedures

Wear personal protective clothing and equipment, see Section 8. Avoid release to the environment. Collect spillage.

#### Methods and Materials for Containment and Cleaning Up



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Collect material in appropriate container for disposal. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect using a vacuum cleaner with a HEPA filter or wet and scoop up dry spills. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid sweeping spilled dry material. If sweeping of a contaminated area is necessary, use a dust suppressant agent. Eliminate all sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Due to the concentration of Creosote and the CERCLA (40 CFR 302.4) reportable quantity of 1 pound, the release of 6 pounds of this product requires National Response Center notification.

### Section 7 - HANDLING AND STORAGE

#### Precautions for Safe Handling

Avoid breathing dust. Wash thoroughly after handling. Wear respiratory protection. Contaminated work clothing should not be allowed out of the workplace. Do not eat, drink, or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/clothing and eye/face protection. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Avoid significant deposits of material, especially on horizontal surfaces, which may become airborne and form combustible dust clouds and may contribute to secondary explosions. Dry wood dust material is defined as having a water content less than 25% by weight. Avoid frequent or prolonged inhalation of sawdust from treated wood. When sawing and machining treated wood, wear a dust mask. When power-sawing and machining, wear goggles to protect eyes from flying particles. Whenever possible, these operations should be performed outdoors to avoid indoor accumulations of airborne sawdust from treated wood. Avoid frequent or prolonged skin contact with creosote-treated wood; when handling the treated wood, wear long-sleeved shirts and long pants and use gloves impervious to the chemicals (for example, gloves that are vinyl-coated). Use protective skin cream on exposed skin before and during work shift. To reduce sun sensitivity a sun-blocking lotion can also be applied prior to application of a protective cream. After working with the wood, and before eating, drinking and use of tobacco products, wash exposed areas thoroughly. If oily preservative or sawdust accumulate on clothes, launder before reuse. Wash work clothes separately from other household clothing.

#### Conditions for Safe Storage, Including any Incompatibilities

Store in a well-ventilated place.

Store locked up.

Store and handle in accordance with all current regulations and standards. Avoid heat, flames, sparks and other sources of ignition. Keep container tightly closed.

#### Incompatible Materials

oxidizing materials, acids

### Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

In *AFL-CIO v OSHA*, 965 F. 2d 962 (11th Cir. 1992), the Court overturned OSHA's 1989 Air Contaminants Rule, including the specific PEL's for wood dust that OSHA had established at that time. The 1989 vacated PEL's were: 5 mg/m<sup>3</sup> PEL-TWA and 10 mg/m<sup>3</sup> STEL (15 min), all softwood and hardwood except Western Red Cedar. Wood dust is now regulated by OSHA as "Particulates Not Otherwise Regulated" (PNOR), which is also referred to as "nuisance dust". However, some states have incorporated the 1989 OSHA PEL's in their state plans. Additionally, OSHA indicated that it may cite employers under the OSHA general duty clause in appropriate circumstances for noncompliance with the 1989 PEL's. Creosote is a complex mixture of variable composition, and while no odor threshold for creosote has been established, work done at the University of California has measured the odor thresholds for one of the more volatile components in creosote and determined that the involved odor threshold is in the part per billion range, and well below applicable exposure limits. On the basis of these data the perception of creosote odor in and of itself should not be taken as an indication of exposure in excess of accepted exposure limits. Exposure to wood dust would not be expected under normal use conditions. If handling or use patterns associated with creosote treated wood involve the use of a power saw, sander, drill or any tool or activity resulting in the generation of airborne particulate the wood dust exposure limits should be observed and appropriate steps taken to minimize exposure.



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### Component Exposure Limits

<b>WOOD DUST, HARDWOODS</b>	<b>Not Available</b>
ACGIH:	1 mg/m <sup>3</sup> TWA inhalable particulate matter (related to Wood dusts (all other wood dusts))
OSHA (US):	15 mg/m <sup>3</sup> TWA total dust ; 5 mg/m <sup>3</sup> TWA respirable fraction (related to Particulates not otherwise classified (PNOC))
	15 mppcf TWA respirable fraction ; 5 mg/m <sup>3</sup> TWA respirable fraction ; 50 mppcf TWA total dust ; 15 mg/m <sup>3</sup> TWA total dust (related to Particulates not otherwise classified (PNOC))
<b>COAL TAR CREOSOTE</b>	<b>8001-58-9</b>
ACGIH:	0.2 mg/m <sup>3</sup> TWA as benzene-soluble aerosol (related to Pitch, coal tar, high-temperature)
OSHA (US):	0.2 mg/m <sup>3</sup> TWA (benzene soluble fraction ) (related to Pitch, coal tar, high-temperature)
<b>Petroleum distillates, light catalytic cracked</b>	<b>64741-59-9</b>
ACGIH:	0.2 mg/m <sup>3</sup> TWA as benzene-soluble aerosol (related to Pitch, coal tar, high-temperature)
OSHA (US):	0.2 mg/m <sup>3</sup> TWA (benzene soluble fraction ) (related to Pitch, coal tar, high-temperature)

### ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)

#### COAL TAR CREOSOTE (8001-58-9)

2.5 µg/l Medium: urine Time: end of shift at end of workweek Parameter: 1-Hydroxypyrene with hydrolysis (background ) ; Medium: urine Time: end of shift at end of workweek Parameter: 3-Hydroxybenzo(a)pyrene with hydrolysis (nonquantitative ) (related to Polycyclic aromatic hydrocarbons)

#### Petroleum distillates, light catalytic cracked (64741-59-9)

2.5 µg/l Medium: urine Time: end of shift at end of workweek Parameter: 1-Hydroxypyrene with hydrolysis (background ) ; Medium: urine Time: end of shift at end of workweek Parameter: 3-Hydroxybenzo(a)pyrene with hydrolysis (nonquantitative ) (related to Polycyclic aromatic hydrocarbons)

### Engineering Controls

Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Ensure compliance with applicable exposure limits.

### Individual Protection Measures, such as Personal Protective Equipment

#### Eye/face protection

ANSI Z87.1-1989 approved safety glasses with side shields.

#### Skin Protection

Wear tightly woven long-sleeved shirts and long pants. Remove and launder contaminated clothing separately from other laundry before reuse.



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**Respiratory Protection**

Any air-purifying respirator with a high-efficiency particulate filter.

**Glove Recommendations**

Individuals must wear gloves impervious to the wood treatment formulations in all situations where dermal contact with creosote is expected.

**Protective Materials**

Examples of impervious materials for protective clothing (e.g. overalls, jackets, gloves and boots) required during application and handling of creosote are polyvinyl acetate (PVA), polyvinyl chloride (PVC), Neoprene and NBR (Buna-N). Protective clothing must be changed when it shows signs of contamination.

**Section 9 - PHYSICAL AND CHEMICAL PROPERTIES**

<b>Appearance</b>	dark brown to black solid	<b>Physical State</b>	solid
<b>Odor</b>	tar odor	<b>Color</b>	dark , brown to black
<b>Odor Threshold</b>	Not available	<b>pH</b>	Not applicable
<b>Melting Point</b>	Not applicable	<b>Boiling Point</b>	Not applicable
<b>Boiling Point Range</b>	Not available	<b>Freezing point</b>	Not applicable
<b>Evaporation Rate</b>	Not applicable	<b>Flammability (solid, gas)</b>	Not flammable
<b>Autoignition Temperature</b>	Not available	<b>Flash Point</b>	Not applicable
<b>Lower Explosive Limit</b>	Not available	<b>Decomposition temperature</b>	Not available
<b>Upper Explosive Limit</b>	Not available	<b>Vapor Pressure</b>	Not applicable
<b>Vapor Density (air=1)</b>	Not applicable	<b>Specific Gravity (water=1)</b>	Not available
<b>Water Solubility</b>	Not available	<b>Partition coefficient: n-octanol/water</b>	Not available
<b>Viscosity</b>	Not applicable	<b>Kinematic viscosity</b>	Not available
<b>Solubility (Other)</b>	Not available	<b>Density</b>	Not available
<b>Physical Form</b>	Pressure cross-ties – treated at a retention level of 6 lbs/ft <sup>3</sup> , with a wood density of 45-55 lbs/ft <sup>3</sup> , Actual	<b>Molecular Weight</b>	Not available





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	retention level dependent on wood stock, moisture levels, and customer specifications		
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### Other Information

No additional information is available.

### Section 10 - STABILITY AND REACTIVITY

#### Reactivity

No reactivity hazard is expected.

#### Chemical Stability

Stable at normal temperatures and pressure.

#### Possibility of Hazardous Reactions

Will not polymerize.

#### Conditions to Avoid

Avoid heat, flames, sparks and other sources of ignition. Avoid accumulation of airborne dusts. Avoid contact with incompatible materials.

#### Incompatible Materials

oxidizing materials, Acids

#### Hazardous decomposition products

oxides of carbon, oxides of nitrogen

### Section 11 - TOXICOLOGICAL INFORMATION

#### Information on Likely Routes of Exposure

##### Inhalation

irritation, allergic reactions, nasal cancer

##### Skin Contact

irritation, allergic reactions, skin cancer

##### Eye Contact

irritation

##### Ingestion

gastrointestinal irritation, bloating

#### Acute and Chronic Toxicity

##### Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

##### COAL TAR CREOSOTE (8001-58-9)

Oral LD50 Rat 2197 mg/kg

Dermal Rabbit >2000 mg/kg LD50

Inhalation Rat >5 mg/L 4 hr LC50

##### Petroleum distillates, light catalytic cracked (64741-59-9)

Oral LD50 Rat 6790 - 7180 mg/kg

Dermal LD50 Rabbit >2000 mg/kg (no deaths occurred )

Inhalation LC50 Rat 5.4 g/L 4 h

#### Product Toxicity Data

##### Acute Toxicity Estimate



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Dermal	>2000 mg/kg
Inhalation - Dust and Mist	4.67 mg/L
Oral	>2000 mg/kg

**Immediate Effects**

harmful if inhaled, respiratory tract irritation, skin irritation, eye irritation, allergic reactions

**Delayed Effects**

allergic reactions, nasal cancer, skin cancer

**Irritation/Corrosivity Data**

No data available.

**Respiratory Sensitization**

Component data indicate the substance is sensitizing.

**Dermal Sensitization**

Component data indicate the substance is sensitizing.

**Component Carcinogenicity**

<b>WOOD DUST, HARDWOODS</b>	<b>Not Available</b>
ACGIH:	A1 - Confirmed Human Carcinogen (related to Wood dusts-hard wood)
IARC:	Monograph 100C [2012] ; Monograph 62 [1995] (related to Wood dust, all soft and hard woods) (Group 1 (carcinogenic to humans))
NTP:	Known Human Carcinogen (related to Wood dust, all soft and hard woods)
NIOSH:	potential occupational carcinogen (related to Wood dust, all soft and hard woods)
<b>COAL TAR CREOSOTE</b>	<b>8001-58-9</b>
ACGIH:	A1 - Confirmed Human Carcinogen (related to Pitch, coal tar, high-temperature)
IARC:	Monograph 100F [2012] ; Supplement 7 [1987] ; Monograph 35 [1985] (related to Pitch, coal tar, high-temperature) (Group 1 (carcinogenic to humans))
IARC:	Monograph 92 [2010] ; Supplement 7 [1987] ; Monograph 35 [1985] (Group 2A (probably carcinogenic to humans))
NTP:	Known Human Carcinogen (related to Pitch, coal tar, high-temperature)
NIOSH:	potential occupational carcinogen
<b>Petroleum distillates, light catalytic cracked</b>	<b>64741-59-9</b>



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ACGIH:	A1 - Confirmed Human Carcinogen (related to Pitch, coal tar, high-temperature)
IARC:	Monograph 100F [2012] ; Supplement 7 [1987] ; Monograph 35 [1985] (related to Pitch, coal tar, high-temperature) (Group 1 (carcinogenic to humans))
NTP:	Known Human Carcinogen (related to Pitch, coal tar, high-temperature)
NIOSH:	potential occupational carcinogen (related to Pitch, coal tar, high-temperature)

### Germ Cell Mutagenicity

No data available.

### Tumorigenic Data

No data available

### Reproductive Toxicity

No data available.

### Specific Target Organ Toxicity - Single Exposure

respiratory system

### Specific Target Organ Toxicity - Repeated Exposure

No data available.

### Aspiration hazard

No data available.

### Medical Conditions Aggravated by Exposure

respiratory disorders, skin disorders and allergies

### Additional Data

COAL TAR CREOSOTE: This product contains coal tar creosote. Volume 35 of the IARC monograph states that there is limited evidence that coal tar derived creosotes are carcinogenic in humans and sufficient evidence for the carcinogenicity of creosote in experimental animals. Limitations in the human exposure studies reviewed by IARC (including the presence of other chemicals, small study populations and not well documented exposure levels) contributed to IARC's conclusions regarding human exposure to creosote. When applied to the skin of mice in experimental studies, creosote produced skin tumors and in one study produced lung tumors. Most available information on the effects of coal tar creosote in humans comes from older occupational studies in the wood-preserving and construction industries. Today, with the use of engineering controls and personal protective equipment, occupational exposure to creosote components is expected to be below permissible exposure limits (measured as Coal Tar Pitch Volatiles). Wood dust is particles of varying size produced from processing or handling wood. Cancer of the nasal cavities and sinuses is associated with exposure to hardwood dust. IARC concluded that there were too few studies to evaluate cancer risks attributable to exposure to softwood alone and to any particular species of wood. In view of the overall lack of consistent findings, IARC also concluded that there is no indication that occupational exposure to wood dust has a causal role in cancers of the throat, lung, lymphatic and blood systems, stomach, colon or rectum. PETROLEUM DISTILLATES, LIGHT CATALYTIC CRACKED: High incidences of benign and malignant skin tumors have been reported in mouse skin application testing and IARC reports there is sufficient evidence for the carcinogenicity in animals of light catalytically cracked distillates. IARC determined there is sufficient evidence for carcinogenicity in experimental animals of light and heavy vacuum distillates, of light and heavy catalytically cracked distillates and of cracked residues (including heavy thermocracked distillates/residues) from the refining of crude oil. Different woods produce different health effects and there is evidence that wood from different trees of the same species can produce varying health effects. Woods other than Western Red Cedar (WRC) seem unlikely to be responsible for large numbers of cases of respiratory



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allergies. Other common wood dusts produce asthma/pulmonary effects that are less well described than the responses to WRC. These other wood species (e.g., oak and pine) are considered somewhat allergenic.

### Section 12 - ECOLOGICAL INFORMATION

#### Component Analysis - Aquatic Toxicity

<b>COAL TAR CREOSOTE</b>	<b>8001-58-9</b>
Fish:	LC50 96 h Brachydanio rerio 2.6 - 6.6 mg/L [static ]; LC50 96 h Oncorhynchus mykiss 0.57 mg/L [static ]
Invertebrate:	EC50 48 h Daphnia magna 1.04 mg/L IUCLID ; EC50 48 h Daphnia magna 0.065 - 0.082 mg/L [Static ] EPA
<b>Petroleum distillates, light catalytic cracked</b>	<b>64741-59-9</b>
Fish:	LC50 96 h Brachydanio rerio 7.3 mg/L [semi-static ]

#### Persistence and Degradability

No information available for the product.

#### Bioaccumulative Potential

No information available for the product.

#### Mobility

No information available for the product.

#### Other Toxicity

No data available.

### Section 13 - DISPOSAL CONSIDERATIONS

#### Disposal Methods

Dispose in accordance with all applicable regulations. Treated wood should not be burned in open fires or in stoves, fireplaces or residential boilers, because toxic chemicals may be produced as part of the smoke and ashes. Treated wood from commercial or industrial use (e.g., construction sites) may be burned only in commercial or industrial incinerators or boilers in accordance with state and federal regulations. For more information please see Koppers Consumer Information Sheet for this product. RCRA Waste Number U051 – applies only to creosote in liquid form.

#### Component Waste Numbers

The U.S. EPA has not published waste numbers for this product's components.

### Section 14 - TRANSPORT INFORMATION

#### US DOT Information:

**Further information:** No classification assigned

#### IATA Information:

**Further information:** No classification assigned

#### TDG Information:

**Further information:** No classification assigned

#### International Bulk Chemical Code

This material contains one or more of the following chemicals required by the IBC Code to be identified as dangerous chemicals in bulk.



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<b>COAL TAR CREOSOTE</b>	<b>8001-58-9</b>
IBC Code:	Category X (coal tar )
<b>Petroleum distillates, light catalytic cracked</b>	<b>64741-59-9</b>
IBC Code:	Category X (related to Polycyclic aromatic hydrocarbons)

### Further information

Component Marine Pollutants This material does not contain any chemicals listed on the Hazardous Materials Table required by US DOT to be identified as a marine pollutant.

### Section 15 - REGULATORY INFORMATION

#### U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

<b>COAL TAR CREOSOTE</b>	<b>8001-58-9</b>
SARA 313:	0.1 % de minimis concentration
CERCLA:	1 lb final RQ ; 0.454 kg final RQ

#### SARA Section 311/312 (40 CFR 370 Subparts B and C) reporting categories

Combustible Dust; Carcinogenicity; Skin Corrosion/Irritation; Respiratory/Skin Sensitization; Serious Eye Damage/Eye Irritation; Specific Target Organ Toxicity

#### U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
<b>WOOD DUST, HARDWOODS</b>	<b>Not Available</b>	No	No	Yes	Yes	Yes
<b>COAL TAR CREOSOTE</b>	<b>8001-58-9</b>	Yes	Yes	Yes	Yes	Yes
<b>Petroleum distillates, light catalytic cracked</b>	<b>64741-59-9</b>	Yes	Yes	Yes	Yes	Yes

#### California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)



**WARNING**

This product can expose you to chemicals including WOOD DUST, HARDWOODS, COAL TAR CREOSOTE , which are known to the State of California to cause cancer. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

#### Canada Regulations

##### Canadian WHMIS Ingredient Disclosure List (IDL)



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Components of this material have been checked against the Canadian WHMIS Ingredients Disclosure List. The List is composed of chemicals which must be identified on MSDSs if they are included in products which meet WHMIS criteria specified in the Controlled Products Regulations and are present above the threshold limits listed on the IDL

<b>COAL TAR CREOSOTE</b>	<b>8001-58-9</b>
	0.1 % (related to Pitch, coal tar, high-temperature)
<b>Petroleum distillates, light catalytic cracked</b>	<b>64741-59-9</b>
	0.1 % (related to Pitch, coal tar, high-temperature)

**WHMIS Classification**

D2A , D2B

**Component Analysis - Inventory**

**WOOD DUST, HARDWOODS (Not Available)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

**COAL TAR CREOSOTE (8001-58-9)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	No

**Petroleum distillates, light catalytic cracked (64741-59-9)**

US	CA	EU	AU	PH	JP - ENCS	JP - ISHL	KR KECI - Annex 1	KR KECI - Annex 2	KR - REACH CCA	CN	NZ	MX	TW	VN (Draft)
Yes	DSL	EIN	Yes	Yes	No	No	Yes	No	No	Yes	No	Yes	Yes	Yes

**U.S. Inventory (TSCA)**

This product is exempt.

**Section 16 - OTHER INFORMATION**

**Further information**

This wood product contains a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the





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classification criteria and hazard information required for safety data sheets, and for workplace labels of non-pesticide chemicals. The pesticide label also includes other important information, including directions for use.

### **NFPA Ratings**

Health: 2 Fire: 1 Reactivity: 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

### **Summary of Changes**

Updated: 7/20/2018; MSDS SUMMARY OF CHANGES: SECTION 15 - CA Proposition 65

### **Key / Legend**

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/Massachusetts/Minnesota/New Jersey/Pennsylvania\*; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CFR - Code of Federal Regulations (US); CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC - European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; F - Background (for Venezuela Biological Exposure Indices); IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL), KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of Lists™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX - Mexico; Ne - Non-specific; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; Nq - Non-quantitative; NSL - Non-Domestic Substance List (Canada); NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL - Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH - Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; Sc - Semi-quantitative; STEL - Short-term Exposure Limit; TCCA - Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW - Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); VN (Draft) - Vietnam (Draft); WHMIS - Workplace Hazardous Materials Information System (Canada).

### **Other Information**

#### **Disclaimer:**

The information set forth in this Safety Data Sheet does not purport to be all-inclusive and should be used only as a guide. While the information and recommendations set forth herein are believed to be accurate, the company makes no warranty regarding such information and recommendations and disclaims all liability from reliance thereon.



## Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

## Ethyl benzene

**Synonyms & Trade Names** Ethylbenzol, Phenylethane

<b>CAS No.</b> 100-41-4	<b>RTECS No.</b> DAO700000 (/niosh-rtecs/DAAAE60.html)	<b>DOT ID &amp; Guide</b> 1175 130 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
<b>Formula</b> CH <sub>3</sub> CH <sub>2</sub> C <sub>6</sub> H <sub>5</sub>	<b>Conversion</b> 1 ppm = 4.34 mg/m <sup>3</sup>	<b>IDLH</b> 800 ppm [10%LEL] See: <a href="http://www.cdc.gov/Other/disclaimer.html">100414 (/niosh/idlh/100414.html)</a>
<b>Exposure Limits</b> NIOSH REL : TWA 100 ppm (435 mg/m <sup>3</sup> ) ST 125 ppm (545 mg/m <sup>3</sup> ) OSHA PEL † ( <a href="http://www.cdc.gov/Other/disclaimer.html">nengapdxg.html</a> ): TWA 100 ppm (435 mg/m <sup>3</sup> ) Endpoint Security by Bitdefender This page is safe		<b>Measurement Methods</b> NIOSH 1501  (/niosh/docs/2003-154/pdfs/1501.pdf); OSHA 7 ( <a href="http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html">http://www.osha.gov/dts/sltc/methods/organic/org001/org001.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ), 1002 ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ), 1002 ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) NIOSH 1501 ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) or OSHA Methods ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

**Physical Description** Colorless liquid with an aromatic odor.

<b>MW:</b> 106.2	<b>BP:</b> 277°F	<b>FRZ:</b> -139°F	<b>Sol:</b> 0.01%	<b>VP:</b> 7 mmHg	<b>IP:</b> 8.76 eV
<b>Sp.Gr:</b> 0.87	<b>Fl.P:</b> 55°F	<b>UEL:</b> 6.7%	<b>LEL:</b> 0.8%		

Class IB Flammable Liquid: FLP. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities** Strong oxidizers**Exposure Routes** inhalation, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma**Target Organs** Eyes, skin, respiratory system, central nervous system**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](http://www.cdc.gov/Other/disclaimer.html))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

Change: No recommendation

**First Aid** (See [procedures \(firstaid.html\)](http://www.cdc.gov/Other/disclaimer.html))

Eye: Irrigate immediately

Skin: Water flush promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

**Respirator Recommendations****NIOSH/OSHA****Up to 800 ppm:**

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

**Emergency or planned entry into unknown concentrations or IDLH conditions:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0268 \(/niosh/ipcsneng/nengo268.html\)](#)

See MEDICAL TESTS: [0098 \(/niosh/docs/2005-110/nmed0098.html\)](#)

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Content source: [National Institute for Occupational Safety and Health \(NIOSH\) Education and Information Division](#)

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## Search the Pocket Guide

Enter search terms separated by spaces.

## Lead

## Synonyms &amp; Trade Names Lead metal, Plumbum

CAS No. 7439-92-1	RTECS No. <a href="/niosh-rtecs/OF72D288.html">OF7525000 (/niosh-rtecs/OF72D288.html)</a>	DOT ID & Guide
Formula Pb	Conversion	IDLH 100 mg/m <sup>3</sup> (as Pb) See: <a href="/niosh/idlh/7439921.html">7439921 (/niosh/idlh/7439921.html)</a>

## Exposure Limits

**NIOSH REL** \*: TWA (8-hour) 0.050 mg/m<sup>3</sup> [See Appendix C \(nengapdxc.html\)](#) [\*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]

**OSHA PEL** \*: [1910.1025] TWA 0.050 mg/m<sup>3</sup> [See Appendix C \(nengapdxc.html\)](#) [\*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]

## Measurement Methods

NIOSH [7082 \(/niosh/docs/2003-154/pdfs/7082.pdf\)](/niosh/docs/2003-154/pdfs/7082.pdf), [7105 \(/niosh/docs/2003-154/pdfs/7105.pdf\)](/niosh/docs/2003-154/pdfs/7105.pdf), [7300 \(/niosh/docs/2003-154/pdfs/7300.pdf\)](/niosh/docs/2003-154/pdfs/7300.pdf), [7301 \(/niosh/docs/2003-154/pdfs/7301.pdf\)](/niosh/docs/2003-154/pdfs/7301.pdf), [7303 \(/niosh/docs/2003-154/pdfs/7303.pdf\)](/niosh/docs/2003-154/pdfs/7303.pdf), [7700 \(/niosh/docs/2003-154/pdfs/7700.pdf\)](/niosh/docs/2003-154/pdfs/7700.pdf), [7701 \(/niosh/docs/2003-154/pdfs/7701.pdf\)](/niosh/docs/2003-154/pdfs/7701.pdf), [7702 \(/niosh/docs/2003-154/pdfs/7702.pdf\)](/niosh/docs/2003-154/pdfs/7702.pdf), [9100 \(/niosh/docs/2003-154/pdfs/9100.pdf\)](/niosh/docs/2003-154/pdfs/9100.pdf), [9102 \(/niosh/docs/2003-154/pdfs/9102.pdf\)](/niosh/docs/2003-154/pdfs/9102.pdf), [9105 \(/niosh/docs/2003-154/pdfs/9105.pdf\)](/niosh/docs/2003-154/pdfs/9105.pdf);

OSHA [ID121 \(http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html\)](http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html)  
 [\(/http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html), [ID125G \(http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html\)](http://www.osha.gov/dts/sltc/methods/inorganic/id125g/id125g.html)  
 [\(/http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html), [ID206 \(http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html\)](http://www.osha.gov/dts/sltc/methods/inorganic/id206/id206.html)  
 [\(/http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)

See: [NMAM \(/niosh/docs/2003-154/\)](/niosh/docs/2003-154/) or [OSHA Methods \(http://www.osha.gov/dts/sltc/methods/index.html\)](http://www.osha.gov/dts/sltc/methods/index.html)  [\(/http://www.cdc.gov/Other/disclaimer.html\)](http://www.cdc.gov/Other/disclaimer.html)

## Physical Description A heavy, ductile, soft, gray solid.

MW: 207.2	BP: 3164°F	MLT: 621°F	Sol: Insoluble	VP: 0 mmHg (approx)	IP: NA
Sp.Gr: 11.3	Fl.P:	UEL:	LEL: NA		

Endpoint Security by Bitdefender

This page is safe

Non

## Incompatibilities &amp; Reactivities Strong oxidizers, hydrogen peroxide, acids

**Exposure Routes** inhalation, ingestion, skin and/or eye contact

**Symptoms** lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension

**Target Organs** Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))  
**Skin:** Prevent skin contact  
**Eyes:** Prevent eye contact  
**Wash skin:** Daily  
**Remove:** When wet or contaminated  
**Change:** Daily

**First Aid** (See [procedures \(firstaid.html\)](#))  
**Eye:** Irrigate immediately  
**Skin:** Soap flush promptly  
**Breathing:** Respiratory support  
**Swallow:** Medical attention immediately

**Respirator Recommendations**  
 (See [Appendix E \(nengapdx.html\)](#))  
 NIOSH/OSHA

Up to 0.5 mg/m<sup>3</sup>:

(APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m<sup>3</sup>:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 2.5 mg/m<sup>3</sup>:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m<sup>3</sup>:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Up to 100 mg/m<sup>3</sup>:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0052 \(/niosh/ipcsneng/neng0052.html\)](#) See MEDICAL TESTS: [0127 \(/niosh/docs/2005-110/nmed0127.html\)](#)

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## SAFETY DATA SHEET

Version 5.4  
Revision Date 06/29/2014  
Print Date 12/11/2014

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**1. PRODUCT AND COMPANY IDENTIFICATION****1.1 Product identifiers**

Product name : Naphthalene

Product Number : 147141  
Brand : Aldrich  
Index-No. : 601-052-00-2

CAS-No. : 91-20-3

**1.2 Relevant identified uses of the substance or mixture and uses advised against**

Identified uses : Laboratory chemicals, Manufacture of substances

**1.3 Details of the supplier of the safety data sheet**

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

Telephone : +1 800-325-5832  
Fax : +1 800-325-5052

**1.4 Emergency telephone number**

Emergency Phone # : (314) 776-6555

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**2. HAZARDS IDENTIFICATION****2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable solids (Category 1), H228  
Acute toxicity, Oral (Category 4), H302  
Carcinogenicity (Category 2), H351  
Acute aquatic toxicity (Category 1), H400  
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

**2.2 GHS Label elements, including precautionary statements**

Pictogram



Signal word

Danger

Hazard statement(s)

H228 Flammable solid.  
H302 Harmful if swallowed.  
H351 Suspected of causing cancer.  
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201 Obtain special instructions before use.  
P202 Do not handle until all safety precautions have been read and understood.  
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P330	Rinse mouth.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

## 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Formula	: C <sub>10</sub> H <sub>8</sub>
Molecular Weight	: 128.17 g/mol
CAS-No.	: 91-20-3
EC-No.	: 202-049-5
Index-No.	: 601-052-00-2

#### Hazardous components

Component	Classification	Concentration
<b>Naphthalene</b>	Flam. Sol. 1; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H228, H302, H351, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice

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

#### If inhaled

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

#### In case of skin contact

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

#### In case of eye contact

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

#### If swallowed

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

### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

### 4.3 Indication of any immediate medical attention and special treatment needed

no data available

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## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

#### Suitable extinguishing media

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

### 5.2 Special hazards arising from the substance or mixture

Carbon oxides

### 5.3 Advice for firefighters

Wear self contained breathing apparatus for fire fighting if necessary.

### 5.4 Further information

Use water spray to cool unopened containers.

---

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Avoid breathing dust.

For personal protection see section 8.

### 6.2 Environmental precautions

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

### 6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place.

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Naphthalene	91-20-3	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye & Upper Respiratory Tract irritation Hematologic effects Eye damage Not classifiable as a human carcinogen Danger of cutaneous absorption		

		STEL	15 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Eye & Upper Respiratory Tract irritation Hematologic effects Eye damage Not classifiable as a human carcinogen Danger of cutaneous absorption		
		TWA	10 ppm 50 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	15 ppm 75 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	10 ppm 50 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	10 ppm 50 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	15 ppm 75 mg/m3	USA. NIOSH Recommended Exposure Limits

## 8.2 Exposure controls

### Appropriate engineering controls

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

### Personal protective equipment

#### Eye/face protection

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Skin protection

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

#### Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

#### Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

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

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the

sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### **Control of environmental exposure**

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

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## **9. PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

- |   |   |
|---|---|
| a) Appearance                                   | Form: solid   |
| b) Odour  | no data available   |
| c) Odour Threshold                              | no data available   |
| d) pH   | no data available   |
| e) Melting point/freezing point                 | Melting point/range: 80 - 82 °C (176 - 180 °F) - lit.                                 |
| f) Initial boiling point and boiling range      | 218 °C (424 °F) - lit.  |
| g) Flash point                                  | 80.0 °C (176.0 °F) - closed cup   |
| h) Evaporation rate                             | no data available   |
| i) Flammability (solid, gas)                    | The substance or mixture is a flammable solid with the category 1.                    |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 5.9 %(V)<br>Lower explosion limit: 0.9 %(V)                    |
| k) Vapour pressure                              | 1.3 hPa (1.0 mmHg) at 53.0 °C (127.4 °F)<br>0.04 hPa (0.03 mmHg) at 25.0 °C (77.0 °F) |
| l) Vapour density                               | no data available   |
| m) Relative density                             | no data available   |
| n) Water solubility                             | no data available   |
| o) Partition coefficient: n-octanol/water       | log Pow: 3.30   |
| p) Auto-ignition temperature                    | 526.0 °C (978.8 °F)   |
| q) Decomposition temperature                    | no data available   |
| r) Viscosity                                    | no data available   |
| s) Explosive properties                         | no data available   |
| t) Oxidizing properties                         | no data available   |

### **9.2 Other safety information**

- |                 |                                  |
|-----------------|----------------------------------|
| Surface tension | 31.8 mN/m at 100.0 °C (212.0 °F) |
|-----------------|----------------------------------|

---

## **10. STABILITY AND REACTIVITY**

### **10.1 Reactivity**

no data available

### **10.2 Chemical stability**

Stable under recommended storage conditions.

### **10.3 Possibility of hazardous reactions**

no data available

#### 10.4 Conditions to avoid

Heat, flames and sparks. Extremes of temperature and direct sunlight.

#### 10.5 Incompatible materials

Strong oxidizing agents

#### 10.6 Hazardous decomposition products

Other decomposition products - no data available  
In the event of fire: see section 5

---

### 11. TOXICOLOGICAL INFORMATION

#### 11.1 Information on toxicological effects

##### Acute toxicity

LD50 Oral - rat - 490.0 mg/kg

LC50 Inhalation - rat - 1 h - > 340 mg/m<sup>3</sup>

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Somnolence (general depressed activity).

LD50 Dermal - rabbit - 20,000 mg/kg

no data available

##### Skin corrosion/irritation

no data available

##### Serious eye damage/eye irritation

Eyes - rabbit

Result: Mild eye irritation

##### Respiratory or skin sensitisation

no data available

##### Germ cell mutagenicity

no data available

##### Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Naphthalene)

NTP: Reasonably anticipated to be a human carcinogen (Naphthalene)

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

##### Reproductive toxicity

no data available

no data available

##### Specific target organ toxicity - single exposure

no data available

##### Specific target organ toxicity - repeated exposure

no data available

##### Aspiration hazard

no data available

##### Additional Information

RTECS: QJ0525000



Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer., Naphthalene is retinotoxic and systemic absorption of its vapors above 15ppm, may result in:, cataracts, optic neuritis, corneal injury, Eye irritation, Ingestion may provoke the following symptoms:, hemolytic anemia, hemoglobinuria, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Convulsions, anemia, Kidney injury may occur., Seizures., Coma.

Heart -

---

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - 0.9 - 9.8 mg/l - 96.0 h  
LC50 - Pimephales promelas (fathead minnow) - 1 - 6.5 mg/l - 96.0 h  
NOEC - other fish - 1.8 mg/l - 3.0 d  
LOEC - other fish - 3.2 mg/l - 3.0 d

Toxicity to daphnia and other aquatic invertebrates EC50 - Daphnia magna (Water flea) - 1.00 - 3.40 mg/l - 48 h

Toxicity to algae EC50 - No information available. - 33.00 mg/l - 24 h

### 12.2 Persistence and degradability

Biodegradability Result: - According to the results of tests of biodegradability this product is not readily biodegradable.  
no data available

### 12.3 Bioaccumulative potential

Bioaccumulation Fish  
Bioconcentration factor (BCF): 427 - 1,158

### 12.4 Mobility in soil

no data available

### 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

### 12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.  
Very toxic to aquatic life with long lasting effects.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.  
Very toxic to aquatic life with long lasting effects.

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

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

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 1334 Class: 4.1 Packing group: III  
Proper shipping name: Naphthalene, refined  
Reportable Quantity (RQ): 100 lbs  
Marine pollutant: No  
Poison Inhalation Hazard: No

**IMDG**

UN number: 1334      Class: 4.1      Packing group: III      EMS-No: F-A, S-G  
 Proper shipping name: NAPHTHALENE, REFINED  
 Marine pollutant: No

**IATA**

UN number: 1334      Class: 4.1      Packing group: III  
 Proper shipping name: Naphthalene, refined

**15. REGULATORY INFORMATION****SARA 302 Components**

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

**SARA 313 Components**

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

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

**SARA 311/312 Hazards**

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

**Massachusetts Right To Know Components**

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

**Pennsylvania Right To Know Components**

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

**New Jersey Right To Know Components**

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

**California Prop. 65 Components**

WARNING! This product contains a chemical known to the State of California to cause cancer.

	CAS-No.	Revision Date
Naphthalene	91-20-3	1990-01-01

**16. OTHER INFORMATION****Full text of H-Statements referred to under sections 2 and 3.**

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Flam. Sol.	Flammable solids
H228	Flammable solid.
H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

**HMIS Rating**

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

**NFPA Rating**

Health hazard:	2
----------------	---

Fire Hazard: 2  
Reactivity Hazard: 2

**Further information**

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**Preparation Information**

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.4

Revision Date: 06/29/2014

Print Date: 12/11/2014



## Search the Pocket Guide

Enter search terms separated by spaces.

## Nickel metal and other compounds (as Ni)

**Synonyms & Trade Names** Nickel metal: Elemental nickel, Nickel catalyst  
Synonyms of other nickel compounds vary depending upon the specific compound.

<b>CAS No.</b> 7440-02-0 (Metal)	<b>RTECS No.</b> <a href="#">QR5950000 (Metal)</a> (/niosh-rtecs/QR5ACA30.html)	<b>DOT ID &amp; Guide</b>
<b>Formula</b> Ni (Metal)	<b>Conversion</b>	<b>IDLH</b> Ca [10 mg/m <sup>3</sup> (as Ni)] See: <a href="#">7440020 (/niosh/idlh/7440020.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> *: Ca TWA 0.015 mg/m <sup>3</sup> See <a href="#">Appendix A (nengapdxa.html)</a> [*Note: The REL does not apply to Nickel carbonyl.] <b>OSHA PEL</b> *† ( <a href="#">nengapdxg.html</a> ): TWA 1 mg/m <sup>3</sup> [*Note: The PEL does not apply to N Endpoint Security by Bitdefender This page is safe]		<b>Measurement Methods</b> <b>NIOSH 7300</b> (/niosh/docs/2003-154/pdfs/7300.pdf), <b>7301</b> (/niosh/docs/2003-154/pdfs/7301.pdf), <b>7303</b> (/niosh/docs/2003-154/pdfs/7303.pdf), <b>9102</b> (/niosh/docs/2003-154/pdfs/9102.pdf) ; <b>OSHA ID121</b> <a href="#">(http://www.osha.gov/ots/sltc/methods/inorganic/id121/id121.html)</a> <b>ier/disclaimer.html)</b> , <b>ID125G</b> <a href="#">(http://www.osha.gov/ots/sltc/methods/inorganic/id125g/id125g.html)</a> ( <a href="#">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> (/niosh/docs/2003-154/) or <b>OSHA Methods</b> ( <a href="#">http://www.osha.gov/dts/sltc/methods/index.html</a> ) <a href="#">(http://www.cdc.gov/Other/disclaimer.html)</a>

**Physical Description** Metal: Lustrous, silvery, odorless solid.

<b>MW:</b> 58.7	<b>BP:</b> 5139°F	<b>MLT:</b> 2831°F	<b>Sol:</b> Insoluble	<b>VP:</b> 0 mmHg (approx)	<b>IP:</b> NA
<b>Sp.Gr:</b> 8.90 (Metal)	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

Metal: Combustible Solid; nickel sponge catalyst may ignite SPONTANEOUSLY in air.

**Incompatibilities & Reactivities** Strong acids, sulfur, selenium, wood & other combustibles, nickel nitrate

**Exposure Routes** inhalation, ingestion, skin and/or eye contact

**Symptoms** sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]

**Target Organs** Nasal cavities, lungs, skin

**Cancer Site** [lung and nasal cancer]

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: No recommendation

Wash skin: When contaminated/Daily

Remove: When wet or contaminated

Change: Daily

**First Aid** (See [procedures \(firstaid.html\)](#))

Skin: Water flush immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

#### Respirator Recommendations

#### NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0062](#)

[\(/niosh/ipcsneng/neng0062.html\)](#) See MEDICAL TESTS: [0156 \(/niosh/docs/2005-110/nmed0156.html\)](#)

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## Search the Pocket Guide

SEARCH

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## Phenol

**Synonyms & Trade Names** Carbohic acid, Hydroxybenzene, Monohydroxybenzene, Phenyl alcohol, Phenyl hydroxide

<b>CAS No.</b> 108-95-2	<b>RTECS No.</b> <a href="#">SJ3325000 (/niosh-rtecs/SJ32BC48.html)</a>	<b>DOT ID &amp; Guide</b> 1671 <b>153</b> ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) (solid) 2312 <b>153</b> ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) (molten) 2821 <b>153</b> ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=153</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) (solution)
<b>Formula</b> C <sub>6</sub> H <sub>5</sub> OH	<b>Conversion</b> 1 ppm = 3.85 mg/m <sup>3</sup>	<b>IDLH</b> 250 ppm See: <a href="#">108952 (/niosh/idlh/108952.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : TWA 5 ppm (19 mg/m <sup>3</sup> ) C 15.6 ppm (60 mg/m <sup>3</sup> ) [15-minute] [skin] <b>OSHA PEL</b> : TWA 5 ppm (19 mg/m <sup>3</sup> ) [skin]		<b>Measurement Methods</b> <b>NIOSH</b> <a href="#">2546</a> ( <a href="#">/niosh/docs/2003-154/pdfs/2546.pdf</a> ); <b>OSHA</b> 32 See: <b>NMAM</b> ( <a href="#">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

**Physical Description** Colorless to light-pink, crystalline solid with a sweet, acrid odor. [Note: Phenol liquefies by mixing with about 8% water.]

<b>MW:</b> 94.1	<b>BP:</b> 359°F	<b>MLT:</b> 109°F	<b>Sol(77°F):</b> 9%	<b>VP:</b> 0.4 mmHg	<b>IP:</b> 8.50 eV
<b>Sp.Gr:</b> 1.06	<b>Fl.P:</b> 175°F	<b>UEL:</b> 8.6%	<b>LEL:</b> 1.8%		

**Combustible Solid**

Endpoint Security by Bitdefender

In cor

This page is safe

, aluminum chloride, acids

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching

**Target Organs** Eyes, skin, respiratory system, liver, kidneys

**Personal Protection/Sanitation** ([See protection codes \(protect.html\)](#))  
 Skin: Prevent skin contact  
 Eyes: Prevent eye contact  
 Wash skin: When contaminated  
 Remove: When wet or contaminated  
 Change: Daily  
 Provide: Eyewash, Quick drench

**First Aid** ([See procedures \(firstaid.html\)](#))  
 Eye: Irrigate immediately  
 Skin: Soap wash immediately  
 Breathing: Respiratory support  
 Swallow: Medical attention immediately

#### Respirator Recommendations

NIOSH/OSHA

Up to 50 ppm:

(APF = 10) Any air-purifying half-mask respirator with organic vapor cartridge(s) in combination with an N95, R95, or P95 filter. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 125 ppm:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with an organic vapor cartridge in combination with a high-efficiency particulate filter.

Up to 250 ppm:

(APF = 50) Any air-purifying full-facepiece respirator equipped with organic vapor cartridge(s) in combination with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s) in combination with a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode



(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0070 \(/niosh/ipcsneng/neng0070.html\)](#) See MEDICAL TESTS: [0182 \(/niosh/docs/2005-110/nmedo182.html\)](#)

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# SAFETY DATA SHEET

## Propane

### Section 1. Identification

<b>GHS product identifier</b>	: Propane
<b>Chemical name</b>	: propane
<b>Other means of identification</b>	: Propyl hydride; n-Propane; Dimethyl methane; Bottled gas; propane in gaseous state; propane liquefied, n-Propane; Dimethylmethane; Freon 290; Liquefied petroleum gas; Lpg; Propyl hydride; R 290; C3H8; UN 1075; UN 1978; A-108; Hydrocarbon propellant.
<b>Product type</b>	: Liquefied gas
<b>Product use</b>	: Synthetic/Analytical chemistry.
<b>Synonym</b>	: Propyl hydride; n-Propane; Dimethyl methane; Bottled gas; propane in gaseous state; propane liquefied, n-Propane; Dimethylmethane; Freon 290; Liquefied petroleum gas; Lpg; Propyl hydride; R 290; C3H8; UN 1075; UN 1978; A-108; Hydrocarbon propellant.
<b>SDS #</b>	: 001045
<b>Supplier's details</b>	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
<b>24-hour telephone</b>	: 1-866-734-3438

### Section 2. Hazards identification

<b>OSHA/HCS status</b>	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
<b>Classification of the substance or mixture</b>	: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas
<b>GHS label elements</b>	
<b>Hazard pictograms</b>	: 
<b>Signal word</b>	: Danger
<b>Hazard statements</b>	: Extremely flammable gas. May form explosive mixtures with air. Contains gas under pressure; may explode if heated. May cause frostbite. May displace oxygen and cause rapid suffocation.
<b>Precautionary statements</b>	
<b>General</b>	: Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.
<b>Prevention</b>	: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
<b>Response</b>	: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.
<b>Storage</b>	: Protect from sunlight. Store in a well-ventilated place.

## Section 2. Hazards identification

- Disposal** : Not applicable.
- Hazards not otherwise classified** : Liquid can cause burns similar to frostbite.

## Section 3. Composition/information on ingredients

- Substance/mixture** : Substance
- Chemical name** : propane
- Other means of identification** : Propyl hydride; n-Propane; Dimethyl methane; Bottled gas; propane in gaseous state; propane liquefied, n-Propane; Dimethylmethane; Freon 290; Liquefied petroleum gas; Lpg; Propyl hydride; R 290; C3H8; UN 1075; UN 1978; A-108; Hydrocarbon propellant.
- Product code** : 001045

### CAS number/other identifiers

- CAS number** : 74-98-6

Ingredient name	%	CAS number
Propane	100	74-98-6

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

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

## Section 4. First aid measures

### Description of necessary first aid measures

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if adverse health effects persist or are severe. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.

### Most important symptoms/effects, acute and delayed

#### Potential acute health effects

- Eye contact** : Liquid can cause burns similar to frostbite.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

## Section 4. First aid measures

- Frostbite** : Try to warm up the frozen tissues and seek medical attention.  
**Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

### Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:, frostbite  
**Inhalation** : No specific data.  
**Skin contact** : Adverse symptoms may include the following:, frostbite  
**Ingestion** : Adverse symptoms may include the following:, frostbite

### Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.  
**Specific treatments** : No specific treatment.  
**Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

## Section 5. Fire-fighting measures

### Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.  
**Unsuitable extinguishing media** : None known.

- Specific hazards arising from the chemical** : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.

- Hazardous thermal decomposition products** : Decomposition products may include the following materials:  
carbon dioxide  
carbon monoxide

- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

## Section 6. Accidental release measures

### Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

## Section 6. Accidental release measures

**For emergency responders** : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

**Environmental precautions** : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

### Methods and materials for containment and cleaning up

**Small spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

**Large spill** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

## Section 7. Handling and storage

### Precautions for safe handling

**Protective measures** : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.

**Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

## Section 8. Exposure controls/personal protection

### Control parameters

#### Occupational exposure limits

Ingredient name	Exposure limits
Propane	<p><b>NIOSH REL (United States, 10/2016).</b> TWA: 1800 mg/m<sup>3</sup> 10 hours. TWA: 1000 ppm 10 hours.</p> <p><b>OSHA PEL (United States, 6/2016).</b> TWA: 1800 mg/m<sup>3</sup> 8 hours. TWA: 1000 ppm 8 hours.</p> <p><b>OSHA PEL 1989 (United States, 3/1989).</b> TWA: 1800 mg/m<sup>3</sup> 8 hours. TWA: 1000 ppm 8 hours.</p> <p><b>ACGIH TLV (United States, 3/2017). Oxygen Depletion [Asphyxiant].</b></p>

## Section 8. Exposure controls/personal protection

- Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.
- Individual protection measures**
- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.
- Thermal hazards** : If there is a risk of contact with the liquid, all protective equipment worn should be suitable for use with extremely low temperature materials.

## Section 9. Physical and chemical properties

### Appearance

- Physical state** : Gas. [Compressed gas.]
- Color** : Colorless.
- Odor** : Odorless.BUT MAY HAVE SKUNK ODOR ADDED.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : -187.6°C (-305.7°F)
- Boiling point** : -161.48°C (-258.7°F)

## Section 9. Physical and chemical properties

<b>Critical temperature</b>	: 96.55°C (205.8°F)
<b>Flash point</b>	: Closed cup: -104°C (-155.2°F) Open cup: -104°C (-155.2°F)
<b>Evaporation rate</b>	: Not available.
<b>Flammability (solid, gas)</b>	: Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
<b>Lower and upper explosive (flammable) limits</b>	: Lower: 1.8% Upper: 8.4%
<b>Vapor pressure</b>	: 109 (psig)
<b>Vapor density</b>	: 1.6 (Air = 1)
<b>Specific Volume (ft<sup>3</sup>/lb)</b>	: 8.6206
<b>Gas Density (lb/ft<sup>3</sup>)</b>	: 0.116 (25°C / 77 to °F)
<b>Relative density</b>	: Not applicable.
<b>Solubility</b>	: Not available.
<b>Solubility in water</b>	: 0.02 g/l
<b>Partition coefficient: n-octanol/water</b>	: 1.09
<b>Auto-ignition temperature</b>	: 287°C (548.6°F)
<b>Decomposition temperature</b>	: Not available.
<b>Viscosity</b>	: Not applicable.
<b>Flow time (ISO 2431)</b>	: Not available.
<b>Molecular weight</b>	: 44.11 g/mole
<b><u>Aerosol product</u></b>	
<b>Heat of combustion</b>	: -46012932 J/kg

## Section 10. Stability and reactivity

<b>Reactivity</b>	: No specific test data related to reactivity available for this product or its ingredients.
<b>Chemical stability</b>	: The product is stable.
<b>Possibility of hazardous reactions</b>	: Under normal conditions of storage and use, hazardous reactions will not occur.
<b>Conditions to avoid</b>	: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow gas to accumulate in low or confined areas.
<b>Incompatible materials</b>	: Oxidizers
<b>Hazardous decomposition products</b>	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
<b>Hazardous polymerization</b>	: Under normal conditions of storage and use, hazardous polymerization will not occur.



## Section 11. Toxicological information

### Information on toxicological effects

#### Acute toxicity

Not available.

#### Irritation/Corrosion

Not available.

#### Sensitization

Not available.

#### Mutagenicity

Not available.

#### Carcinogenicity

Not available.

#### Reproductive toxicity

Not available.

#### Teratogenicity

Not available.

#### Specific target organ toxicity (single exposure)

Not available.

#### Specific target organ toxicity (repeated exposure)

Not available.

#### Aspiration hazard

Not available.

**Information on the likely routes of exposure** : Not available.

### Potential acute health effects

- Eye contact** : Liquid can cause burns similar to frostbite.
- Inhalation** : No known significant effects or critical hazards.
- Skin contact** : Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.
- Ingestion** : Ingestion of liquid can cause burns similar to frostbite.

### Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:, frostbite
- Inhalation** : No specific data.
- Skin contact** : Adverse symptoms may include the following:, frostbite
- Ingestion** : Adverse symptoms may include the following:, frostbite

### Delayed and immediate effects and also chronic effects from short and long term exposure

#### Short term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

#### Long term exposure

**Potential immediate effects** : Not available.

**Potential delayed effects** : Not available.

## Section 11. Toxicological information

### Potential chronic health effects

Not available.

<b>General</b>	: No known significant effects or critical hazards.
<b>Carcinogenicity</b>	: No known significant effects or critical hazards.
<b>Mutagenicity</b>	: No known significant effects or critical hazards.
<b>Teratogenicity</b>	: No known significant effects or critical hazards.
<b>Developmental effects</b>	: No known significant effects or critical hazards.
<b>Fertility effects</b>	: No known significant effects or critical hazards.

### Numerical measures of toxicity

#### Acute toxicity estimates

Not available.

## Section 12. Ecological information

### Toxicity

Not available.

### Persistence and degradability

Not available.

### Bioaccumulative potential

Product/ingredient name	LogP <sub>ow</sub>	BCF	Potential
Propane	1.09	-	low

### Mobility in soil






**Soil/water partition coefficient (K<sub>oc</sub>)** : Not available.

**Other adverse effects** : No known significant effects or critical hazards.

## Section 13. Disposal considerations

**Disposal methods** : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

## Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1978	UN1978	UN1978	UN1978	UN1978
UN proper shipping name	PROPANE	PROPANE	PROPANE	PROPANE	PROPANE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

### Additional information

#### DOT Classification

: **Limited quantity**  
Yes.

#### Packaging instruction

##### Passenger aircraft

Quantity limitation: Forbidden.

##### Cargo aircraft

Quantity limitation: 150 kg

#### Special provisions

19, T50

For domestic transportation only, UN1075 may be substituted for the UN number shown as long as the substitution is consistent on package markings, shipping papers, and emergency response information. See 49 CFR 172.102 Special Provision 19.

Containers of NON-ODORIZED liquefied petroleum gas must be marked either NON-ODORIZED or NOT ODORIZED as of September 30, 2006. [49 CFR 172.301(f), 326(d), 330(c) and 338(e)]

#### TDG Classification

: Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).

**Explosive Limit and Limited Quantity Index** 0.125

**ERAP Index** 3000

**Passenger Carrying Ship Index** 65

**Passenger Carrying Road or Rail Index** Forbidden

**Special provisions** 29, 42

#### IATA

: **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

#### Special precautions for user

: **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

#### Transport in bulk according to Annex II of MARPOL and the IBC Code

: Not available.

## Section 15. Regulatory information

**U.S. Federal regulations** : TSCA 8(a) CDR Exempt/Partial exemption: Not determined  
**Clean Air Act (CAA) 112 regulated flammable substances:** propane

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Not listed

**Clean Air Act Section 602 Class I Substances** : Not listed

**Clean Air Act Section 602 Class II Substances** : Not listed

**DEA List I Chemicals (Precursor Chemicals)** : Not listed

**DEA List II Chemicals (Essential Chemicals)** : Not listed

### SARA 302/304

#### Composition/information on ingredients

No products were found.

**SARA 304 RQ** : Not applicable.

### SARA 311/312

**Classification** : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

### State regulations

**Massachusetts** : This material is listed.

**New York** : This material is not listed.

**New Jersey** : This material is listed.

**Pennsylvania** : This material is listed.

### International regulations

#### Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

#### Montreal Protocol (Annexes A, B, C, E)

Not listed.

#### Stockholm Convention on Persistent Organic Pollutants

Not listed.

#### Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

#### UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

### Inventory list

**Australia** : This material is listed or exempted.

**Canada** : This material is listed or exempted.

**China** : This material is listed or exempted.

**Europe** : This material is listed or exempted.

**Japan** : **Japan inventory (ENCS):** This material is listed or exempted.  
**Japan inventory (ISHL):** This material is listed or exempted.

**Malaysia** : This material is listed or exempted.

**New Zealand** : This material is listed or exempted.

**Philippines** : This material is listed or exempted.

**Republic of Korea** : This material is listed or exempted.

## Section 15. Regulatory information

<b>Taiwan</b>	: This material is listed or exempted.
<b>Thailand</b>	: Not determined.
<b>Turkey</b>	: This material is listed or exempted.
<b>United States</b>	: This material is listed or exempted.
<b>Viet Nam</b>	: Not determined.

## Section 16. Other information

### Hazardous Material Information System (U.S.A.)

Health	/	2
Flammability		4
Physical hazards		3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

### Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment

### History

<b>Date of printing</b>	: 5/6/2018
<b>Date of issue/Date of revision</b>	: 5/6/2018
<b>Date of previous issue</b>	: 6/28/2017
<b>Version</b>	: 1

### Key to abbreviations

: ATE = Acute Toxicity Estimate
: BCF = Bioconcentration Factor
: GHS = Globally Harmonized System of Classification and Labelling of Chemicals
: IATA = International Air Transport Association
: IBC = Intermediate Bulk Container
: IMDG = International Maritime Dangerous Goods
: LogPow = logarithm of the octanol/water partition coefficient
: MARPOL = International Convention for the Prevention of Pollution From Ships, 1973

## Section 16. Other information

as modified by the Protocol of 1978. ("Marpol" = marine pollution)  
UN = United Nations

### References

: Not available.

### Other special considerations

: The information below is given to call attention to the issue of "Naturally occurring radioactive materials". Although Radon-222 levels in the product represented by this MSDS do not present any direct Radon exposure hazard, customers should be aware of the potential for Radon daughter build up within their processing systems, whatever the source of their product streams. Radon-222 is a naturally occurring radioactive gas which can be a contaminant in natural gas. During subsequent processing, Radon tends to be concentrated in Liquefied Petroleum Gas streams and in product streams having a similar boiling point range. Industry experience has shown that this product may contain small amounts of Radon-222 and its radioactive decay products, called Radon "daughters". The actual concentration of Radon-222 and radioactive daughters in the delivered product is dependent on the geographical source of the natural gas and storage time prior to delivery. Process equipment (i.e. lines, filters, pumps and reaction units) may accumulate significant levels of radioactive daughters and show a gamma radiation reading during operation. A potential external radiation hazard exists at or near any pipe valve or vessel containing a Radon enriched stream, or containing internal deposits of radioactive material due to the transmission of gamma radiation through its wall. Field studies reported in the literature have not shown any conditions that subject workers to cumulative exposures in excess of general population limits. Equipment emitting gamma radiation should be presumed to be internally contaminated with alpha emitting decay products which may be a hazard if inhaled or ingested. Protective equipment such as coveralls, gloves, and respirator (NIOSH/MHSA approved for high efficiency particulates and radionuclides, or supplied air) should be worn by personnel entering a vessel or working on contaminated process equipment to prevent skin contamination, ingestion, or inhalation of any residues containing alpha radiation. Airborne contamination may be minimized by handling scale and/or contaminated materials in a wet state.

### Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Revised January 1, 2014

# MSDS

## Material Safety Data Sheet

### PRODUCT NAME: SLAG

#### 1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

##### Supplier

Name: R. W. Sidley, Inc.  
Address: 436 Casement Avenue  
Painesville, OH 44077  
Telephone: 440-352-9343

##### Product Identifier

Blast Furnace Slag, Steel Slag, Granulated Slag, Pelletized Slag, Metallic Slag, Air Cooled Slag, Non-metallic Slag, Mill Scale

Note: This MSDS covers many products. Individual composition of hazardous constituents will vary.

WHMIS Classification: D2A

Emergency Telephone Numbers 440-352-9343

#### 2. INFORMATION ON COMPONENTS

Component Name	%	CAS No.
Amorphous Silica, Hydrated	30 - 50	7631-86-9
Calcium Compounds	30 - 50	various
Aluminum Compounds	0 - 20	various
Crystalline Silica	0 - 15	14808-60-7
Magnesium Compounds	0 - 20	various
Iron Compounds	0 - 10	various
Titanium Compounds	0 - 5	various
Manganese Compounds	0 - 2	various

Component Name	EXPOSURE LIMITS	
	OSHA PEL TWA	ACGIH TLV TWA
*Amorphous Silica Hydrated	(80 mg/m <sup>3</sup> )/(%SiO <sub>2</sub> )	
Uncalcined Respirable		*3 mg/m <sup>3</sup>
Particulate		*10 mg/m <sup>3</sup>
Uncalcined Inhalable Particulate		
Calcium Oxide	5 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>
Aluminum Oxide		
(Respirable Fraction)	5 mg/m <sup>3</sup>	
(Total Dust)	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Crystalline Silica Quartz		
Quartz (Respirable )	10 mg/m <sup>3</sup> /(%SiO <sub>2</sub> +2)	
Quartz (Total Dust)	30 mg/m <sup>3</sup> /(%SiO <sub>2</sub> +2)	0.05 mg/m <sup>3</sup>
Magnesium Oxide	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Iron Oxide	10 mg/m <sup>3</sup>	5 mg/(Fe)/m <sup>3</sup>
Titanium Oxide		
(Total Dust)	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Manganese Oxide		5 mg/m <sup>3</sup>
Nuisance Dust		
(Respirable)	5 mg/m <sup>3</sup>	3 mg/m <sup>3</sup>
(Total /Inhalable)	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>

\* These values are for particulate matter containing no asbestos and < 1% crystalline silica

#### 3. HAZARD IDENTIFICATION

##### Emergency Overview

Solid; light grey/brown; odorless.

##### Potential Health Effects

INHALATION (acute): Breathing dust may cause nose, throat or lung irritation and choking. The described effect depends on the degree of exposure.

INHALATION (chronic): Prolonged or repeated exposure may cause lung injury including silicosis. This product may contain crystalline silica. Crystalline silica has been classified by IARC as a known human carcinogen. Some human studies indicate potential for lung cancer from crystalline silica exposure. Risk of injury depends on duration and level of exposure. Long term exposures which result in silicosis may result in additional health effects.

EYE CONTACT (acute/chronic): May cause eye irritation, burns and damage to cornea.

SKIN CONTACT (acute/chronic): May cause dry skin, redness, discomfort, irritation. Thickening of the skin (scleroderma) may be associated with exposure to high levels of crystalline silica.

INGESTION (acute/chronic): Ingestion of large amounts may cause intestinal distress.

#### 4. FIRST AID MEASURES

INHALATION: Move person to fresh air. Seek medical attention for discomfort.

EYE CONTACT: Rinse thoroughly with water. Seek medical attention for abrasions.

SKIN CONTACT: Wash with soap and water.

INGESTION: Do not induce vomiting, but drink plenty of water. Seek medical attention for discomfort.

#### 5. FIREFIGHTING MEASURES

Flashpoint and Method: None.

Flammable Limits: Not combustible.

Autoignition Temperature: None.

General Hazard: Avoid breathing dust.

Firefighting Instructions: Treat adjacent material.

Firefighting Equipment: This product is not a fire hazard. Self contained breathing apparatus is recommended to limit exposures to smoke from any combustion source.

Hazardous Combustion Products: None.



**6. ACCIDENTAL RELEASE MEASURES**

**General:** Wind blown dust may cause the hazards identified in Section 3. Remove spilled material to limit potential harm.

**Land Spill:** Clean up spilled material.

**Water Spill:** Clean up spilled material.

**7. HANDLING AND STORAGE**

**General:** Avoid accidental release.

**Storage Temperature:** Unlimited.

**Storage Pressure:** Unlimited.

**Empty Containers:** Dispose of containers in an approved landfill or incinerator.

**8. EXPOSURE CONTROL & PERSONAL PROTECTION****Engineering Controls**

Use exhaust ventilation to maintain dust levels below exposure limits in workplaces with poor ventilation and dusty conditions.

**Personal Protection**

**RESPIRATORY PROTECTION:** Under ordinary conditions no respiratory protection is required. Wear a NIOSH approved respirator when exposed to dust above exposure limits.

**EYE PROTECTION:** Wear glasses or safety goggles to prevent contact with eyes. Wearing contact lenses when using this product under dusty conditions is not recommended.

**SKIN PROTECTION:** Wear impervious gloves, shoes and protective clothing to prevent skin contact.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

Vapor Pressure:	Not measurable
Vapor Density:	Not measurable
Specific Gravity:	2.5 - 3.0
Solubility in Water:	Negligible
Evaporation Rate:	Not measurable
pH (in water):	Neutral
Boiling Point:	>1000 <sup>o</sup> C
Freezing Point:	None, solid
Viscosity:	None, solid

**10. STABILITY AND REACTIVITY**

**General:** Product is stable.

**Incompatible Materials and Conditions to Avoid:** Dissolves in hydrofluoric acid producing corrosive silicon tetrafluoride gas. Silicates react with powerful oxidizers such as fluorine, chlorine trifluoride and oxygen difluoride.

**Hazardous Decomposition:** None, solid.

**11. MSDS PREPARATION AND TOXICOLOGICAL INFORMATION**

For detailed toxicological information contact:

Environment , Health & Safety and Government Affairs  
R. W. Sidley, Inc.  
436 Casement Avenue  
Painesville, OH 44077  
440-352-9343

**12. ECOLOGICAL INFORMATION**

For detailed ecological information: See Section 11 above.

**13. DISPOSAL CONSIDERATIONS**

Dispose in landfill in accordance with all applicable regulations. Any disposal practice must be in compliance with local, provincial, state and federal laws and regulations. Contact local environmental agency for specific rules.

**14. REQUIRED TRANSPORT INFORMATION**

Not a hazardous material for DOT or TDG shipping.

**15. REGULATORY INFORMATION**

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

**OSHA Hazard Communication Rule, 29 CFR 1910.1200:**

Some constituents identified in this product are considered by OSHA to be hazardous and should be included in the employer's hazard communication program.

**CERCLA/SUPERFUND, 40 CFR 117,302:**

Not listed.

**SARA TITLE III, Sections 311-312 Hazard Category:**

This product has been reviewed according to the EPA Hazard Categories promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 and is considered a hazardous chemical and a delayed health hazard.

**SARA Section 313 Information:**

This product contains NONE of the substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

**Toxic Substance Control Act (TSCA):**

Some constituents identified in this product are listed on the TSCA Inventory.

**California Proposition 65:**

CHRYSTALLINE SILICA (CAS - 14808-60-7) is considered to be a carcinogen by the state of California.

**WHMIS Information**

This product contains substances considered to be hazardous by Health Canada and is a controlled product. Consult local authorities for acceptable exposure limits. WHMIS <http://www.hc-sc.gc.ca/whmis>

**16. OTHER INFORMATION**

Abbreviations:

CAS No	Chemical Abstract Service number
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
ACGIH	American Conference of Governmental Industrial Hygienists
TLV	Threshold Limit Value
TWA	Time Weighted Average (8 hour)
CL	Ceiling Limit
mg/m <sup>3</sup>	milligrams per cubic meter
IARC	International Agency for Research on Cancer
NIOSH	National Institute for Occupational Safety and Health
pH	negative log of hydrogen ion
>	greater than
DOT	U.S. Department of Transportation
TDG	Transportation of Dangerous Goods
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
SARA	Superfund Amendments and Reauthorization Act
WHMIS	Workplace Hazardous Materials Information System

Information in this MSDS is believed to be current and accurate at the time provided. It is the user's obligation to determine the conditions of safe use of this product.



## Search the Pocket Guide

SEARCH

Enter search terms separated by spaces.

## Styrene

**Synonyms & Trade Names** Ethenyl benzene, Phenylethylene, Styrene monomer, Styrol, Vinyl benzene**CAS No.** 100-42-5**RTECS No.**  
WL3675000 ([/niosh-rtecs/WL381378.html](http://www.niosh-rtecs.com/WL381378.html))**DOT ID & Guide** 2055 128P (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=128&poly=1>)   
(<http://www.cdc.gov/Other/disclaimer.html>) (inhibited)**Formula** C<sub>6</sub>H<sub>5</sub>CH=CH<sub>2</sub>**Conversion** 1 ppm =  
4.26 mg/m<sup>3</sup>**IDLH** 700 ppm  
See: [100425](http://www.niosh.gov/IDLH/100425.html) ([/niosh/idlh/100425.html](http://www.niosh.gov/IDLH/100425.html))**Exposure Limits****NIOSH REL** : TWA 50 ppm (215 mg/m<sup>3</sup>) ST  
100 ppm (425 mg/m<sup>3</sup>)  
**OSHA PEL** † ([nengapdxg.html](http://www.nengapdxg.html)): TWA 100 ppm C  
200 ppm 600 ppm (5-minute maximum peak  
in any 3 hours)**Measurement Methods****NIOSH** [1501](http://www.niosh.gov/docs/2003-154/pdfs/1501.pdf) ([/niosh/docs/2003-154/pdfs/1501.pdf](http://www.niosh.gov/docs/2003-154/pdfs/1501.pdf)), [3800](http://www.niosh.gov/docs/2003-154/pdfs/3800.pdf) ([/niosh/docs/2003-154/pdfs/3800.pdf](http://www.niosh.gov/docs/2003-154/pdfs/3800.pdf));  
**OSHA** [9](http://www.osha.gov/dts/sltc/methods/organic/org009/org009.html)  
(<http://www.osha.gov/dts/sltc/methods/organic/org009/org009.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>), [89](http://www.osha.gov/dts/sltc/methods/organic/org089/org089.html)  
(<http://www.osha.gov/dts/sltc/methods/organic/org089/org089.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>)  
See: **NMAM** ([/niosh/docs/2003-154/](http://www.niosh.gov/docs/2003-154/)) or **OSHA Methods**  
(<http://www.osha.gov/dts/sltc/methods/index.html>)   
(<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless to yellow, oily liquid with a sweet, floral odor.**MW:**  
104.2**BP:**  
293°F**FRZ:**  
-23°F**Sol:**  
0.03%**VP:** 5 mmHg**IP:** 8.40 eV**Sp.Gi** Endpoint Security by Bitdefender  
0.91 This page is safe**Class IC Flammable Liquid:** Fl.F. at or above 73°F and below 100°F.**Incompatibilities & Reactivities** Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, aluminum chloride  
[Note: May polymerize if contaminated or subjected to heat. Usually contains an inhibitor such as tert-butylcatechol.]**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects**Target Organs** Eyes, skin, respiratory system, central nervous system, liver, reproductive system**Personal Protection/Sanitation** (See protection codes ([protect.html](http://www.cdc.gov/NIOSH/PPG/protect.html)))**Skin:** Prevent skin contact**First Aid** (See procedures ([firstaid.html](http://www.cdc.gov/NIOSH/PPG/firstaid.html)))**Eye:** Irrigate immediately**Skin:** Water flush

**Eyes:** Prevent eye contact**Wash skin:** When contaminated**Remove:** When wet (flammable)**Change:** No recommendation**Breathing:** Respiratory support**Swallow:** Medical attention immediately**Respirator Recommendations****NIOSH****Up to 500 ppm:**

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

**Up to 700 ppm:**

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode\*

(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

**Emergency or planned entry into unknown concentrations or IDLH conditions:**

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0073 \(/niosh/ipcsneng/neng0073.html\)](#)See MEDICAL TESTS: [0214 \(/niosh/docs/2005-110/nmedo214.html\)](#)

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# Toluene

**Synonyms & Trade Names** Methyl benzene, Methyl benzol, Phenyl methane, Toluol

**CAS No.** 108-88-3

**RTECS No.**

[XS5250000 \(/niosh-rtecs/XS501BDo.html\)](#)

**DOT ID & Guide** 1294 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130>) (<http://www.cdc.gov/Other/disclaimer.html>)

**Formula** C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>

**Conversion** 1 ppm = 3.77 mg/m<sup>3</sup>

**IDLH** 500 ppm  
See: [108883 \(/niosh/idlh/108883.html\)](#)

### Exposure Limits

**NIOSH REL** : TWA 100 ppm (375 mg/m<sup>3</sup>)

ST 150 ppm (560 mg/m<sup>3</sup>)

**OSHA PEL** † ([nengapdxg.html](#)): TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)

### Measurement Methods

NIOSH [1500](#) ([/niosh/docs/2003-154/pdfs/1500.pdf](#)), [1501](#)

([/niosh/docs/2003-154/pdfs/1501.pdf](#)), [3800](#)

([/niosh/docs/2003-154/pdfs/3800.pdf](#)), [4000](#)

([/niosh/docs/2003-154/pdfs/4000.pdf](#));

OSHA [111](#)

(<http://www.osha.gov/dts/sltc/methods/organic/org111/org111.html>)

(<http://www.cdc.gov/Other/disclaimer.html>)

See: [NMAM \(/niosh/docs/2003-154/\)](#) or [OSHA Methods](#)

[sltc/methods/index.html](#)

[/disclaimer.html](#)

Endpoint Security by Bitdefender

This page is safe

**Physical Description** Colorless liquid with a sweet, pungent, benzene-like odor.

**MW:**

92.1

**BP:**

232°F

**FRZ:**

-139°F

**Sol(74°F):**

0.07%

**VP:** 21 mmHg

**IP:** 8.82 eV

**Sp.Gr:**

0.87

**Fl.P:**

40°F

**UEL:**

7.1%

**LEL:** 1.1%

Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.

**Incompatibilities & Reactivities** Strong oxidizers

**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact

**Symptoms** irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage

**Target Organs** Eyes, skin, respiratory system, central nervous system, liver, kidneys

**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash promptly

**Eyes:** Prevent eye contact  
**Wash skin:** When contaminated  
**Remove:** When wet (flammable)  
**Change:** No recommendation

**Breathing:** Respiratory support  
**Swallow:** Medical attention immediately

### Respirator Recommendations

#### NIOSH

##### Up to 500 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

##### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

##### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0078](#)

[\(/niosh/ipcsneng/neng0078.html\)](#) See MEDICAL TESTS: [0232 \(/niosh/docs/2005-110/nmedo232.html\)](#)

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SEARCH

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## Trichloroethylene

**Synonyms & Trade Names** Ethylene trichloride, TCE, Trichloroethene, Trilene**CAS No.** 79-01-6**RECS No.** [KX4550000](http://niosh-rtecs/KX456D7o.html)  
([/niosh-rtecs/KX456D7o.html](http://niosh-rtecs/KX456D7o.html))**DOT ID & Guide** 1710 160 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=160>)   
(<http://www.cdc.gov/Other/disclaimer.html>)**Formula** ClCH=CCl<sub>2</sub>**Conversion** 1 ppm = 5.37 mg/m<sup>3</sup>**IDLH** Ca [1000 ppm]  
See: [79016](http://niosh/idlh/79016.html) ([/niosh/idlh/79016.html](http://niosh/idlh/79016.html))**Exposure Limits****NIOSH REL** : Ca [See Appendix A \(nengapdxa.html\)](http://nengapdxa.html)  
[See Appendix C \(nengapdx.html\)](http://nengapdx.html)**OSHA PEL** † ([nengapdxg.html](http://nengapdxg.html)): TWA 100 ppm C  
200  
in arEndpoint Security by Bitdefender  
This page is safe**Measurement Methods****NIOSH 1022** ([/niosh/docs/2003-154/pdfs/1022.pdf](http://niosh/docs/2003-154/pdfs/1022.pdf)),  
**3800** ([/niosh/docs/2003-154/pdfs/3800.pdf](http://niosh/docs/2003-154/pdfs/3800.pdf));**OSHA 1001**[v/dts/sltc/methods/mdt/mdt1001/1001.html](http://www.osha-slc/methods/mdt/mdt1001/1001.html)  
[gov/Other/disclaimer.html](http://www.osha.gov/Other/disclaimer.html)[1/docs/2003-154/](http://www.osha.gov/dts/sltc/methods/index.html) or **OSHA Methods**[\(<http://www.osha.gov/dts/sltc/methods/index.html>\)](http://www.osha.gov/dts/sltc/methods/index.html)   
[\(<http://www.cdc.gov/Other/disclaimer.html>\)](http://www.cdc.gov/Other/disclaimer.html)**Physical Description** Colorless liquid (unless dyed blue) with a chloroform-like odor.**MW:**  
131.4**BP:**  
189°F**FRZ:** -99°F**Sol:** 0.1%**VP:** 58 mmHg**IP:** 9.45 eV**Sp.Gr:**  
1.46**Fl.P:** ?**UEL(77°F):**  
10.5%**LEL(77°F):**  
8%

Combustible Liquid, but burns with difficulty.

**Incompatibilities & Reactivities** Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]**Target Organs** Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system**Cancer Site** [in animals: liver & kidney cancer]**Personal Protection/Sanitation** ([See protection codes \(protect.html\)](http://protect.html))**First Aid** ([See procedures \(firstaid.html\)](http://firstaid.html))  
Eye: Irrigate immediately



Control Measures

Skin: Prevent skin contact  
 Eyes: Prevent eye contact  
 Wash skin: When contaminated  
 Remove: When wet or contaminated  
 Change: No recommendation  
 Provide: Eyewash, Quick drench

First Aid Measures

Skin: Soap wash promptly  
 Breathing: Respiratory support  
 Swallow: Medical attention immediately

**Respirator Recommendations****NIOSH**

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:**

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0081 \(/niosh/ipcsneng/neng0081.html\)](#)

See MEDICAL TESTS: [0236 \(/niosh/docs/2005-110/nmedo236.html\)](#)

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Version 1.9

-----  
Section 1 - Product and Company Information  
-----

Product Name VANADIUM(V) OXIDE  
Product Number V6881  
Brand SIGMA

Company Sigma-Aldrich  
Address 3050 Spruce Street  
SAINT LOUIS, MO 63103  
USA

Technical Phone: +1 800-325-5832  
Fax: +1 800-325-5052  
Emergency Phone: (314) 776-6555

-----Section 2 - Composition/Information on Ingredient  
-----

Substance Name	CAS #	SARA 313
VANADIUM (V) OXIDE	1314-62-1	Yes

Formula V2O5  
Synonyms Anhydride vanadique (French) \* C.I. 77938 \* Divanadium pentoxide \* RCRA waste number P120 \* Vanadic anhydride \* Vanadio, pentossido di (Italian) \* Vanadium (OSHA) \* Vanadium oxide (V2O5) \* Vanadium pentaoxide \* Vanadiumpentoxid (German) \* Vanadium pentoxide (ACGIH) \* Vanadiumpentoxyde (Dutch) \* Vanadium, pentoxyde de (French) \* Wanadu pieciotlenek (Polish)

RTECS Number: YW2450000

-----Section 3 - Hazards Identification  
-----

## EMERGENCY OVERVIEW

Highly Toxic (USA) Very Toxic (EU). Dangerous for the environment. Very toxic by inhalation and if swallowed. Irritating to eyes and respiratory system. Limited evidence of a carcinogenic effect. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Possible risk of harm to the unborn child. Possible mutagen. Target organ(s): Lungs. Calif. Prop. 65 carcinogen.

## HMIS RATING

HEALTH: 3\*  
FLAMMABILITY: 0  
REACTIVITY: 0

## NFPA RATING

HEALTH: 3  
FLAMMABILITY: 0  
REACTIVITY: 0

\*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

SIGMA - V6881

Page 1

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

-----  
Section 5 - Fire Fighting Measures  
-----

FLASH POINT

N/A

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Noncombustible. Use extinguishing media appropriate to surrounding fire conditions.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.  
Specific Hazard(s): Emits toxic fumes under fire conditions.

-----  
Section 6 - Accidental Release Measures  
-----

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL

Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)

Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

-----  
Section 7 - Handling and Storage  
-----

HANDLING

User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed.

ENGINEERING CONTROLS

Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.

Hand: Compatible chemical-resistant gloves.

Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	0.05 MG/M3 (RESPIRABLE DUST)
USA	MSHA Standard-air	Ceiling	co0.5 MG/M3
USA	OSHA.	PEL	CL 0.5 MG(V2O5)/M3, RESPIRABLE
USA	NIOSH	Ceiling	co0.05 MG/M3/15M

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	0.05 MG/M3
Poland		NDSch	0.5 MG/M3
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	181.88 AMU	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	690 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	1.02 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	

Miscellaneous Data N/A  
Solubility N/A

N/A = not available

-----  
Section 10 - Stability and Reactivity  
-----

STABILITY

Stable: Stable.

Materials to Avoid: Strong acids.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Nature of decomposition products not known.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

-----  
Section 11 - Toxicological Information  
-----

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.

Skin Absorption: Skin absorption may occur. May be harmful if absorbed through the skin.

Eye Contact: Causes eye irritation.

Inhalation: Material is irritating to mucous membranes and upper respiratory tract. Highly toxic by inhalation.

Ingestion: Highly toxic by ingestion.

SENSITIZATION

Sensitization: Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

TARGET ORGAN(S) OR SYSTEM(S)

Lungs.

SIGNS AND SYMPTOMS OF EXPOSURE

Repeated exposure may result in a greenish discoloration of the tongue and may result in sensitivity to vanadium and its compounds. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral

Rat

10 mg/kg

LD50

Remarks: Behavioral:Coma.

Inhalation

Rat

126 mg/m3

LC50

Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Other. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Intraperitoneal

Rat

12 MG/KG

Subcutaneous

Rat

14 MG/KG

LD50

Remarks: Behavioral:Coma.

Intratracheal

Rat

6 MG/KG

LD50

Oral

Mouse

5 mg/kg

LD50

Intraperitoneal

Mouse

23 MG/KG

LD50

Subcutaneous

Mouse

10 MG/KG

LD50

Skin

Rabbit

50 mg/kg

LD50

Remarks: Kidney, Ureter, Bladder:Other changes. Liver:Other changes.

#### IRRITATION DATA

Eyes

Rabbit

20 mg

24H

Remarks: Moderate irritation effect

#### ACGIH CARCINOGEN LIST

Rating: A4

#### CHRONIC EXPOSURE - TERATOGEN

Result: Possible risk of congenital malformation in the fetus.

Species: Rat

Dose: 180 MG/KG

Route of Application: Oral

Exposure Time: (6-15D PREG)

Result: Effects on Embryo or Fetus: Other effects to embryo.

Species: Rat

Dose: 50 MG/KG

Route of Application: Intraperitoneal

Exposure Time: (6-15D PREG)

Result: Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Other developmental abnormalities. Specific Developmental Abnormalities: Skin and skin appendages.

Dose: 5 MG/KG  
Route of Application: Intraperitoneal  
Exposure Time: (10D PREG)  
Result: Specific Developmental Abnormalities: Skin and skin appendages. Specific Developmental Abnormalities: Other developmental abnormalities. Specific Developmental Abnormalities: Musculoskeletal system.

Species: Mouse  
Dose: 85 MG/KG  
Route of Application: Intraperitoneal  
Exposure Time: (6-15D PREG)  
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Other developmental abnormalities.

Species: Mouse  
Dose: 85 MG/KG  
Route of Application: Intraperitoneal  
Exposure Time: (6-15D PREG)  
Result: Effects on Embryo or Fetus: Other effects to embryo.

Species: Mouse  
Dose: 10900 MG/KG  
Route of Application: Intravenous  
Exposure Time: (8D PREG)  
Result: Specific Developmental Abnormalities: Musculoskeletal system.

#### CHRONIC EXPOSURE - MUTAGEN

Result: Laboratory experiments have shown mutagenic effects.

Species: Human  
Dose: 300 NMOL/L  
Cell Type: leukocyte  
Mutation test: DNA damage

Species: Human  
Dose: 30 UMOL/L  
Cell Type: lymphocyte  
Mutation test: DNA damage

Species: Human  
Dose: 10 NMOL/L  
Cell Type: lymphocyte  
Mutation test: SLN

Species: Hamster  
Dose: 1 MG/L  
Cell Type: lung  
Mutation test: Micronucleus test

#### CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat  
Dose: 90 MG/KG  
Route of Application: Oral  
Exposure Time: (6-15D PREG)  
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).  
Effects on Embryo or Fetus: Fetal death.

Dose: 10 MG/KG  
Route of Application: Intraperitoneal  
Exposure Time: (6-15D PREG)  
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).  
Effects on Embryo or Fetus: Fetal death. Specific Developmental Abnormalities: Other developmental abnormalities.

Species: Rat  
Dose: 10 MG/KG  
Route of Application: Intraperitoneal  
Exposure Time: (6-15D PREG)  
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Mouse  
Dose: 179 MG/KG  
Route of Application: Intraperitoneal  
Exposure Time: (60D MALE)  
Result: Effects on Fertility: Male fertility index (e.g., # males impregnating females per # males exposed to fertile nonpregnant females). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Mouse  
Dose: 170 MG/KG  
Route of Application: Intraperitoneal  
Exposure Time: (60D MALE)  
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Fertility: Litter size (e.g.; # fetuses per litter; measured before birth). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse  
Dose: 170 MG/KG  
Route of Application: Intraperitoneal  
Exposure Time: (60D MALE)  
Result: Effects on Fertility: Male fertility index (e.g., # males impregnating females per # males exposed to fertile nonpregnant females). Paternal Effects: Testes, epididymis, sperm duct. Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count).

-----  
Section 12 - Ecological Information  
-----

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish  
Species: Pimephales promelas (Fathead minnow)  
Time: 96 h  
Value: 1.8 mg/l

Test Type: LC50 Fish  
Species: Onchorhynchus mykiss (Rainbow trout)  
Time: 96 h  
Value: 5.2 mg/l



Time: 48 h  
Value: 0.94 mg/l

-----  
Section 13 - Disposal Considerations  
-----

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations.

-----  
Section 14 - Transport Information  
-----

DOT

Proper Shipping Name: Vanadium pentoxide, [non-fused form]  
UN#: 2862  
Class: 6.1  
Packing Group: Packing Group III  
Hazard Label: Toxic substances.  
PIH: Not PIH

IATA

Proper Shipping Name: Vanadium pentoxide  
IATA UN Number: 2862  
Hazard Class: 6.1  
Packing Group: III

-----  
Section 15 - Regulatory Information  
-----

EU DIRECTIVES CLASSIFICATION

Symbol of Danger: T-N  
Indication of Danger: Toxic. Dangerous for the environment.  
R: 20/22-37-48/23-51/53-63-68  
Risk Statements: Harmful by inhalation and if swallowed.  
Irritating to respiratory system. Toxic: danger of serious damage to health by prolonged exposure through inhalation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Possible risk of harm to the unborn child. Possible risk of irreversible effects.  
S: 36/37-38-45-61  
Safety Statements: Wear suitable protective clothing and gloves. In case of insufficient ventilation, wear suitable respiratory equipment. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT

Indication of Danger: Highly Toxic (USA) Very Toxic (EU).  
Dangerous for the environment.  
Risk Statements: Very toxic by inhalation and if swallowed.  
Irritating to eyes and respiratory system. Limited evidence of a carcinogenic effect. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Possible risk of harm to the unborn child.  
Safety Statements: Wear suitable protective clothing and gloves. In case of insufficient ventilation, wear suitable respiratory equipment. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.  
US Statements: Possible mutagen. Target organ(s): Lungs. Calif.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes

NOTES: This product is subject to SARA section 313 reporting requirements.

TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65

California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes

NDSL: No

-----  
Section 16 - Other Information  
-----

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2007 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.



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## m-Xylene

**Synonyms & Trade Names** 1,3-Dimethylbenzene; meta-Xylene; m-Xylol**CAS No.** 108-38-3**RTECS No.**  
[ZE2275000 \(/niosh-rtecs/ZE22B6B8.html\)](#)**DOT ID & Guide** 1307 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130>) [↗](#)  
(<http://www.cdc.gov/Other/disclaimer.html>)**Formula** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>**Conversion** 1 ppm =  
4.34 mg/m<sup>3</sup>**IDLH** 900 ppm  
See: [95476 \(/niosh/idlh/95476.html\)](#)**Exposure Limits****NIOSH REL** : TWA 100 ppm (435 mg/m<sup>3</sup>)  
**ST** 150 ppm (655 mg/m<sup>3</sup>)  
**OSHA PEL** † ([nengapdxg.html](#)): TWA 100 ppm  
(435 mg/m<sup>3</sup>)

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**Measurement Methods****NIOSH 1501** [↗](#) ([/niosh/docs/2003-154/pdfs/1501.pdf](#)),  
**3800** [↗](#) ([/niosh/docs/2003-154/pdfs/3800.pdf](#));  
**OSHA 1002**  
(<http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html>)  
[↗](#) (<http://www.cdc.gov/Other/disclaimer.html>)  
[↗](#) ([/niosh/docs/2003-154/](#)) or **OSHA Methods**  
[s/sltc/methods/index.html](#)) [↗](#)  
(<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless liquid with an aromatic odor.**MW:**  
106.2**BP:**  
282°F**FRZ:**  
-54°F**Sol:**  
Slight**VP:** 9 mmHg**IP:** 8.56 eV**Sp.Gr:**  
0.86**Fl.P:**  
82°F**UEL:**  
7.0%**LEL:**  
1.1%

Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.

**Incompatibilities & Reactivities** Strong oxidizers, strong acids**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis**Target Organs** Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Change: No recommendation

#### Respirator Recommendations

##### NIOSH/OSHA

###### Up to 900 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

###### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

###### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0085 \(/niosh/ipcsneng/neng0085.html\)](#)

Page last reviewed: April 4, 2011

Page last updated: November 18, 2010

Content source: [National Institute for Occupational Safety and Health \(NIOSH\)](#) Education and Information Division

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## o-Xylene

**Synonyms & Trade Names** 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol**CAS No.** 95-47-6**RTECS No.**  
[ZE2450000 \(/niosh-  
rtecs/ZE256250.html\)](#)**DOT ID & Guide** 1307 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130>)   
(<http://www.cdc.gov/Other/disclaimer.html>)**Formula** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>**Conversion** 1 ppm =  
4.34 mg/m<sup>3</sup>**IDLH** 900 ppm  
See: [95476 \(/niosh/idlh/95476.html\)](#)**Exposure Limits****NIOSH REL** : TWA 100 ppm (435 mg/m<sup>3</sup>)  
ST 150 ppm (655 mg/m<sup>3</sup>)  
**OSHA PEL** † ([nengapdxg.html](#)): TWA 100 ppm  
(435 mg/m<sup>3</sup>)

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**Measurement Methods****NIOSH 1501** ([/niosh/docs/2003-154/pdfs/1501.pdf](#)),  
**3800** ([/niosh/docs/2003-154/pdfs/3800.pdf](#));  
**OSHA 1002**  
(<http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html>)  
 (<http://www.cdc.gov/Other/disclaimer.html>)  
[cs/2003-154/](#)) or **OSHA Methods**  
[s/sltc/methods/index.html](#))   
(<http://www.cdc.gov/Other/disclaimer.html>)**Physical Description** Colorless liquid with an aromatic odor.**MW:**  
106.2**BP:**  
292°F**FRZ:**  
-13°F**Sol:**  
0.02%**VP:** 7 mmHg**IP:** 8.56 eV**Sp.Gr:**  
0.88**Fl.P:**  
90°F**UEL:**  
6.7%**LEL:**  
0.9%**Class IC Flammable Liquid:** Fl.P. at or above 73°F and below 100°F.**Incompatibilities & Reactivities** Strong oxidizers, strong acids**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis**Target Organs** Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

REMOVE: WHICH NOT (RECOMMENDATION)

Change: No recommendation

#### Respirator Recommendations

##### NIOSH/OSHA

###### Up to 900 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

###### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

###### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0084 \(/niosh/ipcsneng/neng0084.html\)](#)

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## p-Xylene

**Synonyms & Trade Names** 1,4-Dimethylbenzene; para-Xylene; p-Xylol**CAS No.** 106-42-3**RTECS No.**[ZE2625000 \(/niosh-rtecs/ZE280DE8.html\)](#)**DOT ID & Guide** 1307 130 (<http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=130>) [☒](http://www.cdc.gov/Other/disclaimer.html)**Formula** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>**Conversion** 1 ppm = 4.41 mg/m<sup>3</sup>**IDLH** 900 ppm  
See: [95476 \(/niosh/idlh/95476.html\)](#)**Exposure Limits****NIOSH REL** : TWA 100 ppm (435 mg/m<sup>3</sup>) ST 150 ppm (655 mg/m<sup>3</sup>)**OSHA PEL** † ([nengapdxg.html](#)): TWA 100 ppm (435 mg/m<sup>3</sup>)**Measurement Methods****NIOSH 1501** [☒ \(/niosh/docs/2003-154/pdfs/1501.pdf\)](#), **3800** [☒ \(/niosh/docs/2003-154/pdfs/3800.pdf\)](#);**OSHA 1002**<http://www.osha.gov/dts/sltc/methods/mdt/mdt1002/1002.html>[☒ http://www.cdc.gov/Other/disclaimer.html](http://www.cdc.gov/Other/disclaimer.html)

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[docs/2003-154/\) or OSHA Methods](#)  
[ts/sltc/methods/index.html](#) [☒](#)<http://www.cdc.gov/Other/disclaimer.html>**Physical Description** Colorless liquid with an aromatic odor. [Note: A solid below 56°F.]**MW:**  
106.2**BP:**  
281°F**FRZ:**  
56°F**Sol:**  
0.02%**VP:** 9 mmHg**IP:** 8.44 eV**Sp.Gr:**  
0.86**Fl.P:**  
81°F**UEL:**  
7.0%**LEL:**  
1.1%**Class IC Flammable Liquid:** Fl.P. at or above 73°F and below 100°F.**Incompatibilities & Reactivities** Strong oxidizers, strong acids**Exposure Routes** inhalation, skin absorption, ingestion, skin and/or eye contact**Symptoms** irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis**Target Organs** Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys**Personal Protection/Sanitation** (See [protection codes \(protect.html\)](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet (flammable)

**First Aid** (See [procedures \(firstaid.html\)](#))

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately



Change: No recommendation

#### Respirator Recommendations

### NIOSH/OSHA

#### Up to 900 ppm:

(APF = 10) Any chemical cartridge respirator with organic vapor cartridge(s)\*

(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)\*

(APF = 10) Any supplied-air respirator\*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

#### Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

#### Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](#) See ICSC CARD: [0086 \(/niosh/ipcsneng/neng0086.html\)](#)

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## Zinc oxide

## Synonyms &amp; Trade Names Zinc peroxide

<b>CAS No.</b> 1314-13-2	<b>RTECS No.</b> <a href="/niosh-rtecs/ZH496510.html">ZH4810000 (/niosh-rtecs/ZH496510.html)</a>	<b>DOT ID &amp; Guide</b> 1516 143 ( <a href="http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=143">http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=143</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )
<b>Formula</b> ZnO	<b>Conversion</b>	<b>IDLH</b> 500 mg/m <sup>3</sup> See: <a href="/niosh/idlh/1314132.html">1314132 (/niosh/idlh/1314132.html)</a>
<b>Exposure Limits</b> <b>NIOSH REL</b> : Dust: TWA 5 mg/m <sup>3</sup> C 15 mg/m <sup>3</sup> Fume: TWA 5 mg/m <sup>3</sup> ST 10 mg/m <sup>3</sup> <b>OSHA PEL</b> † ( <a href="http://www.cdc.gov/Other/disclaimer.html">nengapdxg.html</a> ): TWA 5 mg/m <sup>3</sup> (fume) TWA 15 mg/m <sup>3</sup> (total dust) TWA 5 mg/m <sup>3</sup> (resp dust)		<b>Measurement Methods</b> <b>NIOSH 7303</b> ( <a href="/niosh/docs/2003-154/pdfs/7303.pdf">/niosh/docs/2003-154/pdfs/7303.pdf</a> ), <b>7502</b> ( <a href="/niosh/docs/2003-154/pdfs/7502.pdf">/niosh/docs/2003-154/pdfs/7502.pdf</a> ); <b>OSHA ID121</b> ( <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html">http://www.osha.gov/dts/sltc/methods/inorganic/id121/id121.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ), <b>ID143</b> ( <a href="http://www.osha.gov/dts/sltc/methods/inorganic/id143/id143.html">http://www.osha.gov/dts/sltc/methods/inorganic/id143/id143.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> ) See: <b>NMAM</b> ( <a href="/niosh/docs/2003-154/">/niosh/docs/2003-154/</a> ) or <b>OSHA Methods</b> ( <a href="http://www.osha.gov/dts/sltc/methods/index.html">http://www.osha.gov/dts/sltc/methods/index.html</a> ) ( <a href="http://www.cdc.gov/Other/disclaimer.html">http://www.cdc.gov/Other/disclaimer.html</a> )

## Physical Description White, odorless solid.

<b>MW:</b> 81.4	<b>BP:</b> ?	<b>MLT:</b> 3587°F	<b>Sol(64°F):</b> 0.0004%	<b>VP:</b> 0 mmHg (approx)	<b>IP:</b> NA
<b>Sp.Gr:</b> 5.61	<b>Fl.P:</b> NA	<b>UEL:</b> NA	<b>LEL:</b> NA		

## Noncombustible Solid

## Incompatibilities &amp; Reactivities Chlorinated rubber (at 419°F), water [Note: Slowly decomposed by water.]

Expo:

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**Symptoms** Metal fume fever: chills, fever, muscle aches, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function

**Target Organs** respiratory system**Personal Protection/Sanitation** ([See protection codes \(protect.html\)](#))

Skin: No recommendation  
 Eyes: No recommendation  
 Wash skin: No recommendation  
 Remove: No recommendation  
 Change: No recommendation

**First Aid** ([See procedures \(firstaid.html\)](#))

Breathing: Respiratory support

**Respirator Recommendations**

## NIOSH/OSHA

Up to 50 mg/m<sup>3</sup>:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 125 mg/m<sup>3</sup>:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter.

Up to 250 mg/m<sup>3</sup>:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 500 mg/m<sup>3</sup>:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

## Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

## Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#)

See also: [INTRODUCTION \(/niosh/npg/pgintrod.html\)](/niosh/npg/pgintrod.html) See ICSC CARD: [0208 \(/niosh/ipcsneng/nengo208.html\)](/niosh/ipcsneng/nengo208.html) See MEDICAL TESTS: [0246 \(/niosh/docs/2005-110/nmedo246.html\)](/niosh/docs/2005-110/nmedo246.html)

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## **APPENDIX D**

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# Confirmation of Suitability – Fill Material Supplier Form

## PART A – General Site Source Information

MDE Tracking No.: **0001-22**

Name of Entity Supplying Material: Tradepoint Atlantic

Address: 1600 Sparrows Point Boulevard

City: Sparrows Point

State: Maryland

Email: phaid@tradepointatlantic.com

Phone Number: (410) 709-1286

Supplying Facility Address: Tradepoint Atlantic

City: Sparrows Point

State: Maryland

Contact Name: Peter Haid

Email: phaid@tradepointatlantic.com

Phone Number: (410) 709-1286

## PART B – Fill Material Characterization Sampling

The number of representative samples to be collected for analysis for fill material is specified in the MDE *Innovative Reuse and Beneficial Use of Dredged Material Guidance Document*.<sup>1</sup> Additional information on all fill material types, including dredged material, is available in the *Fill Material and Soil Management Fact Sheet*.

1. Attach sampling and analysis plan.
2. Attach analytical results in a summary data table, including at a minimum; analyte name, sample date, location ID, result, units, and method.
3. Include name and/or certification number (if available) for laboratory performing the analysis.
4. Include any Phase 2 Report(s) or additional characterization data collected for the Supplier Site.

Check all that apply and list number of samples and volume in cubic yards of material in each category:

<input type="checkbox"/> Category 1	Number of samples: _____	Volume: _____ cy
<input checked="" type="checkbox"/> Category 2	Number of samples: <u>32</u>	Volume: <u>350,000</u> cy
<input type="checkbox"/> Category 3	Number of samples: _____	Volume: _____ cy

## PART C – Maryland Department of the Environment (MDE) Approval (for MDE use only)

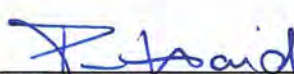
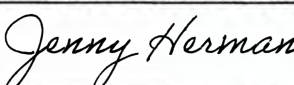
The MDE has determined that the fill material described in Parts A & B and accompanying documents is acceptable for use at sites with the following Land Use Classification Category, as described in the *Innovative Reuse and Beneficial Use of Dredged Material Guidance Document*. Note that this form can be used for dredged material and all other types of fill material.

The MDE has reviewed the information contained in this form and the accompanying attachments. Based upon the information provided to MDE, it has determined that chemical composition of the material is consistent with the following classification and may be used at a property with the following land use:

Land Use Classification	Quantity of Material (Cubic Yards)
<input type="checkbox"/> Category 1 [1]	
<input checked="" type="checkbox"/> Category 2 [2]	VCP Landscape Clean Cap Material; Industrial Fill
<input type="checkbox"/> Category 3 [3]	

- (1) A Category 1 fill material may be used on properties where the land use classification is Category 1, 2 or 3.
- (2) A Category 2 fill material may be used on properties where the existing soils conform to Category 2 or 3 land use classification.
- (3) A Category 3 fill material may be used on properties where the existing soils conform to Category 3 land use classification.

## PART D – SIGNATURE BLOCKS

SUPPLIER		<u>3/11/22</u>
	OWNER/OPERATOR SUPPLYING FILL MATERIAL SIGNATURE	DATE
MDE		3/16/2022
	MDE SIGNATURE (Acknowledging Supplier and Characterization) <sup>2</sup>	DATE

<sup>1</sup> Should the fill material be processed or amended additional characterization will be required.  
<sup>2</sup> Copies of this signed form and analytical data will be provided to supplier, interim facility, and end user.  
 Note that all necessary State and local permits must be obtained.





## Confirmation of Suitability – Fill Material Supplier Form

<b>INSTRUCTIONS FOR CONFIRMATION OF SUITABILITY – FILL MATERIAL SUPPLIER FORM</b>	
<b>Part A – General Site Source Information</b>	
Name of Entity Supplying Fill Material	Insert the name of the entity that has supplied the fill material for reuse and is accumulating it at a land-based facility prior to its intended end use.
MDE Tracking Number	The Maryland Department of the Environment’s (MDE) Land Restoration Program (LRP) will assign a tracking number to the entity supplying the fill material when the sampling data is submitted for review.
Address	Insert the mailing address of the entity that has supplied the fill material.
City	Insert the city in which the entity’s mailing address is located.
State	Insert the state in which the entity’s mailing address is located.
Facility Address	Insert the entity’s facility address supplying the fill material.
City	Insert the city in which the entity’s facility is located.
State	Insert the state in which the entity’s facility is located.
Contact Name	Provide the name of the contact person for the entity that has supplied the fill material.
Email	Provide the email address of the contact person for the entity that has supplied the fill material.
Phone Number	Provide the primary phone number of the contact person for the entity that has supplied the fill material.
<b>Part B – Fill Material Characterization Sampling</b>	
Number of Samples	As explained in the text, the number of representative samples needed for characterizing and analyzing the fill material is specified in the <a href="#">MDE Guidance Document</a> and <a href="#">Fact Sheet</a> . The number of fill material samples collected shall follow the MDE guidance based on project size (cubic yards of material or acres covered), characteristics, recognized environmental conditions (RECs) and potential receptors. Sampling should include appropriate quality assurance and quality control measures, including collection of blind duplicate samples, matrix spikes, field blanks, rinsate/equipment blanks, and trip blanks, as necessary.
Categories	<p>Please select the most appropriate category for the fill material received and identify the volume of fill material.</p> <ul style="list-style-type: none"> <li>Category 1- residential, unrestricted use</li> <li>Category 2- non-residential, restricted use</li> <li>Category 3- non-residential, restricted use, cap required</li> <li>Category 4- unacceptable for reuse</li> </ul> <p><b><u>When selecting the category, this should be based on when the fill material is received and not after the fill material is processed for some future use.</u></b></p>
Volume (cy)	Amount of fill material anticipated to be classified under each category
<b>Part C – Maryland Department of the Environment (MDE) Approval (for MDE use only)</b>	
In this section, MDE shall review data for the fill material and identify the quantity of fill material eligible for a particular land use classification. For example, if a supplier has 500 cubic yards of fill material, the MDE shall review the data for the fill material. If all 500 cubic yards qualify for Category 1, the MDE will check the appropriate box and indicate that 500 cubic yards are eligible for this category.	
Land Use Classification	Please select the most appropriate category for the fill material received and identify the volume of fill material.
Quantity	Indicate the quantity of fill material for each land use classification to be innovatively reused/beneficially used.

Questions contact MDE’s Land Restoration Program at 410-537-3493.





# Confirmation of Suitability – Fill Material Supplier Form

## PART A – General Site Source Information

MDE Tracking No.: 0002-22

Name of Entity Supplying Material: Tradepoint Atlantic

Address: 1600 Sparrows Point Boulevard

City: Sparrows Point

State: Maryland

Email: phaid@tradepointatlantic.com

Phone Number: (410) 709-1286

Supplying Facility Address: Tradepoint Atlantic

City: Sparrows Point

State: Maryland

Contact Name: Peter Haid

Email: phaid@tradepointatlantic.com

Phone Number: (410) 709-1286

SUPPLIER

## PART B – Fill Material Characterization Sampling

The number of representative samples to be collected for analysis for fill material is specified in the MDE [Innovative Reuse and Beneficial Use of Dredged Material Guidance Document](#).<sup>1</sup> Additional information on all fill material types, including dredged material, is available in the [Fill Material and Soil Management Fact Sheet](#).

1. Attach sampling and analysis plan.
2. Attach analytical results in a summary data table, including at a minimum; analyte name, sample date, location ID, result, units, and method.
3. Include name and/or certification number (if available) for laboratory performing the analysis.
4. Include any Phase 2 Report(s) or additional characterization data collected for the Supplier Site.

Check all that apply and list number of samples and volume in cubic yards of material in each category:

<input type="checkbox"/> Category 1	Number of samples: _____	Volume: _____ cy
<input checked="" type="checkbox"/> Category 2	Number of samples: <u>16</u>	Volume: <u>180,000</u> cy
<input type="checkbox"/> Category 3	Number of samples: _____	Volume: _____ cy

## PART C – Maryland Department of the Environment (MDE) Approval (for MDE use only)

The MDE has determined that the fill material described in Parts A & B and accompanying documents is acceptable for use at sites with the following Land Use Classification Category, as described in the [Innovative Reuse and Beneficial Use of Dredged Material Guidance Document](#). Note that this form can be used for dredged material and all other types of fill material.


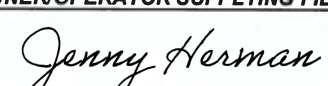
The MDE has reviewed the information contained in this form and the accompanying attachments. Based upon the information provided to MDE, it has determined that chemical composition of the material is consistent with the following classification and may be used at a property with the following land use:

Land Use Classification	Quantity of Material (Cubic Yards)
<input type="checkbox"/> Category 1 [1]	
<input checked="" type="checkbox"/> Category 2 [2]	Landfill cover and clean cap material;
<input type="checkbox"/> Category 3 [3]	

- (1) A Category 1 fill material may be used on properties where the land use classification is Category 1, 2 or 3.
- (2) A Category 2 fill material may be used on properties where the existing soils conform to Category 2 or 3 land use classification.
- (3) A Category 3 fill material may be used on properties where the existing soils conform to Category 3 land use classification.

MDE (for MDE Use Only)

## PART D – SIGNATURE BLOCKS

SUPPLIER		
	OWNER/OPERATOR SUPPLYING FILL MATERIAL SIGNATURE	3/11/22 DATE
MDE		
	MDE SIGNATURE (Acknowledging Supplier and Characterization) <sup>2</sup>	3/16/2022 DATE

<sup>1</sup> Should the fill material be processed or amended additional characterization will be required.  
<sup>2</sup> Copies of this signed form and analytical data will be provided to supplier, interim facility, and end user.  
 Note that all necessary State and local permits must be obtained.



## Confirmation of Suitability – Fill Material Supplier Form

INSTRUCTIONS FOR CONFIRMATION OF SUITABILITY – FILL MATERIAL SUPPLIER FORM	
<b>Part A – General Site Source Information</b>	
Name of Entity Supplying Fill Material	Insert the name of the entity that has supplied the fill material for reuse and is accumulating it at a land-based facility prior to its intended end use.
MDE Tracking Number	The Maryland Department of the Environment’s (MDE) Land Restoration Program (LRP) will assign a tracking number to the entity supplying the fill material when the sampling data is submitted for review.
Address	Insert the mailing address of the entity that has supplied the fill material.
City	Insert the city in which the entity’s mailing address is located.
State	Insert the state in which the entity’s mailing address is located.
Facility Address	Insert the entity’s facility address supplying the fill material.
City	Insert the city in which the entity’s facility is located.
State	Insert the state in which the entity’s facility is located.
Contact Name	Provide the name of the contact person for the entity that has supplied the fill material.
Email	Provide the email address of the contact person for the entity that has supplied the fill material.
Phone Number	Provide the primary phone number of the contact person for the entity that has supplied the fill material.
<b>Part B – Fill Material Characterization Sampling</b>	
Number of Samples	As explained in the text, the number of representative samples needed for characterizing and analyzing the fill material is specified in the <a href="#">MDE Guidance Document</a> and <a href="#">Fact Sheet</a> . The number of fill material samples collected shall follow the MDE guidance based on project size (cubic yards of material or acres covered), characteristics, recognized environmental conditions (RECs) and potential receptors. Sampling should include appropriate quality assurance and quality control measures, including collection of blind duplicate samples, matrix spikes, field blanks, rinsate/equipment blanks, and trip blanks, as necessary.
Categories	<p>Please select the most appropriate category for the fill material received and identify the volume of fill material.</p> <ul style="list-style-type: none"> <li>Category 1- residential, unrestricted use</li> <li>Category 2- non-residential, restricted use</li> <li>Category 3- non-residential, restricted use, cap required</li> <li>Category 4- unacceptable for reuse</li> </ul> <p><b><u>When selecting the category, this should be based on when the fill material is received and not after the fill material is processed for some future use.</u></b></p>
Volume (cy)	Amount of fill material anticipated to be classified under each category
<b>Part C – Maryland Department of the Environment (MDE) Approval (for MDE use only)</b>	
In this section, MDE shall review data for the fill material and identify the quantity of fill material eligible for a particular land use classification. For example, if a supplier has 500 cubic yards of fill material, the MDE shall review the data for the fill material. If all 500 cubic yards qualify for Category 1, the MDE will check the appropriate box and indicate that 500 cubic yards are eligible for this category.	
Land Use Classification	Please select the most appropriate category for the fill material received and identify the volume of fill material.
Quantity	Indicate the quantity of fill material for each land use classification to be innovatively reused/beneficially used.

Questions contact MDE’s Land Restoration Program at 410-537-3493.

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## **APPENDIX E**

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## **Utility Excavation NAPL Contingency Plan**

Revision 5 – September 20, 2022

### **Objectives:**

The purpose of this plan is to describe procedures to be followed in the event that non-aqueous phase liquid (NAPL) is encountered in utility trenches or other excavations during development of the Tradepoint Atlantic property. The specific objectives of this plan and the procedures outlined herein are:

1. To ensure identification and proper management of NAPL contaminated soils.
2. To ensure proper worker protection for working in areas of NAPL contamination.
3. To ensure that the installation of new utilities does not create new preferential flow paths for the migration of NAPL or soil vapors.

### **Identification of Oil & Grease and Petroleum Contaminated Soil:**

An Environmental Professional (EP) will be on-site to determine if soils show evidence of the presence of NAPL during installation of utility trenches or other excavation activities completed during development. NAPL-contaminated soils can be identified by the presence of free oil. Free oil (NAPL) is liquid oil which could potentially be drained or otherwise extracted from the soil, and is the focus of this contingency plan, although severe staining accompanied by odors may be addressed via similar contingency measures provided herein (based on the judgement of the EP).

If NAPL is encountered during construction, potentially impacted material from the excavation will be removed and separated on plastic / covered with the same. Additional discussion of removal of material is in the **Soil Excavation, Staging, Sampling and Disposal** section below. If NAPL is encountered in an area where there is no known historical NAPL impact, the MDE will be notified (see **Initial Reporting** section) and the open excavation may be allowed to sit overnight. If after removal of the initial material identified additional NAPL impacted material enters the open excavation, the extent of impacts may be delineated and additional material removed / segregated. .

### **Soil Excavation, Staging, Sampling and Disposal:**

The EP will monitor all utility trenching and excavation activities for signs of potential contamination. In particular, soils will be monitored with a hand-held photoionization detector (PID) for potential volatile organic compounds (VOCs) and will also be visually inspected for the presence of staining, petroleum waste materials, or other indications of NAPL contamination that may be different than what was already characterized.

Soil exhibiting physical evidence of NAPL contamination, which is located within a proposed new utility or subsurface structure (i.e., foundation, sump, electrical vault, underground tank, etc.), will

be excavated and segregated for disposal at the on-site nonhazardous landfill (Greys Landfill) or an off-site facility pending the completion of required analytical testing. If NAPL material continues to enter the open excavation, additional excavation may be continued in the field based on visual screening supplemented by the PID.

Any recovered NAPL impacted material will be segregated and collected for disposal. As required for disposal, samples impacted by NAPL will be collected for profiling/waste characterization and submitted to a fixed laboratory. Upon receipt of any additional characterization analytical results, the stockpiles will be tracked from generation to disposal.

### **Initial Reporting:**

If evidence of NAPL in soil or groundwater is encountered during excavation in an area with no known historic NAPL impact, it will be reported to the MDE. Information regarding the location and characteristics of NAPL contaminated material will be documented as follows:

- Location (Site / Parcel ID with map);
- Approximate extent of contamination (horizontally and vertically – prepare a sketch including dimensions);
- Relative degree of contamination (i.e. free oil with strong odor vs. staining); and
- Visual documentation (take photographs and complete a photograph log)

### **Utility Installations in Impacted Areas:**

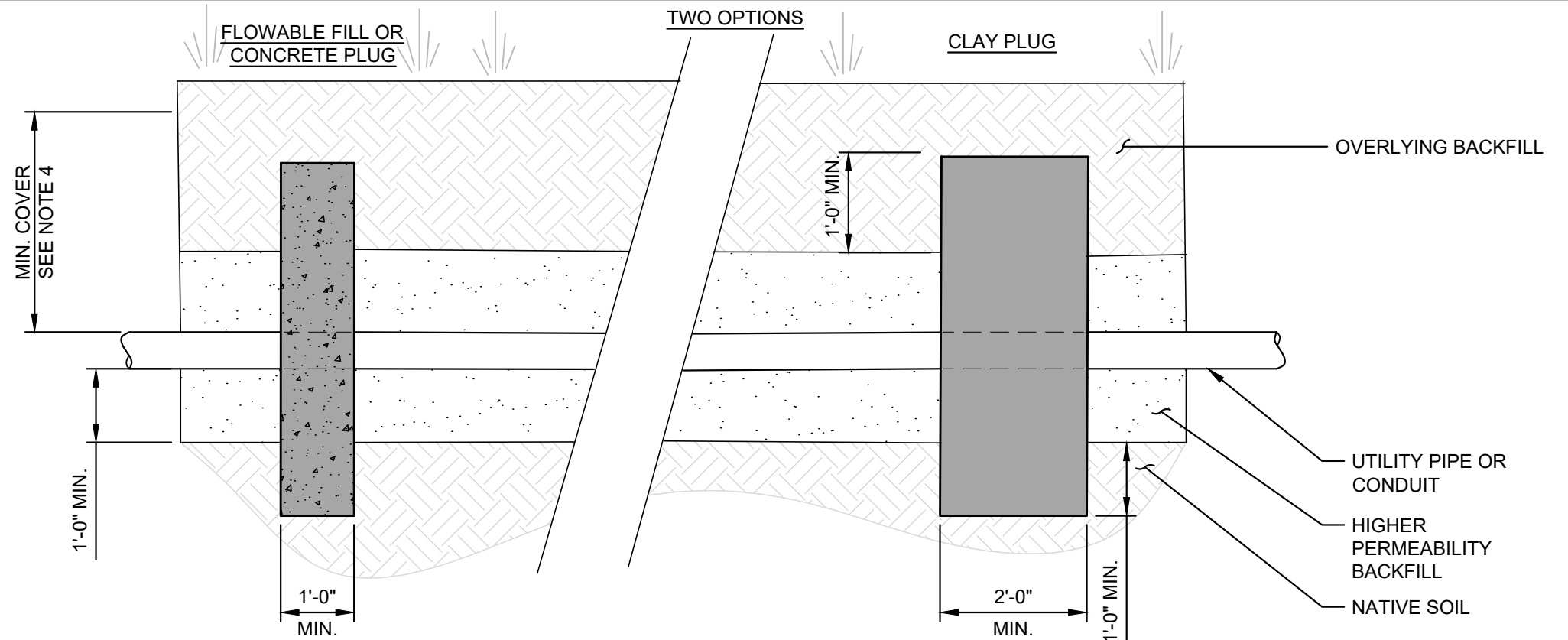
Underground piping or conduits installed through areas of known NAPL contamination shall be leak proof and water tight. All joints will be adequately sealed or gasketed, and pipes or conduits will be properly bedded and placed to prevent leakage. Trench backfill will meet the MDE definition of clean fill, or be otherwise approved by the MDE. Bedding must be properly placed and compacted below the haunches of the pipe. Clay, flowable fill, or concrete plugs may be placed every 100 feet across any permeable bedding to minimize the preferential flow and concentration of water along the bedding of such utilities.

If required, each trench plug will be constructed with a 2-foot-thick clay plug or 1-foot-thick flowable fill or concrete plug, perpendicular to the pipe, which extends at least 1 foot in all directions beyond the permeable pipe bedding. The plug acts as an anti-seep collar, and will extend above the top of the pipe. A specification drawing for installation of the trench plug has been provided as **Figure 1**.

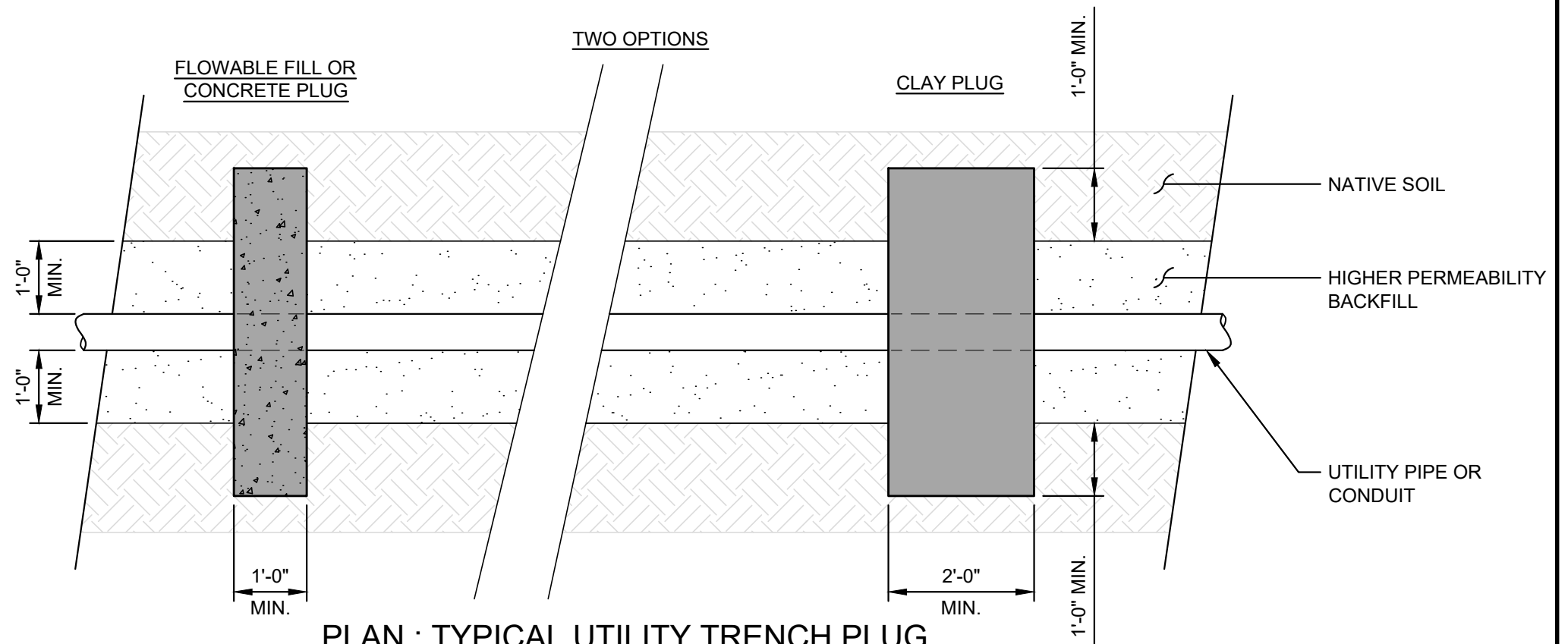


**GENERAL NOTES:**

1. ALL PIPES OR CONDUIT PASSING THROUGH AREAS OF PETROLEUM CONTAMINATION SHALL BE LEAK-PROOF AND WATERTIGHT. ALL JOINTS SHALL BE SEALED OR GASKETED.
2. ALL PIPES SHALL BE PROPERLY PLACED AND BEDDED TO PREVENT MISALIGNMENT OR LEAKAGE. PIPE BEDDING SHALL BE INSTALLED IN SUCH A MANNER AS TO MINIMIZE THE POTENTIAL FOR ACCUMULATION OF WATER AND CONCENTRATED INFILTRATION.
3. ANTI-SEEP COLLARS FROM THE PIPE MANUFACTURER, THAT ARE PRODUCED SPECIFICALLY FOR THE PURPOSE OF PREVENTING SEEPAGE AROUND THE PIPE, ARE ACCEPTABLE IF INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS, AND ONLY WITH PRIOR APPROVAL BY TPA.
4. MINIMUM COVER ABOVE UTILITY SHALL BE BASED ON SPECIFIC UTILITY REQUIREMENTS.
5. TRENCHES SHALL BE BACKFILLED WITH BEDDING AND MATERIALS APPROVED BY MDE.
6. FOR ADDITIONAL REQUIREMENTS, INCLUDING THE USE OF MDE VCP CLEAN FILL FOR INDUSTRIAL LAND USE AND INSTALLATION OF GEOTEXTILE MARKER FABRIC, REFER TO NOTE 5 ON THE TYPICAL UTILITY CROSS SECTIONS.
7. ALL UTILITIES INSTALLED THROUGH AREAS CONTAINING NAPL OR ELEVATED CHEMICAL IMPACTS WITH THE POTENTIAL TO TRANSMIT VAPORS ALONG PREFERENTIAL FLOW PATHWAYS SHALL BE EITHER 1) BACKFILLED WITH LOW PERMEABILITY BACKFILL MATERIAL (LESS THAN OR EQUAL TO THE PERMEABILITY OF THE EXISTING SUBGRADE), OR 2) INSTALLED WITH TRENCH PLUGS ALONG THE ALIGNMENT IN ACCORDANCE WITH THE DETAILS SHOWN ON THIS PLAN AND THE FOLLOWING NOTES:
  - A.) UTILITY TRENCH PLUGS SHALL BE INSTALLED AT 100-FOOT (MAX.) INTERVALS THROUGH ALL AREAS OF NAPL CONTAMINATION.
  - B.) UTILITY TRENCH PLUGS SHALL EXTEND A MINIMUM OF 1-FOOT IN ALL DIRECTIONS BEYOND ANY HIGHER PERMEABILITY BACKFILL MATERIALS (I.E., MATERIALS EXCEEDING THE PERMEABILITY OF THE EXISTING SUBGRADE).



**SECTION : TYPICAL UTILITY TRENCH PLUG**



**PLAN : TYPICAL UTILITY TRENCH PLUG**

This drawing, its contents, and each component of this drawing are the property of and proprietary to ARM Group LLC, and shall not be reproduced or used in any manner except for the purpose identified on the Title Block, and only by or on behalf of this client for the identified project unless otherwise authorized by the express, written consent of ARM Group LLC.



**UTILITY TRENCH PLUG**  
Sparrows Point Site  
Tradepoint Atlantic

September 2020  
Not to Scale  
160443M

Figure  
**1**

P:\EnvirosAnalytics Group\160443M EAG\_TPA Redevelopment\Drawings\NAPL\_Contingency\SK01\_UTILITY Trench Plug\_rev2.dwg Plotted: September 24, 2018

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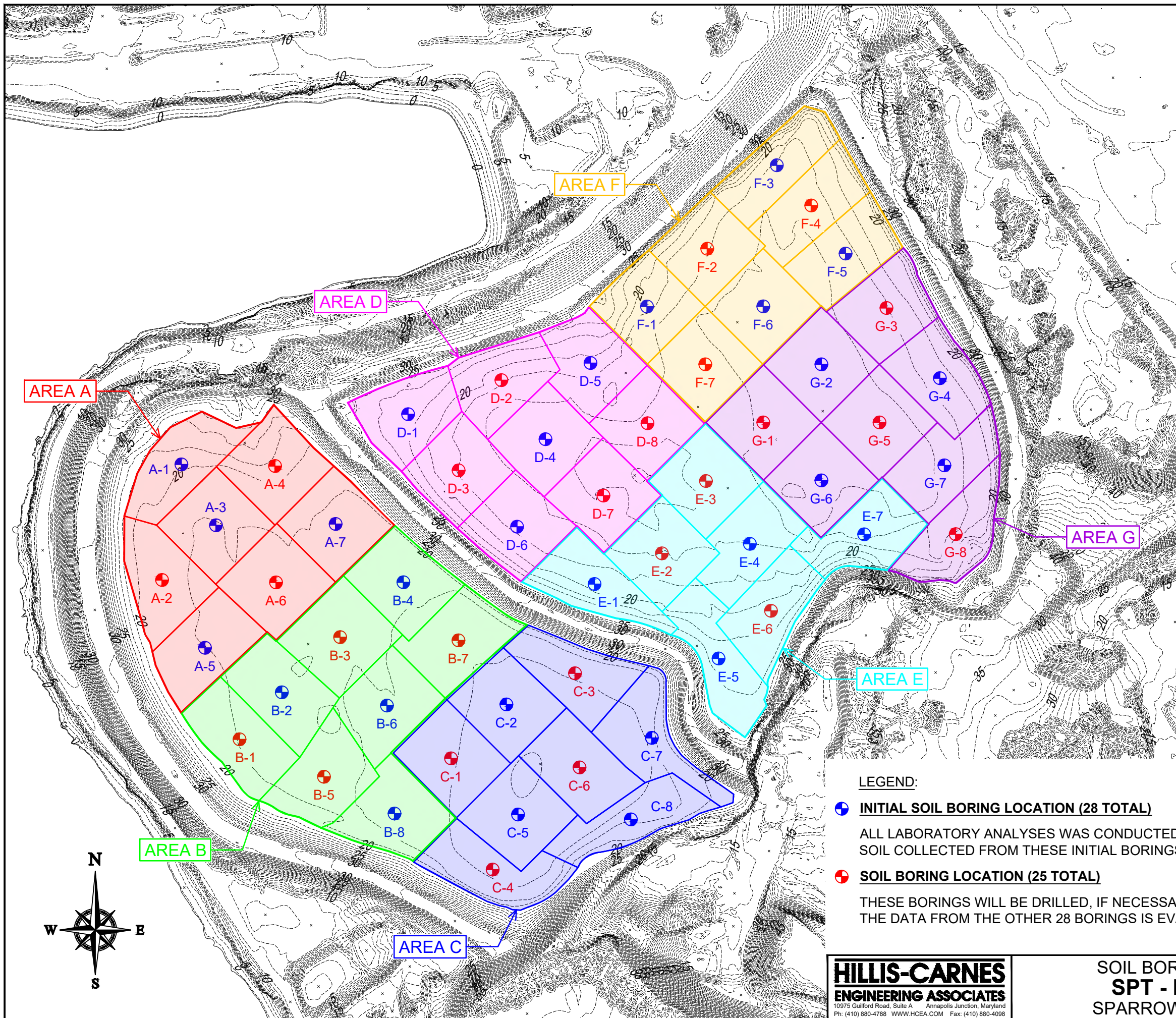
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## **APPENDIX F**

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AREA 'A' BORING COORDINATES	
A-1	1454637.81, 561076.97
A-2	1454607.82, 560898.00
A-3	1454691.33, 560982.72
A-4	1454782.95, 561074.54
A-5	1454674.43, 560793.00
A-6	1454784.50, 560894.26
A-7	1454876.73, 560984.73

AREA 'B' BORING COORDINATES	
B-1	1454728.01, 560651.32
B-2	1454793.28, 560724.08
B-3	1454883.62, 560809.57
B-4	1454981.55, 560894.44
B-5	1454858.63, 560593.19
B-6	1454956.17, 560703.61
B-7	1455066.93, 560804.55
B-8	1454967.75, 560536.11

AREA 'C' BORING COORDINATES	
C-1	1455055.40, 560621.86
C-2	1455141.05, 560705.29
C-3	1455247.31, 560753.52
C-4	1455119.74, 560449.41
C-5	1455159.09, 560534.81
C-6	1455254.32, 560607.77
C-7	1455366.19, 560653.43
C-8	1455333.79, 560527.26

AREA 'D' BORING COORDINATES	
D-1	1454988.85, 561154.87
D-2	1455133.38, 561207.42
D-3	1455067.03, 561067.71
D-4	1455201.60, 561116.11
D-5	1455271.34, 561234.17
D-6	1455157.70, 560980.56
D-7	1455291.34, 561028.90
D-8	1455359.46, 561140.90

AREA 'E' BORING COORDINATES	
E-1	1455277.68, 560891.81
E-2	1455381.88, 560939.19
E-3	1455449.95, 561051.23
E-4	1455517.94, 560954.00
E-5	1455469.64, 560776.41
E-6	1455550.69, 560850.17
E-7	1455694.97, 560968.79

AREA 'F' BORING COORDINATES	
F-1	1455358.91, 561321.52
F-2	1455451.97, 561411.17
F-3	1455559.80, 561540.40
F-4	1455613.09, 561478.18
F-5	1455666.17, 561403.68
F-6	1455538.86, 561321.92
F-7	1455448.92, 561231.98

AREA 'G' BORING COORDINATES	
G-1	1455538.86, 561142.04
G-2	1455628.81, 561231.98
G-3	1455729.44, 561319.20
G-4	1455812.21, 561210.57
G-5	1455718.75, 561142.04
G-6	1455628.72, 561052.28
G-7	1455819.34, 561075.66
G-8	1455836.83, 560969.13

**LEGEND:**

**INITIAL SOIL BORING LOCATION (28 TOTAL)**

ALL LABORATORY ANALYSES WAS CONDUCTED ON THE SOIL COLLECTED FROM THESE INITIAL BORINGS

**SOIL BORING LOCATION (25 TOTAL)**

THESE BORINGS WILL BE DRILLED, IF NECESSARY, AFTER THE DATA FROM THE OTHER 28 BORINGS IS EVALUATED



**HILLIS-CARNES**  
**ENGINEERING ASSOCIATES**  
 10975 Guilford Road, Suite A Annapolis Junction, Maryland  
 Ph: (410) 880-4788 WWW.HCEA.COM Fax: (410) 880-4098

SOIL BORING LOCATION PLAN  
**SPT - DMCF BORINGS**  
 SPARROWS POINT, MARYLAND

PROJECT NO:	17675A	DESIGN BY:	NB
DATE:	12/19/17	DRAWN BY:	AM
SCALE:	1" = 150'	CHECKED BY:	GLG
SHEET:	1		