Soil Management Plan

Future Federal Way Hospital
29805 Pacific Highway South
Federal Way, King County, Washington

Presented to:

MultiCare Health System, a Washington nonprofit corporation
315 Martin Luther King Jr. Way
Tacoma, Washington 98415-0299

Prepared by:

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1.0 INTRODUCTION

TGE Resources, Inc., ("TGE") has prepared this Soil Management Plan ("SMP") on behalf of MultiCare Health System, a Washington nonprofit corporation, ("MulitCare", "MHS", or "Lessee") for the Future Federal Way Hospital property located at 29805 Pacific Highway South, King County, Washington, hereinafter referred to as the "Site" or "Property" (**Figure 1 – Site Location Map**). This plan was prepared to convey certain control methods to be used during disturbance of environmentally impacted soil that will be encountered during redevelopment of the Property. Specifically, the purpose of this plan is to specify key components, applicable and relevant operating procedures and control methods, pertinent personnel, and documentation necessary to execute a compliant environmental contaminated soil management plan per federal and state requirements at the above-referenced Property.

Site Background

According to King County Appraisal District (CAD) information, the Property is currently owned by NIKLEXI, LLC ("Owner" or "Lessor"). The Site is leased by MultiCare via a lease agreement executed on March 29, 2019. The Site is slated for repurposing for healthcare redevelopment. The Property is comprised of two parcels encompassing a reported 1.72 acres (74,887 square feet). Current Site improvements (pre-construction) consist of a 6,350 square-foot, partial two-story, commercial office and automobile repair facility that was constructed in 1970. Relevant environmental investigations for the Site are listed/summarized below:

- A Phase I Environmental Site Assessment (ESA), dated August 2017, was prepared by TGE for PhiloWilke Partnership (Client's architect). The Phase I ESA identified historic Site use as a retail fueling station with concurrent use of underground petroleum storage tanks (PSTs), historic/current Site use for automotive repair, and the former location of a greenhouse – these were recognized environmental conditions (RECs) for the Property.

- TGE conducted a Limited Phase II ESA (issued to PhiloWilke), which included soil vapor assessment at the Property in September and November 2017. TGE advanced and sampled certain soil borings (designated SB-1 through SB-5) to depths ranging from 12 feet below grade (fbg) to 20 fbg; likewise, two additional soil borings were completed as temporary vapor monitor points (designated TVMP-1 and TVMP-2) to depths of eight (8) fbg. Sample locations were selected in consideration of RECs identified in connection with the Property.

- A Supplemental Phase II assessment was conducted by TGE in October 2017. TGE installed and sampled one temporary screened borehole (designated TSB-1) to a terminal depth of 110 fbg, with the intention of groundwater characterization. However, poor groundwater production was realized and groundwater sample collection was not possible within the stated depth of assessment. Additionally, seven (7) soil borings (designated SB-6 through SB-12) were completed within areas designated by the current Owner as "accessible", prior to the lease being finalized by MHS. These borings were extended to depths not in excess of 10 fbg and performed to further predevelopment soil characterization assessment.

- In August 2018, TGE conducted oversight of an environmental investigation performed at the Site by Environmental Associates, Inc. ("EAI"). EAI was reported as the environmental consultant representing the Property Owner, which (at that time) was identified as "Cantu Commercial Property, LLC". EAI performed field procedures for soil and soil vapor investigation within the shop area; they allowed TGE to collect "split" samples for analysis. Per the EAI scope of work, areas of investigation for the split sampling event were limited to the auto bays, adjacent to interior sumps, adjacent to waste material storage containers, and at notable exterior surface stained areas that were previously

inaccessible to TGE during prior assessment (2017). Additional soil vapor borings were placed near the northern, eastern and western Property boundaries to "evaluate" the potential for soil vapor encroachment from an off-Site source(s).

- In November 2019, with construction imminent, TGE was given access to characterize previously non-accessible Site areas. Specifically, TGE performed an expedited characterization assessment, which included the performance of a series of soil borings (soil borings SB-13 through SB-53) across the Property. This assessment was performed to serve the following purposes:

    - to establish (or rule out) whether a reporting responsibility under Washington Administrative Code (WAC) 173-340-350 and provisions of the State of Washington's Model Toxics Control Act (MTCA - Chapter 70.105D RCW) would be required;

    - to allow preparation of this SMP in compliance with Owner requirements;

    - to characterize pathway-of-disturbance soil in advance of construction-related earthwork prior to removal management and associated budgeting;

    - to establish Ecology's agency/program requirements (Voluntary Cleanup Program [VCP], Pollution Liability Insurance Association [PLIA], or both); and

    - to allow the preparation of project budget estimates and environmentally- related obligations for the Owner and tenant in advance of, during, and following Site redevelopment.

- A follow-on Phase II assessment was conducted in January 2020 to better establish and determine disposal alternatives for the affected soil volume. Based on findings from supplemental soil investigation, five (5) areas of contamination (designated "Area A" through "Area E" – Figure 2 Impacted Soil Map) have been delineated with an estimated quantity of approximately 1,400 truck tons of material requiring excavation and regulated, off-Property disposal.

- On January 29 and 30, 2020, TGE conducted oversight during the excavation/removal of three (3) interior sumps within automotive repair bays associated with the Site structure. The "Exterior Sump", located west of the Site structure, was excavated to a depth of three (3) fbg. The sumps located within Bay 1 and Bay 3 were excavated to depths of four (4) and five (5) feet, respectively. Additionally, the discharge line connecting all interior sumps was determined to be discharging to the soils immediately beneath the building slab. Soil samples from the base and sidewalls of each excavation were collected and analyzed by a certified laboratory to characterize pathway-of-disturbance soil in advance of construction-related earthwork and to allow for revisions of this SMP in compliance with Owner requirements.

- Based on the November 2019 and January 2020 assessment outcomes, six (6) areas of contamination (Area A through Area F) exist within the limits of the Property. Chemicals of concern (COCs) concentrations exceed applicable MTCA Method A, Soil Protective of Groundwater Vadose at 13 Degrees and/or Simplified Terrestrial Ecological screening levels and will require advanced coordination with the Owner, Ecology, and MHS representatives respecting remediation.

- TGE has established that the material will be addressed under dual agency oversight. Petroleum hydrocarbon-impacted soil will be managed through the PLIA program; while soil impacted with pesticide (greenhouse area) will be managed via the state's Voluntary Cleanup Program (VCP). Remediation via a self-implementation strategy (Independent Remedial Action) will entail excavation and off-Property disposal of affected soil at a permitted Subtitle D landfill during planned Site redevelopment.

2.0 PURPOSE

This Plan has been prepared pursuant to Agreement No. 2 – Soils Management Plan, Discovery Notice, Remediation Work Notice, and Lessor Oversight of the Environmental Reimbursement Agreement (effective as of March 29, 2019) between Owner and MHS and to ensure compliance with applicable environmental and employee health and safety standards ("Environmental Laws"). Such compliance will minimize risk to the Lessee, the General Contractor, workers/employees, and the environment during earthwork (e.g., excavation, drilling, grading, trenching, etc.) in areas of known environmental impact ("Existing Contamination").

There is a potential that construction workers will encounter environmentally-impacted soil ("Hazardous Substances" - petroleum hydrocarbons, volatile organic compounds [VOCs], RCRA metals, and/or pesticides present on-Site prior to March 29, 2019) during Site redevelopment/construction (the "Project"). Existing Contamination (a "release") is known to have occurred at the Site from historical Site use as a retail fueling station with concurrent use of underground PSTs, historic/recent use as an automotive repair facility from the early 1970s to November 2019, and former presence of a greenhouse on-Site (see **Figure 2 – Impacted Soil Map**). Additionally, the potential exists that additional areas of environmental impact will be encountered at the Site once building demolition begins.

The principal purpose of this Plan is to provide/describe recommended procedures and best management practices (BMPs) to be undertaken in anticipation of encountering environmentally-impacted soil, fill material, and/or underground PST system components (e.g., tanks, product piping, etc.) during "Remedial Activities" to be conducted/coordinated with planned Site redevelopment. The SMP is intended to serve as a guide to the Lessee's General Contractor specific to effective management of Existing Contamination and minimization of potential effects to worker health and safety. This plan is also to be used as a reference to ensure for prompt communication of the discovery of additional environmental impact (a "material change in scope") to Lessor, affected parties, and/or regulatory personnel; and a means to reduce the potential for impact to the environment respecting contaminated media. This Plan and the General Contractor's Occupational Safety and Health Administration (OSHA) mandated Health and Safety Plan should control/limit exposure of Site workers and the general public to soil, dust, vapors, and odors associated with these operations.

Additionally, this Plan provides a description of how Existing Contamination is to be manipulated (handled) upon discovery of additional "Hazardous Substances" during Remedial Activities, sampling requirements for disposal characterization, profiling of unsuitable soil, reduction of potential impact to ambient air or storm water runoff, and specific record-keeping requirements to be maintained. Appropriate management of Existing Contamination is required for the following reasons:

- to protect human health and the environment;
- to protect against liability for environmental damage(s); and
- to reduce/limit potential impact to construction schedules and associated costs.

Implementation of this Plan will be the responsibility of the contractor of choice (recommended to be an OSHA trained company) with supervision/oversight by Lessee's Consultant (TGE). Additionally, work practices presented herein are to be used by any party involved in soil disturbance activities (e.g., excavation, grading, trenching, drilling, utility installation, and/or landscaping).

3.0 EXTENT OF SOIL IMPACT

Soil, groundwater, and soil vapor testing at the Property between September 2017 and January 2020 by TGE confirmed the presence of Existing Contamination at the Site. As detailed below, certain soil (within former vehicle parking/storage areas, former PST areas associated with historic/recent auto repair Site use, and a former greenhouse) has been determined impacted with petroleum hydrocarbons (specifically, gasoline-range organics [GRO], diesel-range organics [DRO] and oil-range organics [ORO]); RCRA metals cadmium, lead and arsenic; and the organochlorine pesticide dieldrin above respective Washington Department of Ecology (Ecology) MTCA Method A, Soil Protective of Groundwater Vadose at 13 Degrees and/or Simplified Terrestrial Ecological screening limits, as set forth within MTCA regulation/statute (as applicable). The extent of known and suspected contamination exists at the Site within six (6) areas of concern, referred to herein as "Area A" through "Area F" (see **Figure 2 –Impacted Soil Map**). Each area is described below and includes a table with respective analyte(s) and associated maximum concentrations reported for that zone.

While there are no underground PSTs known to currently exist at the Property, the potential exists for a "ghost" tank (or associated product piping) to be discovered during planned earthwork activities. Should a PST (or any associated equipment/piping) be encountered during redevelopment, the tank (and any system component) will require decommissioning and removal in accordance with Washington Administrative Code (WAC) Chapter 173-360A (such requirements are not specified herein).

While it is likely that TGE has encountered the majority of Existing Contamination at the Site during previous environmental investigations, it is likely that impacted soil will require advanced coordination with the Owner, Ecology, and MHS representatives. Of the six Existing Contamination areas, Area A (impacted with arsenic at concentrations in excess of the MTCA Method A cleanup level of 20 mg/kg) is positioned adjacent to the western Property boundary. As a component of planned Site redevelopment, a retaining wall (i.e., a soil nail wall) will be constructed for slope stabilization along the western Property boundary. Therefore, due to potential damage to the western slope and the retaining wall design that would be necessitated by excavation, a portion of impacted material in Area A will likely be abandoned under a disproportionate cost analysis per WAC 173-340-360.

TGE has established that the material will be addressed under dual agency oversight. Petroleum hydrocarbon-impacted soil will be managed through the PLIA program; while soil impacted with pesticide (greenhouse area) will be managed via the state's Voluntary Cleanup Program (VCP). Remediation via a self-implementation strategy (Independent Remedial Action) will entail excavation and off-Property disposal of affected soil at a permitted Subtitle D landfill during planned Site redevelopment.

Area A

Area A was identified (Phase I ESA) as the former location of a greenhouse, this area has been utilized as unpaved as well as paved vehicle parking/storage, and is positioned in the northeastern portion of the Property. Laboratory analyses of soil samples (collected at depths ranging from the ground surface to 12 fbg) reported the following (tabulated) concentrations of the pesticide dieldrin and associated RCRA metals (arsenic, cadmium, and lead).

				Metals (EPA Method 6010/7471)				OC Pesticides (Method 8081)
Station Name	**Laboratory Identification**	**Sample Date**	**Depth Range**	**Arsenic**	**Cadmium**	**Lead**	**Total Chromium**	**Dieldrin**
Method A Direct Contact				20	2	250	NL	NL
Method B Cancer Direct Contact				0.67	NL	NL	NL	0.0625
Simplified Terrestrial Eco Evaluation Unrestricted				NL	NL	220	42	0.17
Soil Protective of Groundwater Vadose at 13 Deg				2.92	0.69	3000	NL	0.00282
Reporting Units				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB15	L1161924-01 L1165576-01	11/14/2019	0 - 1 ft	**43.1**	**0.4300 J**	**107**	**22.6**	NT
	L1161924-02		1 - 2 ft	**3.26**	**0.2170 J**	**14.6**	**33.3**	NT
	L1169568-01		3 - 4 ft	**3.52**	NT	NT	NT	NT
	L1169568-02		6 - 8 ft	**5.18**	NT	NT	NT	NT
	L1161924-03 L1165576-03		10 - 12 ft	**1.990 J**	**0.1860 J**	**2.32**	**31.4**	NT
SB15B	L1165628-03 L1168120-03	11/14/2019	0 - 1 ft	**36.4**	NT	NT	NT	NT
	L1168403-25		1 - 2 ft	NT	NT	NT	NT	NT
	L1165628-04 L1168120-04		2 - 3 ft	**3.96**	NT	NT	NT	NT
	L1168120-09		3 - 4 ft	**22.6**	NT	NT	NT	NT
	L1169561-01		6 - 8 ft	**2.64**	NT	NT	NT	NT
	L1169561-02		14 - 15 ft	**1.73 J**	NT	NT	NT	NT
SB30	L1161924-65	11/14/2019	0 - 0.5 ft	**338**	**0.911**	**301**	**43.9**	**0.00314 J**
	L1161924-66		0.5 - 1 ft	**291**	**0.85**	**261**	**37.4**	**0.00290 J**
	L1161924-67		1 - 1.5 ft	**142**	**0.4980 J**	**127**	**33.3**	**0.00200 J**
	L1161924-68		1.5 - 2 ft	**86.9**	**0.341 J**	**74.6**	**36.9**	**0.00245 J**
	L1165628-39		3 - 3.5 ft	**5.31**	NT	**27.5**	**31.8**	**0.00186 J**
	L1165628-40		4.5 - 5 ft	**13.2**	NT	**12**	**28.7**	<0.00164
SB31	L1161924-69	11/14/2019	0 - 0.5 ft	**59.3**	**0.4460 J**	**84.5**	**30.3**	**0.00249 J P**
	L1161924-70		0.5 - 1 ft	**51.7**	**0.4110 J**	**65.4**	**27.8**	**0.00201 J P**
	L1161924-71		1 - 1.5 ft	**125**	**0.986**	**143**	**34.1**	**0.00657 J P**
	L1161924-72		1.5 - 2 ft	**163**	**1.15**	**182**	**35.4**	**0.00549 J P**
	L1165628-41		3 - 3.5 ft	**170**	**1.13**	NT	NT	**0.00291 J**
	L1165628-42		4.5 - 5 ft	**56.4**	**0.296 J**	NT	NT	<0.00163

				Metals (EPA Method 6010/7471)				OC Pesticides (Method 8081)
Station Name	**Laboratory Identification**	**Sample Date**	**Depth Range**	**Arsenic**	**Cadmium**	**Lead**	**Total Chromium**	**Dieldrin**
Method A Direct Contact				20	2	250	NL	NL
Method B Cancer Direct Contact				0.67	NL	NL	NL	0.0625
Simplified Terrestrial Eco Evaluation Unrestricted				NL	NL	220	42	0.17
Soil Protective of Groundwater Vadose at 13 Deg				2.92	0.69	3000	NL	0.00282
Reporting Units				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SB32	L1177542-01	1/7/2020	0.5 - 1 ft	**13.7**	**0.2930 J**	**20.5**	NT	<0.00163
	L1177542-02		1 - 1.5 ft	**26.8**	**0.2340 J**	**37.7**	NT	<0.00169
	L1177542-03		1.5 - 2 ft	**29.5**	**0.2340 J**	**40.6**	NT	<0.00164
	L1177542-04		5 - 6 ft	**6.51**	**0.1430 J**	**8.18**	NT	<0.00163
	L1177542-05		8 - 9 ft	**2.35**	**0.0971 J**	**0.846**	NT	<0.0017
	L1177542-06		10 - 11 ft	**1.810 J**	**0.0755 J**	**1.28**	NT	<0.00163
SB33	L1177542-07	1/7/2020	0.5 - 1 ft	**69.1**	**0.2410 J**	**52**	NT	**0.0443**
	L1177542-08		1 - 1.5 ft	**64.9**	**0.2060 J**	**59.7**	NT	**0.0743**
	L1177542-09		1.5 - 2 ft	**117**	**0.4130 J**	**120**	NT	**0.0594**
	L1177542-10		5 - 6 ft	**52.8**	**0.2530 J**	**55.8**	NT	**0.0794**
	L1177542-11		8 - 9 ft	**40.6**	**0.1860 J**	**38.3**	NT	**0.0496**
	L1177542-12		10 - 11 ft	**1.6 J**	**0.096 J**	**1.23**	NT	**0.00290 J**
	L1178820-01		11 - 12 ft	NT	NT	NT	NT	<0.0017
SB34	L1177542-13	1/7/2020	0.5 - 1 ft	**35.1**	**0.2200 J**	**39.7**	NT	<0.00159
	L1177542-14		1 - 1.5 ft	**44.7**	**0.2930 J**	**43.2**	NT	<0.0016
	L1177542-15		1.5 - 2 ft	**8.22**	**0.1630 J**	**15**	NT	<0.00161
	L1177542-16		5 - 6 ft	**3.94**	**0.1420 J**	**6.78**	NT	<0.00188
	L1177542-17		8 - 9 ft	**1.610 J**	<0.0795	**0.502 J**	NT	<0.00173
	L1177542-18		10 - 11 ft	**1.850 J**	**0.1120 J**	**1.89**	NT	<0.00165
SB35	L1177542-19	1/7/2020	0.5 - 1 ft	**231**	**0.712**	**185**	NT	<0.0017
	L1177542-20		1 - 1.5 ft	**214**	**0.4770 J**	**187**	NT	<0.00165
	L1177542-21		1.5 - 2 ft	**223**	**0.4460 J**	**164**	NT	<0.00166
	L1177542-22		5 - 6 ft	**70**	**0.1970 J**	**57.9**	NT	<0.00164
	L1177542-23		8 - 9 ft	**5.79**	**0.0973 J**	**3.71**	NT	<0.00164
	L1177542-24		10 - 11 ft	**3.4**	**0.0970 J**	**2.22**	NT	<0.00165
SB38	L1177542-37	1/7/2020	0.5 - 1 ft	**65.1**	**0.3250 J**	**63.4**	NT	<0.0017
	L1177542-38		1 - 1.5 ft	**19.1**	**0.2130 J**	**26.1**	NT	<0.0017
	L1177542-67		1.5 - 2 ft	**40**	**0.3020 J**	**33**	NT	<0.00166
	L1178820-02		3 - 3.5 ft	**22.8**	NT	NT	NT	NT
	L1178820-03		4.5 - 5 ft	**20.7**	NT	NT	NT	NT
	L1177542-39		5 - 6 ft	**36.4**	**0.1200 J**	**30.3**	NT	<0.00174
	L1178820-04		6 - 7 ft	**36.9**	NT	NT	NT	NT
	L1177542-40		8 - 9 ft	**0.953 J**	**0.0815 J**	**0.401 J**	NT	<0.00167
	L1177542-41		10 - 11 ft	**2.1 J**	<0.0761	**1.27**	NT	<0.00165

NT – Not Tested

NL – No Limit

Area B

Area B comprises two locations positioned in the north-central portion of the Site and in the central portion of the Property, adjacent to Area A. Area B was previously utilized for unpaved as well as paved vehicle parking/storage. Laboratory analyses of soil samples (collected at depths ranging from ground surface to 15 fbg) reported the following (tabulated) concentrations of petroleum hydrocarbons (GRO/DRO/ORO).

				Hydrocarbon (NWTPHGx and NWTPHDx)			
Station Name	**Laboratory Identification**	**Sample Date**	**Depth Range**	**Gasoline range organics (Benzene Present)**	**Gasoline Range organics (Benzene NonDetect)**	**Diesel Range organics**	**Oil Range Organics**
Method A Direct Contact				30	100	2000	2000
Method B Cancer Direct Contact				NL	NL	NL	NL
Simplified Terrestrial Eco Evaluation Unrestricted				200	200	460	NL
Soil Protective of Groundwater Vadose at 13 Deg				NL	NL	NL	NL
Reporting Units				mg/kg	mg/kg	mg/kg	mg/kg
SB14A	L1168403-03	11/13/2019	0 - 1 ft	NT	NT	**482 T8**	**1330 T8**
	L1168403-04		1 - 2 ft	NT	NT	**12.40 T8**	**55.40 T8**
SB14B	L1168403-05	11/13/2019	0 - 1 ft	NT	NT	**547 T8**	**2300 T8**
	L1168403-06		1 - 2 ft	NT	NT	**111 J T8**	**597 T8**
SB15	L1161924-01 L1165576-01	11/14/2019	0 - 1 ft	<0.893	--	**971**	**2300**
	L1161924-02		1 - 2 ft	<0.954	<0.954	**10.1**	**70.7**
	L1169568-01		3 - 4 ft	NT	NT	NT	NT
	L1169568-02		6 - 8 ft	NT	NT	NT	NT
	L1161924-03 L1165576-03		10 - 12 ft	<0.895	<0.895	**2.8 J**	**23.1**
SB15A	L1165628-01 L1168120-01	11/14/2019	0 - 1 ft	NT	NT	**2280**	**4820**
	L1168403-24		1 - 2 ft	NT	NT	**438 T8**	**815 T8**
	L1165628-02 L1168120-02		2 - 3 ft	NT	NT	**536**	**1210**
SB15B	L1165628-03 L1168120-03	11/14/2019	0 - 1 ft	NT	NT	**917**	**878**
	L1168403-25		1 - 2 ft	NT	NT	**371 T8**	**265 T8**
	L1165628-04 L1168120-04		2 - 3 ft	NT	NT	**9.17**	**20.1**
	L1168120-09		3 - 4 ft	NT	NT	NT	NT
	L1169561-01		6 - 8 ft	NT	NT	NT	NT
	L1169561-02		14 - 15 ft	NT	NT	NT	NT

NT – Not Tested

NL – No Limit

Area C

Area C is located in the north-central portion of the Property and has been utilized for both unpaved as well as paved vehicle parking/storage. Laboratory analyses of soil samples (collected at depths ranging from the ground surface to 25 fbg) reported the following (tabulated) concentrations of petroleum hydrocarbons (Gasoline/Diesel/Oil Range [GRO/DRO/ORO]), VOC analyte 1,1,2,2-tetrachloroethane (1,1,2,2-TCA) and RCRA metals total chromium and lead.

				Hydrocarbon (NWTPHGx and NWTPHDx)			
Station Name	**Laboratory Identification**	**Sample Date**	**Depth Range**	**Gasoline Range organics (Benzene Present)**	**Gasoline Range organics (Benzene NonDetect)**	**Diesel Range organics**	**Oil Range Organics**
Method A Direct Contact				30	100	2000	2000
Method B Cancer Direct Contact				NL	NL	NL	NL
Simplified Terrestrial Eco Evaluation Unrestricted				200	200	460	NL
Soil Protective of Groundwater Vadose at 13 Deg				NL	NL	NL	NL
Reporting Units				mg/kg	mg/kg	mg/kg	mg/kg
SB17	L1161400-11 L1166078-01	11/13/2019	0 - 1 ft	<0.907	<0.907	**135.0 J**	**2300**
	L1165628-10		1 - 2 ft	NT	NT	**10.9 J**	**136**
	L1165628-11		2 - 3 ft	NT	NT	**121**	**104**
	L1165628-12		3 - 4 ft	NT	NT	**146 J**	**717**
	L1161400-12		6 - 8 ft	**2.27 B J**	-	**9.11**	**29.1**
	L1161400-13		14 - 15 ft	<0.957	<0.957	**27.8**	**11.7**
SB17C	L1168403-22	11/13/2019	0 - 1 ft	NT	NT	**371 T8**	**2160 T8**
	L1168403-23		1 - 2 ft	NT	NT	**326 T8**	**1400 T8**
	L1161400-16		2 - 3 ft	**4.22**	**4.22**	**18.6**	**19.2**
	L1161400-17 L1165576-11		9 - 10 ft	**377**	-	**385**	**830**
	L1161400-18 L1165576-12		14 - 15 ft	**580**	-	**294**	**580**
SB17F	L1165628-16	11/14/2019	6 - 8 ft	<0.982	--	**13.8**	**53.3**
	L1167359-02		10 - 11 ft	<1	--	**11**	**60.7**
	L1161924-07		18 - 20 ft	--	**3.39 B**	NT	NT
	L1161924-08		24 - 25 ft	--	**26.2**	**61**	**213**
SB20	L1168403-29	11/13/2019	0 - 1 ft	**5.84**	--	**117**	**211**
	L1168403-30		1 - 2 ft	<0.897	--	**38.5**	**81**
	L1161924-15 L1165576-05		2 - 3 ft	**116**	--	**687**	**182**
	L1161924-16 L1165576-06		4 - 6 ft	--	**78.4**	**243**	**83.8**
	L1161924-17		10 - 11 ft	**21.2**	--	**369**	**1010**
SB21	L1161924-18 L1165576-07	11/14/2019	2 - 3 ft	**8.83 B**	--	**310**	**632**
	L1165628-23 L1161924-19		4 - 6 ft	--	**8.97 B**	**292**	**432**
	L1161924-19		6 - 8 ft	--	**4.34**	**151**	**429**
	L1161924-20 L1166082-02		9 - 11 ft	--	**6.44**	**102**	**279**

Station Name	Laboratory Identification	Sample Date	Depth Range	Gasoline Range organics (Benzene Present)	Gasoline Range organics (Benzene NonDetect)	Diesel Range organics	Oil Range Organics
Method A Direct Contact				30	100	2000	2000
Method B Cancer Direct Contact				NL	NL	NL	NL
Simplified Terrestrial Eco Evaluation Unrestricted				200	200	460	NL
Soil Protective of Groundwater Vadose at 13 Deg				NL	NL	NL	NL
Reporting Units				mg/kg	mg/kg	mg/kg	mg/kg
SB22	L1161924-21	11/14/2019	0 - 1 ft	**1.38 J**	--	**47.1 J**	**558**
	L1168403-31		1 - 2 ft	NT	NT	**39.7 J T8**	**230 T8**
	L1161924-22		2 - 3 ft	**3.990 B**	--	**30.6 J**	**252**
	L1161924-23		4 - 6 ft	**1.690 B J**	--	**49.1 J**	**470**
SB46	L1178043-27	1/8/2020	0 - 1 ft	<0.914	--	**29.1 J**	**318**
	L1178043-28		1 - 2 ft	<0.974	--	<143	**1910**
	L1178043-29		9 - 10 ft	<1	--	<15.7	**131**
	L1178043-30		14 - 15 ft	<0.994	--	**10.5 J**	**98.9**
	L1178043-31		16 - 18 ft	<1.09	--	**8.12**	**59.4**
	L1178043-32		20 - 22 ft	<0.92	--	**4.14 J**	**24.2**

NT – Not Tested

NL – No Limit

Area D

Area D is located along the east-central portion of the Property, adjacent to Area C. Area D was formerly utilized as unpaved as well as paved vehicle parking/storage. Laboratory analyses of soil samples (collected at depths ranging from ground surface to 6 fbg) reported the following (tabulated) concentrations of RCRA metal arsenic.

				Metals (EPA Method 6010/7471)
Station Name	**Laboratory Identification**	**Sample Date**	**Depth Range**	**Arsenic**
Method Direct Contact				20
Method B Cancer Direct Contact				0.67
Simplified Terrestrial Eco Evaluation Unrestricted				NL
Soil Protective of Groundwater Vadose at 13 Deg				2.92
Reporting Units				mg/kg
SB24	L1161924-27	11/14/2019	0 - 1 ft	**102**
	L1168403-32	11/14/2019	1 - 2 ft	NT
	L1161924-28	11/14/2019	2 - 3 ft	**7.22**
	L1161924-29	11/14/2019	4 - 6 ft	**5.26**

NT – Not Tested

NL – No Limit

Area E

Area E is positioned within the east-central portion of the Property and was formerly used for unpaved/paved vehicle parking. Laboratory analyses of soil samples (collected at depths ranging from the ground surface to 20 fbg) reported the following (tabulated) concentrations of RCRA metals (cadmium and lead).

				Metals (EPA Method 6010/7471)		
Station Name	**Laboratory Identification**	**Sample Date**	**Depth Range**	**Arsenic**	**Cadmium**	**Lead**
Method A Direct Contact				20	2	250
Method B Cancer Direct Contact				0.67	NL	NL
Simplified Terrestrial Eco Evaluation Unrestricted				NL	NL	220
Soil Protective of Groundwater Vadose at 13 Deg				2.92	0.69	3000
ReportingUnits				mg/kg	mg/kg	mg/kg
SB26	L1161924-37	11/14/2019	0 - 1 ft	**5.85**	**0.5000 J**	**137**
	L1161924-38	11/14/2019	2 - 3 ft	**7.68**	**0.848**	**251**
	L1161924-39	11/14/2019	4 - 6 ft	**6.94**	**0.712**	**185**
	L1161924-40	11/14/2019	8 - 9 ft	**7.47**	**0.756**	**261**
	L1161924-41	11/14/2019	10 - 11 ft	**7.71**	**0.662**	**320**
	L1166115-01	11/14/2019	11 - 12 ft	NT	NT	**76.5**
	L1165628-33	11/14/2019	14 - 15 ft	NT	NT	**26.7**
	L1161924-42	11/14/2019	16 - 17 ft	**6.28**	**0.4690 J**	**77.1**
	L1161924-43	11/14/2019	19 - 20 ft	**6.09**	**0.4250 J**	**80.3**
SB40	L1178043-01	1/8/2020	2 - 3 ft	NT	<0.091	**14.6**
	L1178043-02	1/8/2020	4 - 6 ft	NT	<0.0843	**25.6**
	L1178043-03	1/8/2020	8 - 9 ft	NT	**0.856**	**319**
	L1178043-04	1/8/2020	10 - 11 ft	NT	**0.4880 J**	**228**
	L1178043-05	1/8/2020	11 - 12 ft	NT	**0.4080 J**	**186**
	L1178043-06	1/8/2020	16 - 17 ft	NT	**0.2710 J**	**113**
SB54	L1178043-33	1/8/2020	2 - 3 ft	NT	**0.2530 J**	**7.75**
	L1178043-34	1/8/2020	4 - 6 ft	NT	**0.1700 J**	**2.28**
	L1178043-35	1/8/2020	8 - 9 ft	NT	**0.1430 J**	**2.07**
	L1178043-36	1/8/2020	10 - 11 ft	NT	**0.4120 J**	**32.2**
	L1178043-37	1/8/2020	11 - 12 ft	NT	**0.8**	**91.2**
	L1178043-38	1/8/2020	16 - 17 ft	NT	**0.61**	**63.3**

NT – Not Tested

NL – No Limit

Area F

Area F is positioned within the current Site structure within the former automotive service bays. Laboratory analyses of soil samples (collected at depths ranging from the ground surface to 5 fbg) reported the following tabulated concentrations of RCRA metals (cadmium, total chromium, arsenic and lead) and petroleum hydrocarbons (DRO/ORO).

				Metals (EPA Method 6010/7471)					Hydrocarbon (NWTPHGx and NWTPHDx)			
Station Name	**Laboratory Identification**	**Sample Date**	**Depth Range**	**Arsenic**	**Total Chromium**	**Hexavalent Chromium**	**Cadmium**	**Lead**	**Gasoline range organics (Benzene Present)**	**Gasoline range organics (Benzene NonDetect)**	**Diesel range organics**	**Oil Range Organics**
Method A Direct Contact				20	NL	19	2	250	30	100	2000	2000
Method B Cancer Direct Contact				0.67	NL	240	NL	NL	NL	NL	NL	NL
Simplified Terrestrial Eco Evaluation Unrestricted				NL	42	NL	NL	220	200	200	460	NL
Soil Protective of Groundwater Vadose at 13 Deg				2.92	NL	18	0.69	3000	NL	NL	NL	NL
ReportingUnits				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Bay 1 Sump E. Sidewall	L1184753-07	1/29/2020	4 ft	**3.8**	**76.9**	**18.9**	<0.0817	**239**	--	**2.02 J**	**14.1**	**51.2**
Bay 1 Sump Base	L1184753-03	1/29/2020	4 ft	**8.66**	**44.2**	--	<0.0935	**101**	--	**9.46**	**39.9**	**80.6**
Bay 1 Sump S. Sidewall	L1184753-05	1/29/2020	4 ft	**3.4**	**73.9**	--	<0.0778	**212**	--	**0.970 J**	**14.3**	**49.4**
Bay 3 Sump Base	L1184753-09	1/29/2020	5 ft	**11.5**	**40.4**	--	**0.2930 J**	**61.7**	--	**3.85**	**2470**	**5350**
Bay 3 Sump 2 FT Below Base	L1187323-08	1/29/2020	7 ft	--	--	--	--	--	--	--	**1600**	**1750**
Exterior Sump S. Sidewall	L1184753-16	1/29/2020	3 ft	**54.8**	**28.1**	--	<0.0814	**50.7**	--	<0.986	**4.47 J**	**12.3**
Sump Line Midpoint	L1184715-01	1/30/2020	1 ft	**8.24**	**52.8**	--	**1.04**	**94.5**	--	**6.56**	**60.7**	**190**

NT – Not Tested

NL – No Limit

Per current engineering plans, Mr. Doug Early, Project Manager with Archer Construction (subcontractor to GC [Anderson Construction]), provided to TGE on December 10, 2019 a gross estimated volume for soil requiring removal (i.e., 'cut') from the development zone of the Project, which is as follows:

- 1,047 bcy (or, an estimated 1,466 truck tons with a conversion factor of 1.4) for "cut to fill"; and
- 336 bcy (470 truck tons) for "footing excavation".

While Site soils are referenced as being "cut" or "excavated", all material (referenced above) would be "*reused*" to fill proposed excavation of Existing Contamination areas (Area A through Area F). However, and as referenced above, Site characterization efforts conducted by TGE have determined that petroleum hydrocarbons (specifically, GRO, DRO and ORO); the VOC analyte 1,1,2,2-TCA; RCRA metals cadmium, lead and arsenic; and the organochlorine pesticide dieldrin are present in this soil at concentrations in excess of respective MTCA screening levels (see **Section 3.0** and **Figure 2**). Therefore, and in accordance with requirements of MTCA, these soils/fill material (estimated at 1,430 truck tons of impacted Pathway of construction [POC] soil) are currently slated for excavation and off-Property disposal at a permitted Subtitle D landfill. POC soil is defined (herein) as that soil that is currently in place at the Property

that will be moved from its position (and possibly removed from the Site) to facilitate Property redevelopment.

Furthermore, Project development plans provided to TGE depict excavation of a detention pond positioned in the southeast corner of the property, with excavated material anticipated to be re-used/relocated entirely within the Site limits in advance of building construction. Such material will be analytically characterized by TGE prior to excavation and use/placement beneath the Site development; however, such testing has not occurred to date.

As mentioned in Section 1.0 of this Plan, groundwater was not encountered during environmental investigations of the Site and therefore, was not tested.

3.1 Identification of Impacted Soil

Although not necessarily effective for RCRA metals (e.g., arsenic, cadmium, and lead), the organochlorine pesticide dieldrin, or the VOC analyte 1,1,2,2-TCA, petroleum-hydrocarbon contaminated soil can generally be identified in the field by the presence of a “sheen”/oil-like staining, a petroleum odor, or any combination of these. The appearance of oil-like staining is not always consistent and can vary depending on the nature of the oil or petroleum hydrocarbon present, the soil type involved in the release, and the age (date) of the release. Soil staining associated with old petroleum contamination often presents with a “greenish” hue, but may also be brown or black in appearance.

The olfactory sense is the most sensitive instrument for identifying petroleum contamination in the field. Therefore, a “petroleum” odor may observed during excavation, although no visible sign of oil or staining is apparent. In some instances, decayed organic matter can produce a similar odor. A photo-ionization detector (PID) or organic vapor monitor (OVM) should be used by an environmental professional (i.e., TGE) to take field readings of ambient air in any excavation zone(s); or, used to monitor hydrocarbon in the soil “head-space” within a partially filled jar containing excavated soil. Both such approaches are commonly used to indicate the presence of petroleum impact; however, such instruments are less reliable for old, degraded hydrocarbons where the more volatile (“light”) petroleum hydrocarbon fractions have dissipated.

3.2 Potential Receptors During Site Work

Based on analytical data compiled during the environmental assessment process and considering planned Site redevelopment, receptors of concern are believed to include construction workers (who will be engaged in invasive activities such as excavation, grading, trenching, utility installation and/or landscaping), surface water pathways (in the event of rain), and improved surfaces such as contiguous driveways or roads (“tracking out”).

3.3 Site Constituents/Hazards (Existing Contamination)

The potential for exposure to Existing Contamination in the form of RCRA metals arsenic, cadmium, and/or lead; the pesticide dieldrin; the VOC solvent 1,1,2,2-TCA; and/or petroleum hydrocarbon constituents in soil (or other unknown environmental impact/Hazardous Substance) exists at the Site and may pose a hazard. Other workplace hazards associated with construction activities (e.g., physical, heat stress, noise, heavy equipment, etc.) will likely be present, yet are not specifically addressed within this Plan.

Skin contact with potentially contaminated soil will be minimized by the use of personal protective clothing (PPE). Inhalation of vapors or particulate during Site redevelopment activities will be minimized by the use of engineering controls, limiting employee smoking to off-Site areas, and coincident air monitoring by

an environmental professional. Ingestion of impacted soil will be minimized by the use of appropriate personal hygiene procedures during decontamination (i.e., thoroughly washing face and hands with soap and water after leaving the identified impacted soil area [**Figure 2**] and prior to eating or drinking).

Categories of chemical hazards in Existing Contamination (i.e., contaminated soil) associated with planned Site redevelopment activities include:

RCRA metals (arsenic, cadmium, and/or lead);

- VOCs (1,1,2,2-TCA);
- Organochlorine Pesticides (dieldrin);
- Residual petroleum hydrocarbon constituents (GRO/DRO/ORO); and
- Chemicals used to conduct the Site work (e.g., equipment fuel).

Existing Contamination, per the Environmental Reimbursement Agreement, is defined as any waste, pollutant, contaminant, chemical, petroleum product, pesticide, fertilizer, substance, or material that is defined, classified, or designated as hazardous, toxic, radioactive, dangerous, or other comparable term or category under any Environmental Laws, whether currently known or unknown as being present (as of March 29, 2019) in soil (including fill material), soil vapor, and/or groundwater at, on, or under the Property in excess of applicable cleanup levels or remedial action levels.

Additional petroleum hydrocarbons and chemicals that are brought to the Site to conduct redevelopment/construction activities may be hazardous and are subject to regulation under OSHA's Hazard Communication Standard (29 Code of Federal Regulations [CFR] 1910.1200).

4.0 PRE-CONSTRUCTION SOIL ASSESSMENT

Per a geotechnical engineering report (prepared by GeoEngineers Inc.) in anticipation of Site redevelopment, surface fill of unknown origin is present across much of the Property (to depths of greater than 11.5 fbg). This report included engineering requirements specific to the Site, and relevance to the presence of the referenced fill. The GeoEngineer's report, dated September 29, 2017, states that "*loose fill soils may not be suitable for foundation support. Overexcavation of the fill could be required…*". Additionally, as previously reported historic Site use included a retail fueling station with concurrent use of underground PSTs, automotive repair, and a greenhouse with the potential to have residual impact to Site soil.

Therefore, to facilitate initial phases of construction, further assessment was conducted in November 2019 and January 2020 for soil/fill material (POC soil) that may be disturbed during construction activities. This effort was conducted for purposes of identifying/delineating areas of environmental impact and cost-effective analytical characterization to establish proper soil/material management options with respect to regulated disposal off-Property during planned redevelopment. As previously discussed, Mr. Early, with Archer Construction, provided estimated volumes for material requiring removal (i.e., 'cut') from the development zone of 1,047 bcy (1,466 truck tons) for "cut to fill" and 336 bcy (470 truck tons) for "footing excavation".

Again, while Site soils are referenced as being "cut" or "excavated", all material (referenced above) is to be "*reused"* on the Property. However, Site characterization efforts to date have determined that petroleum hydrocarbons (specifically, GRO, DRO and ORO); the VOC analyte 1,1,2,2-TCA; RCRA metals cadmium, lead, and arsenic; and the organochlorine pesticide dieldrin (Existing Contamination) are present at concentrations in excess of respective MTCA screening levels (see **Figure 2**).

TGE has established that the material will be addressed under dual agency oversight. Therefore, per Lessee's directive and Ecology MTCA requirements, environmentally-impacted soil/fill material (estimated 1,430 truck tons of impacted POC soil) is currently slated for management through the PLIA program; while soil impacted with pesticide (greenhouse area) will be managed via the state's VCP. Remediation via a self-implementation strategy (Independent Remedial Action) will entail excavation and off-Property disposal of affected soil at a permitted Subtitle D landfill (Republic Services Roosevelt Regional Landfill) during planned Site redevelopment. Additionally, due to planned construction of a retaining wall (i.e., soil mail wall) along the western Property boundary for slope stabilization, a portion of impacted material in Area A will likely be abandoned under a disproportionate cost analysis per WAC 173-340-360.

5.0 PROJECT RESPONSIBILITIES

As summarized in Section 1.0, although the Site has documented environmental impact to soil, there are no restrictions regarding property use/development. Based on the potential presence of environmentally-impacted soil, the General Contractor selected for redevelopment of the Property should be properly trained, experienced, and qualified (possessing specialized knowledge and skills) to address projects associated with known/potential environmental impact. OSHA's "General Duty" clause (Section 5[a][1]) requires that an employer provide a workplace that is "free from recognized hazards that are causing or likely to cause death or serious harm." The following project staff and associated "key" responsibilities are provided to assist the General Contractor with OSHA workplace compliance (29 CFR 1910).

5.1 PROJECT SUPERINTENDENT

As with most construction-related projects, the Project Superintendent for the General Contractor will direct daily on-Site operations and is charged with the duty of Plan implementation. During redevelopment efforts at the Site, the Project Superintendent, assisted by the Site Safety Officer, has primary responsibility for the following:

- ensuring all workers and subcontractors have been notified/are aware of the presence and location of Site hazards (specifically, environmentally-impacted soil);
- acting as the project "Competent Person" and seeing that appropriate personal protective equipment (PPE) and monitoring equipment (as necessary) are available and properly used by all on-Site employees;
- establishing that Site personnel are aware of the provisions of the Site-specific HASP, are instructed/trained in the work practices necessary to ensure safety, and are familiar with planned procedures for dealing with emergencies;
- establishing that all Site personnel/subcontractors have completed a minimum of 40 hours of health and safety training, as required by 29 CFR 1910.120 (OSHA Hazardous Waste Operations and Emergency Response [HAZWOPER]);
- monitoring the safety performance of all personnel to see that required work practices are employed and correcting any work practices or conditions that may result in injury or exposure to hazardous substances;
- preparing any accident/incident reports for Site activities;
- halting any Site construction operation, if necessary, in the event of an emergency or to correct unsafe work practices; and
- reviewing and approving this Plan and the Site-specific HASP.

5.2 SITE SAFETY OFFICER

The Site Safety Officer's duties may be carried out by the Project Superintendent or another qualified Site Manager. The Site Safety Officer is responsible for the following:

- implementing the Plan and the Site-specific HASP and reporting any deviations from anticipated conditions described in HASP to the Project Superintendent;

- determining that monitoring equipment is used properly by qualified/trained personnel (with results properly recorded and filed) and that it is calibrated in accordance with the manufacturer's instructions or other standards;

- assuring Site personnel and subcontractors have current training;

- assuming any other duties as directed by the Project Superintendent;

- coordinating with the Project Superintendent to identify personnel on-Site for whom specialized PPE, exposure monitoring, or work restrictions may be required;

- conducting safety meetings for all Site personnel;

- conducting daily Site safety and health inspections prior to the start of each shift (all inspections must be fully documented);

- providing ongoing reviews of protection level needs as work is performed and informing the Project Superintendent of the need to upgrade/downgrade protection levels, as deemed appropriate;

- seeing that decontamination procedures are followed for field equipment used in environmentally impacted areas;

- establishing monitoring of personnel and recording the results of exposure evaluations;

- halting Site operations, if necessary, in the event of an emergency or to correct unsafe work practices;

- maintaining a log of all subcontractors/visitors to the Site; and

- posting OSHA "Safety of the Job" and other required posters at the Site.

5.3 PROJECT PERSONNEL

Project personnel involved in on-Site redevelopment operations are responsible for:

- taking all reasonable precautions to prevent injury to themselves and to their fellow employees;

- performing only those tasks that they believe they can do safely and immediately reporting any accidents and/or unsafe conditions to the Site Safety Officer or Project Superintendent;

- implementing the procedures set forth in the Plan and the Site-specific HASP and reporting any deviations from the procedures described to the Site Safety Officer or Project Superintendent for action;

- notifying the Project Superintendent or Site Safety Officer of any special medical problems (i.e., allergies) and seeing that all on-Site personnel are aware of such problems; and

- reviewing the project HASP.

5.4 SUBCONTRACTOR'S SAFETY REPRESENTATIVE

Subcontractors are requested to designate an on-Site employee (preferably a manager) who will serve as the Safety Representative for their company. In this capacity, the Safety Representative is responsible for providing health and safety oversight of their personnel participating on the project team. In addition, the Safety Representative will perform routine work area inspections, conduct safety meetings, provide safety orientations for new employees and investigate incidents involving their employees. The Safety Representative will attend periodic safety meetings with the Project Superintendent or Site Safety Officer.

6.0 SOIL MANAGEMENT PLAN PROCEDURES

Planned redevelopment of the Site will likely entail soil grading, detention pond excavation, drilling and excavation for building foundations, and/or trenching of utility corridors. If, during soil disturbance activity of any kind (and in any area), environmentally or petroleum hydrocarbon impacted soil (or other suspect material) is encountered, the General Contractor will immediately notify the Site Owner and implement soil management procedures detailed herein.

The General Contractor will periodically inspect disturbed soils during excavation/grading activities for obvious environmental impact, odors, staining, or abandoned tank system components. These inspections will be conducted using visual, olfactory, and/or a PID meter and documented on Daily Field Logs (attached). If impacted soil or an abandoned tank system or ancillary equipment is encountered during Site preparation/redevelopment, the soil and/or feature is to be managed in accordance with this Plan.

In anticipation of impacted soil being encountered at the Property, the General Contractor will engage a third-party resource to execute air monitoring as described herein; provide Owner/agency notifications as required; properly segregate the impacted material from other soil; and coordinate the collection of confirmation/characterization samples to facilitate its appropriate off-Property disposal. Soil characterization samples will be collected by trained personnel in accordance with general industry practice and state/federal requirements in an appropriate frequency and for specific chemicals of concern. Results of sample collection and analyses will be utilized as required documentation for determination of proper disposition off-Property (disposal) at a permitted landfill. If impact is found to be more extensive and present at a greater magnitude than anticipated, more expanded Site characterization will be required.

Equipment used to excavate or otherwise handle environmentally-impacted soil shall not be used to excavate or otherwise handle non-impacted soil until it has been appropriately decontaminated. If physical handling of suspect, environmentally or petroleum hydrocarbon impacted soil is required, gloves shall be worn.

6.1 Stained and/or Odiferous Soil

Should soil excavation or grading activities encounter stained soil or odors indicative of environmental impact, such material is to be inspected, field tested via real-time “head-space” analysis for the qualitative presence of VOCs, segregated, and stockpiled on-Site (**Section 5.2** – below) with the proposed margins or base of the excavation zone advanced to a greater depth and/or lateral dimension as appropriate until soil exhibiting the evidence of obvious impact has been removed.

6.2 Stockpile Management

Soil from potentially impacted areas is to be segregated from non-impacted material (soil, concrete, and other demolition debris) and stockpiled for subsequent inspection, analytical characterization, quantification and waste profiling. Alternatively, impacted material may be placed in properly lined, roll-off dumpsters (depending on the volume of material generated). A soil stockpile will be established on the Property in a location that does not interfere with redevelopment activities, pending receipt of analytical results and transport off-Site for disposal. When stockpiling suspect or contaminated material, the following steps shall be taken:

- impacted material may be temporarily stockpiled in the excavation zone, but shall be moved to a designated stockpile area as soon as is practical;

- stockpiled material should be placed on 10-mil polyethylene sheeting or similar to prevent contamination of the underlying soil;

- maintain stockpile integrity as provided within the Site Storm Water Pollution Prevention Plan (SWPPP);

- the plastic liner will be wrapped around a row of hay bales or sand bags placed around the perimeter of the stockpile area to form a berm to prevent runoff from leaving the area or storm water from other areas entering the stockpile area;

- the stockpile shall be covered and secured at all times when not being actively worked on/addressed and during precipitation events, prior to the end of each workday or when needed to prevent dust, nuisance odors or emissions and storm water contact;

- the stockpile will not be placed near storm water drains, swales or any other watercourses;

- BMPs will be implemented to prevent potentially contaminated soil becoming windborne, or to leach into the underlying subsurface or storm water; and

- stockpiled soil/material will be profiled for proper disposal management at a permitted off-Property landfill or re-use/relocation on Site (as appropriate). Characterization analyses and number of samples will be based on specific landfill requirements and the estimated volume of material realized.

6.3 Storm Water Control

Storm water pollution can occur when surface runoff from a construction site contacts environmentally-impacted soil in excavation/grading areas or stockpiles and carries muddy water, debris, and chemicals into local waterways. Resulting sediments, chemicals, and debris in surface runoff can harm aquatic life and reduce water quality. A construction storm water discharge must not cause or contribute to a violation of surface water quality standards (WAC Chapter 173-201A), groundwater quality standards (WAC Chapter 173-200), sediment management standards (WAC Chapter 173-204), or human health criteria in the National Toxics Rule (40 CFR Part 131.36).

Therefore, runoff shall be prevented/minimized by managing water that may be contaminated from a construction site through the use of a construction storm water permit, engineering controls, good housekeeping practices, and proper storm water BMPs to prevent off-Site discharge. Storm water discharges should comply with Water Quality Standards for surface waters of the State of Washington (WAC 173-201A-240). Divert flow from exposed environmental contaminated soil or otherwise constrain runoff and the discharge of pollutants.

Per the US Environmental Protection Agency (USEPA) National Pollutant Discharge Elimination System (NPDES) regulations, construction zones in which land disturbance is equal to, or more than, one acre in size require the submittal of a Notice of Intent (NOI) to be covered by a state General Permit for Storm Water Discharges Associated with Construction Activity and the preparation of a SWPPP. Ecology requires regulated construction projects to get coverage under the Construction Stormwater General Permit (CSWGP). Construction Stormwater Permits require permittees to prevent water pollution by managing water that may be contaminated from their construction sites. Known or suspected contaminants must be reported on the NOI. Operators of regulated construction sites are required to:

- develop a storm water pollution prevention plan; and

- implement sediment, erosion, and pollution prevention control measures.

A storm water pollution prevention/erosion control plan shall be developed by the General Contractor prior to initiation of work at the Property. Guidance for preparation of the required storm water pollution prevention plan and selecting appropriate BMPs (Best Management Practices) to manage contaminated runoff is provided within the 2012 Stormwater Management Manual for Western Washington, as Amended in December 2014 (the 2014 SWMMWW). The storm water pollution prevention plan must provide the location(s), contaminant(s), and contaminant concentration(s) of the impacted soil and/or groundwater. Pollution prevention methods and/or BMPs proposed to control the discharge of soil/groundwater contaminants (example: treatment method) must be detailed and may include (as needed to meet water quality requirements) a treatment system effective in treating the site-specific contaminant(s) or runoff collection and off-Property treatment/disposal (associated with a significant increase in operational costs). The effectiveness of a treatment system must be evaluated prior to implementation to confirm that use of the treatment system will not cause or contribute to a violation of Water Quality Standards.

Pursuant to King County Council adoption of Ordinance 18257, the Department of Natural Resources and Parks adopted a public rule revising the King County Surface Water Design Manual (SWDM). King County's 2005 SWMMWW-equivalent program consists of:

- King County Code Chapter 9.04 Surface Water Runoff Policy, as amended by Ordinance 16264 approved Oct. 20, 2008;
- King County Code Chapter 9.12 Water Quality, as amended by Ordinance 16264 approved Oct. 20, 2008;
- King County Code Chapter 16.82 Clearing and Grading;
- 2009 King County SWDM;
- 2009 King County Stormwater Pollution Prevention Manual (SPPM); and
- Elimination of impervious surface percentage exemption and small project review threshold.

The SWPPP will include design elements such as silt fencing, hay bales, diversion dikes, storm drain inlet protection, and/or sediment traps to control storm water flow. Covering of soil stockpiles, if any, should be included.

6.4 Dust Control

Planned Site redevelopment has the potential to generate emissions in the form of fugitive dust. Dust control measures shall be implemented at the Site when environmentally-impacted soils are encountered. Potential sources of fugitive dust include:

- Site grading or excavation;
- Heavy Equipment Traffic – the movement of equipment or vehicular traffic on-Site; and
- Material stockpiles, exposed excavation zones, or disturbed ground surfaces.

High winds and Site redevelopment operations may cause an airborne dust hazard. Should Site activities generate sustained visible dust, a light water mist will be applied to the excavation/grading zone to reduce dust generation. Specific dust control measures include the following.

- Exposed soils shall be lightly sprayed with water, as necessary, to maintain moisture content and minimize dust generation (visible emissions). Increase application as needed to maintain proper moisture content.

- Reduce the pace (speed) of Site activities creating fugitive dust. Notify the Project Superintendent of dust conditions and implement necessary mitigation measures.

- Water shall be lightly sprayed on any stockpiled material when exposed or during loading into transportation vehicles. When not in use, soil stockpiles will remain covered.

- Transportation vehicles shall employ tarpaulins or other effective covers to limit dust generation while traveling on public roadways. Prior to exiting the Property, vehicles will be inspected to ensure the covers are in-place and no loose material is present on the vehicle exterior.

- Any visible accumulations of loose, impacted material on paved public roadways, access routes, or parking/staging areas ("track out") shall be swept daily (using brooms, wet sweeping vacuum or a combination, as needed). Stabilized construction entrances (gravel pads) shall be installed at the primary Property access point to prevent tracking of soil onto public roadways. All haul trucks will access the Property via the established gravel pads.

Should visible dust from redevelopment activities be observed coming from the vicinity of the former automotive repair facility, the specific source/activity of the emissions shall be immediately ceased and a more aggressive application of existing dust mitigation measures will be directed. Thereafter, observations of continued work will be made to ensure mitigation measures are effective and recorded in the Daily Field Log.

6.5 Soil Disposal

Environmentally-impacted soil (Existing Contamination) that is excavated during planned redevelopment activities at the Site will require off-Property disposal and shall be segregated and separately stockpiled. Non-impacted POC soil excavated at the Site may also require off-Property disposal due to various construction-related requirements (e.g., geotechnical consideration, available space, no subsequent re-use) and should be managed separately.

Prior to disposal, the suspect impacted soil shall be analytically tested for the presence of petroleum hydrocarbon/hazardous constituents according to specific waste profiling requirements of the facility to which the soil will be transported for management. A State-approved manifest system shall be used so that all such material can be tracked from generation to ultimate disposal, and the manifests shall comply with all transportation (WADOT) transportation and disposal (USEPA/Ecology) regulations for waste tracking (as hazardous or non-hazardous wastes).

Appropriate vehicles and operating practices shall be used to prevent spillage or leakage of materials from occurring on-Site or during transport. Trucks/trailers/bins shall be properly permitted, placarded, lined and securely covered prior to departure from the Property. All transportation vehicles leaving the Site shall be thoroughly inspected to ensure that no soil is adhered to the tires or undercarriage. Any such material shall be removed at the work area or decontamination pad before the truck is allowed to leave the Site. Adjacent roadways are to be routinely inspected to ensure that no accumulations of tracked or spilled soil are present. If impacted material is observed in a roadway, it shall be immediately cleaned and procedures modified as necessary to prevent/limit recurrence.

6.6 Monitoring

In accordance with 29 CFR 1910.120(h), the Site Safety Officer or an industrial hygienist will perform quantitative ambient air and/or monitoring of personnel at the greatest risk of exposure (i.e., those working in the potential hydrocarbon impacted soil zone) on a routine basis to evaluate the potential for exposure to airborne contaminants. The Site Safety Officer or industrial hygienist will determine where or who to sample based on Site conditions at the time of sampling.

When working in the vicinity of the former automotive repair facility (or an area of suspect environmental impact), real-time monitoring should be conducted periodically for total VOCs. A PID or equivalent (OVM) will be used to screen disturbed/excavated soils for VOC contaminants and measure/record employee breathing zone levels of organic vapors and gases. As necessary, a monitoring program should be set/established by the General Contractor as indicated by field conditions encountered and/or monitoring results. Measurements should be collected at the excavation zone/apparent source area and in the breathing zone of Site personnel.

Monitoring instruments employed shall only be operated by General Contractor personnel who have been trained in their proper operation, limitations, and calibration needs; and have demonstrated skills necessary to properly operate the equipment. Readings shall be properly recorded and logged as to the date, time, operator, conditions, location and reading. All monitoring data, including background readings and the results of daily instrument calibrations, will be recorded in the daily field log. All monitoring instruments will be calibrated in accordance with the manufacturers' instructions prior to the start of each shift. Calibration will also be performed when inconsistent or erratic readings are obtained.

All "direct-read" instrument readings will be evaluated relative to background readings, not "meter zero." Prior to the start of work at each work shift, and whenever there is a significant shift in ambient wind direction, instrument readings will be obtained upwind of the potential impacted soil work zone to determine the level of "background" readings from such things as local vehicle traffic or emissions from nearby operations unrelated to the Site. Site readings will be evaluated against these background readings (i.e., if an "action level" is listed as 20 parts per million [ppm], it is evaluated as 20 ppm above the background reading). The Site Safety Officer will consult with the industrial hygienist regarding the potential health hazards associated with background readings above 5 ppm.

6.7 Site Control

For safety purposes, barricade tape and/or temporary construction fencing will be used to delineate the work zone during redevelopment operations in the vicinity of the former on-Site automotive repair facility and documented affected soil. A short piece of barricade tape can be affixed to a secure upright (e.g., a vehicle antenna) to serve as a wind direction telltale. An opening in the barricade tape and/or fencing should be established at the support zone (upwind of the work zone) to serve as a personnel and equipment entry and exit point. A decontamination station for equipment and personnel may be established at this point, if decontamination procedures are required. All entry and exit from the work zone should be made at this opening to control potential sources of contamination and leave contaminated soil and debris in the work area. At the end of each workday, all stockpiles of impacted soil or hydrocarbon impacted soil excavation zones must be covered or otherwise secured to limit access.

6.8 Documentation

Field personnel are required to keep daily field logs (see **Attachment 1 - Field Report Form**). Field notes will be as descriptive and as inclusive as possible. Language used is to be factual, objective, and free of inappropriate terminology. A summary of each day's events will be completed to include, at a minimum, the date, project number, project location, weather conditions, personnel/contractors present, field equipment in use, any indication of impacted soil, drawings, photographs, real-time monitoring data, and any associated soil sample collection.

Should additional impacted soil/material (Existing Contamination) be encountered and disposed off-Property, a **Waste Inventory Form** (**Attachment 2**) is provided for use to document and track any wastes generated during the redevelopment process. The form will include information on the waste, origin, type, date generated, date removed, transporter, and disposal facility.

Field documentation shall be maintained throughout at the project and shall be available for use in project close-out record-keeping to be submitted to Lessee for submittal to Lessor, or provided for reference to agency personnel.

7.0 CONTINGENCY ACTION PLAN

This section outlines steps to be taken should suspect contaminated soil or hazardous materials be discovered during earthwork in areas other than as anticipated (see **Figure 2**). Procedures outlined below are to provide the General Contractor with preliminary directions to address/identify the presence of potential contamination and take appropriate action to avoid adverse worker health effects or contaminant dispersion into the surrounding environment.

Indicators of environmental contamination or Hazardous Substances may include, but are not limited to the following:

- intact or ruptured drums or containers;
- unusual odors;
- obviously discolored/stained soil;
- petroleum hydrocarbon contaminated soil and/or free product;
- liquid waste, putrescent waste, household refuse and/or any material that would normally be sent to a permitted landfill for disposal (e.g., tires, batteries, etc.);
- bubbling pool of standing liquid;
- broken transite (asbestos-containing cement) sheets or piping; and
- stressed vegetation.

During Site excavation or grading, the General Contractor shall actively monitor the work area for conditions/materials specified above, as well as any other unusual findings. In the event any are identified or reported, the following actions shall be taken:

- ensure worker health and safety, evacuate all Site personnel from the affected area, and limit the potential for dispersion of contamination;
- cease work in the area or advise work to proceed in an area clear of the suspect contamination indicators until material inspection/testing (as necessary) by appropriately trained/licensed personnel has defined the suspect material's characteristics/hazards;
- document the suspect material, and as appropriate, record observations on a Daily Log Form, photograph, estimate size/quantity/volume, etc.;
- notify appropriate personnel or regulatory agency (if required) of the discovery of environmental contamination (emergency contact information is provided below and an Emergency Response Checklist is provided as **Attachment 4**);
- as needed, coordinate a third party environmental contractor for the physical and chemical characterization of the potentially contaminated material via sample collection for analytical waste profiling;

- determine the appropriate management of suspect materials based on inspection/analytical characterization;

- per findings from above-referenced characterization efforts, a specialty contractor shall remove the material and place it into a proper stockpile or lined/covered bin for subsequent disposal management to an approved off-Property facility as appropriate for its class/characteristics;

- manage material as appropriate and coordinate any required confirmation sampling/testing as may be required; and

- record all details on the Daily Field Log (including GPS coordinates of suspect material).

In the event of a Site emergency requiring evacuation, all Site personnel will evacuate to a pre-designated area a safe distance from any health or safety hazard. Once personnel are assembled, a head count will be made. During any evacuation, all employees will be instructed to observe wind direction indicators. During evacuation, employees will be instructed to travel upwind or crosswind of the area of influence.

In certain hazardous situations, the Project Superintendent or Site Safety Officer may direct that redevelopment activities be temporarily suspended while a hazard/potential hazard is corrected or controlled. During operation shutdowns, all personnel will be required to stand upwind to prevent exposure to fugitive emissions, if any.

Emergency Numbers:

King County Fire and Rescue Department (telephone):

Emergency - 911

King County Fire Department (non-emergency)	206-242-2040
King County Department of Emergency Management:	206-296-0100

WA Emergency Management Division Hotline: 800-258-5990 (24-hour Spill Reporting)

National Response Center: 800-424-8802 (24-hour Spill Reporting)

8.0 GENERAL SITE SAFETY PRACTICES

A Site-specific HASP is required for activities that are conducted at hazardous waste facilities. Though not specifically designated as a hazardous waste operations area, and potential exposure to known chemicals present at the Site (as reported in foregoing subsurface assessment reports) do not likely pose a material threat to construction workers, a HASP should be prepared for standard health and safety precautions and should comply with the requirements of the "General Duty Clause" provided in Section 5(a)(1) of the Occupational Safety and Health Act of 1970 (29 USC Section 65 et. seq.). The General Duty Clause requires that each employer furnish to its employees a workplace that is free from recognized hazards that are causing or likely to cause death or serious physical harm.

This section does not relieve the Contractor of its responsibility to prepare and implement a project specific HASP. All contractors on the Property shall independently evaluate health and safety requirements for their employees and develop a Site-specific HASP for their use. A copy of the HASP shall be maintained on-Site (with this Plan) at all times during earthwork. Daily safety meetings will be held to reinforce the need for all Site personnel to be cognizant and responsive to conditions or activities that pose a risk to human health and the environment.

Per 29 CFR 1910.1200 (Hazard Communication), the General Contractor must institute a comprehensive, written hazard communications program to ensure that chemical hazards are evaluated and any information concerning their hazards and any appropriate protective measures shall be provided to employers and employees.

The General Contractor shall be solely responsible for compliance with environmental and hazardous materials regulatory requirements; and for conducting all redevelopment/construction activities on the Property under a Site-specific HASP. **No action, directive, or advice undertaken shall relieve the General Contractor of these responsibilities.** The following General Site Safety Practices should be conveyed to all Site personnel and strictly enforced, along with the Contractor specific HASP.

- Eating, drinking, chewing gum or tobacco, and/or smoking are prohibited in contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists.

- Alcohol consumption is prohibited on-Site. Use of prescription medications that impair judgement or affect motor skills are prohibited, as are all illegal drugs. Behavior that could endanger the health or safety of any individual shall not be tolerated.

- Personnel will wash their hands and faces thoroughly with soap and water prior to eating, drinking, or smoking.

- Personnel will avoid contact with potentially contaminated soil/materials and will not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling, leaning, or sitting on contaminated surfaces, and do not place equipment on potentially contaminated surfaces.

- All Site personnel shall remain alert to potentially dangerous situations in which they should not become involved (i.e., note the presence of strong, irritating, or nauseating odors, etc.).

- Only equipment and/or those vehicles required to complete work tasks are permitted within the potentially hydrocarbon impacted work zone (excavator, bulldozer, motor grader, support truck, etc.).

- Spills should be prevented, to the extent possible. Should a spill occur, any liquid should be contained, if possible.

- Splashing of potentially impacted materials should be prevented.

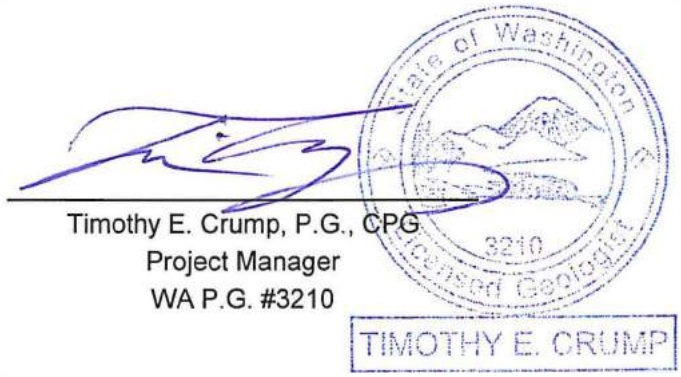
- All PPE will be used as specified and required.

- Personnel are to immediately notify the Project Superintendent or Site Safety Officer if any indications of potential impacted materials or unusual conditions are observed.

- Field personnel are to be familiar with the physical characteristics of Site operations including:
  - wind direction in relation to the potentially impacted area;
  - accessibility to equipment and vehicles;
  - areas of known or potential environmentally-impact or petroleum hydrocarbon impact;
  - Site access; and
  - nearest water sources.

9.0 CERTIFICATION

This Soil Management Plan was prepared by TGE under the responsible charge of the undersigned. The information presented in this plan is believed to be accurate and consistent with the level of care and skill ordinarily exercised and is in general compliance with accepted practices and applicable USEPA/OSHA/State of Washington regulations.



Timothy E. Crump, P.G., CPG
Project Manager
WA P.G. #3210

Robin D. Franks, CHMM, TX P.G.
President

February 17, 2020
Date

FIGURES

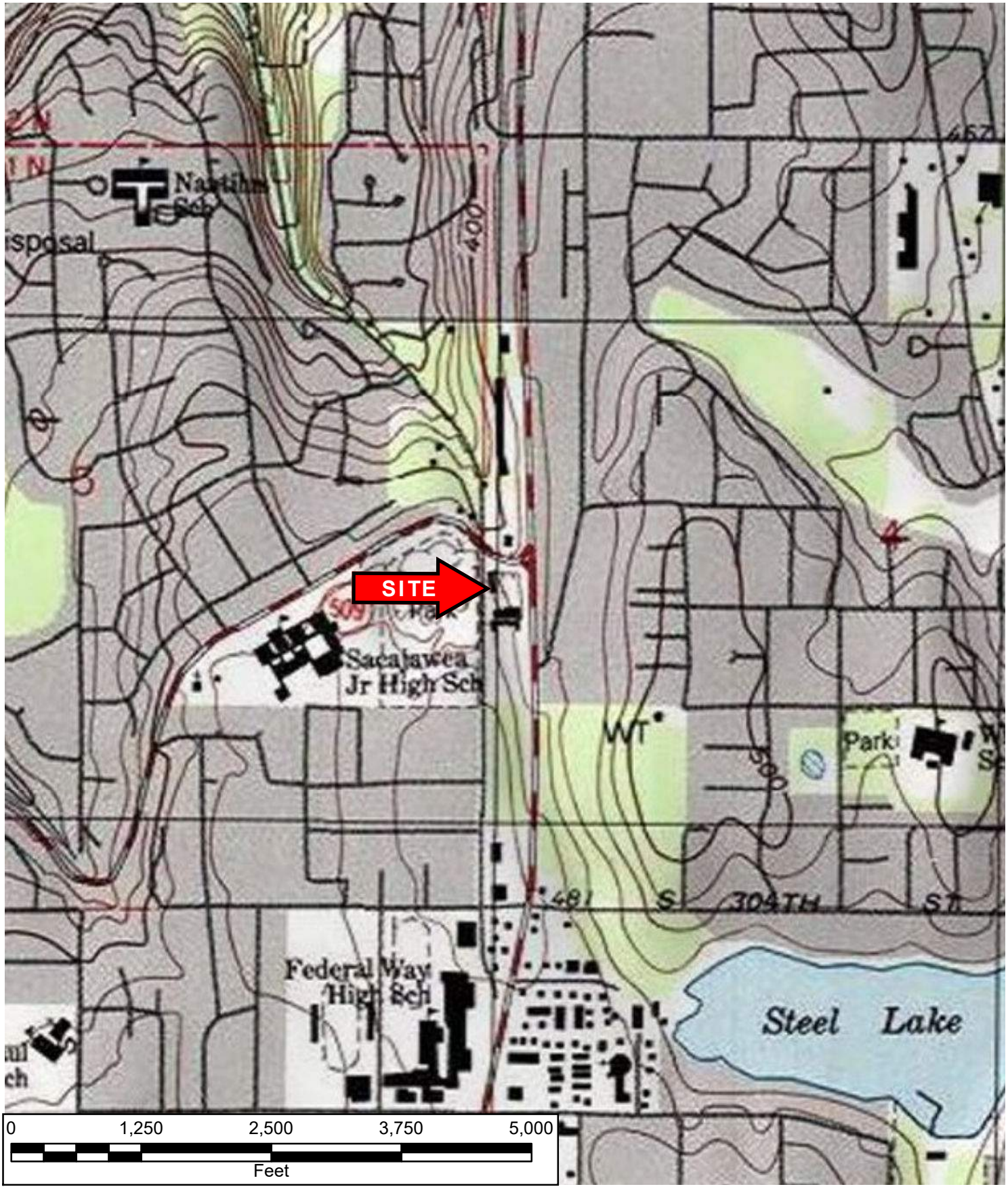


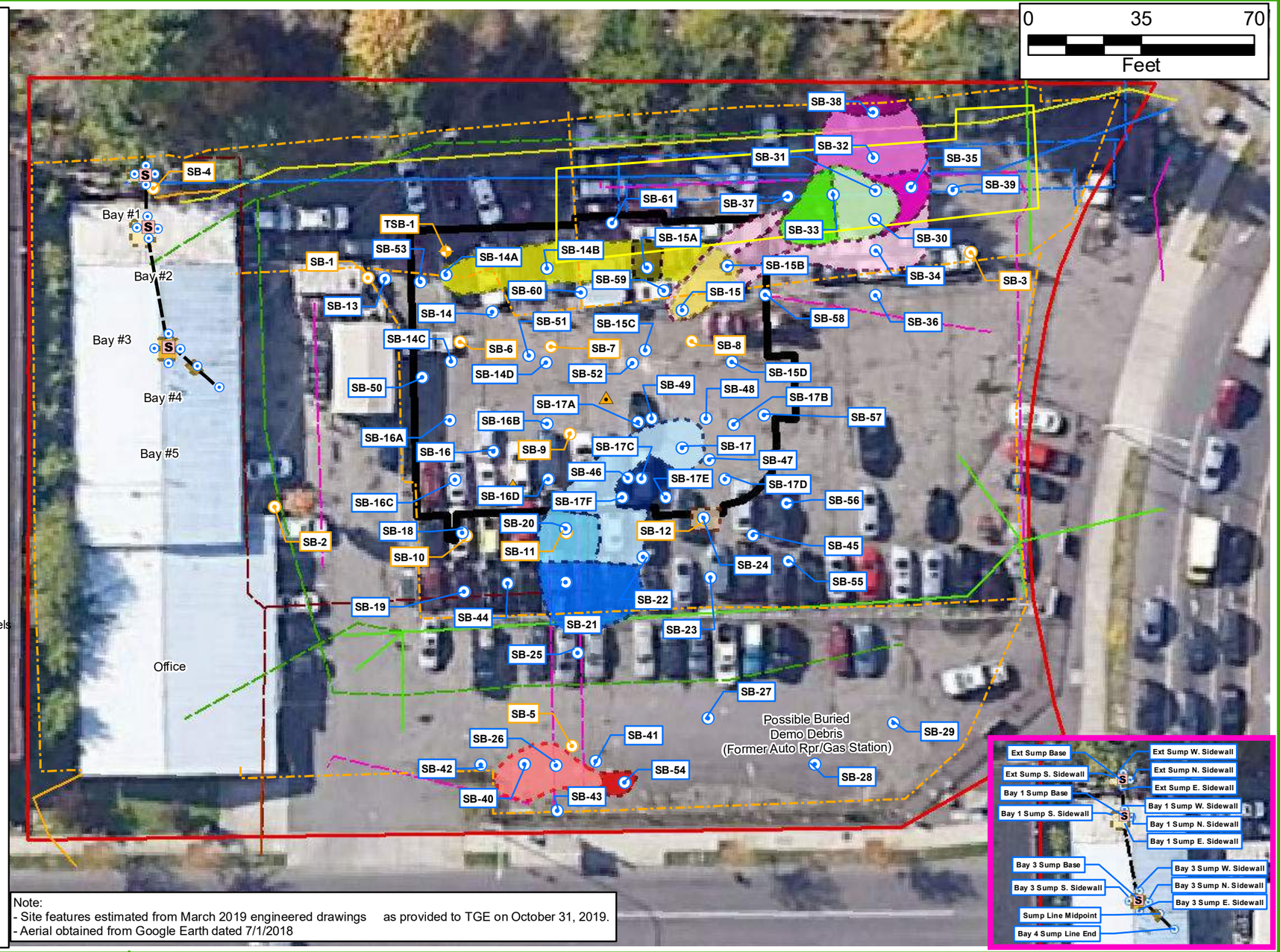
Figure 1
Site Location Map
TGE Project No.: R13411.07

TGE RESOURCES, INC.
8048 Northcourt Road
Houston, Texas 77040

Topographic Map
USGS 7.5 Minute Series Topographic Map
Poverty Bay, Washington Quadrangle
1994

Legend

- Approximate Limits of RCRA metal Arsenic impact in excess of Ecology Screening Limits to a depth of 2 fbg **(Area A1)**
- Approximate Limits of RCRA metal Arsenic impact in excess of Ecology Screening Limits to a depth of 3 fbg **(Area A2)**
- Approximate Limits of RCRA metal Arsenic impact in excess of Ecology Screening Limits to a depth of 5 fbg **(Area A3)**
- Approximate Limits of RCRA metal Arsenic impact in excess of Ecology Screening Limits to a depth of 7 fbg **(Area A4)**
- Approximate Limits of RCRA metal Arsenic impact in excess of Ecology Screening Limits to a depth of 8 fbg **(Area A5)**
- Approximate Limits of OC Pesticide Dieldrin impact in excess of Ecology Screening Limits to a depth of 6 fbg **(Area A6)**
- Approximate Limits of OC Pesticide Dieldrin impact in excess of Ecology Screening Limits to a depth of 12 fbg **(Area A7)**
- Approximate Limits of TPH DRO/ORO impact in excess of Ecology Screening Limits to a depth of 2 fbg **(Area B1)**
- Approximate Limits of TPH DRO/ORO impact in excess of Ecology Screening Limits to a depth of 4 fbg **(Area B2)**
- Approximate Limits of TPH DRO/ORO impact in excess of Ecology Screening Limits to a depth of 2 fbg **(Area C1)**
- Approximate Limits of petroleum hydrocarbon (GRO) impact in excess of Ecology Screening Levels to 4 fbg **(Area C2)**
- Approximate Limits of RCRA metal lead and/or 1,1,2,2-TCA impact in excess of Ecology Screening Limits to a depth of 9 fbg **(Area C3)**
- Approximate Limits of petroleum hydrocarbon (GRO) impact in excess of Ecology Screening Levels to 18 fbg **(Area C4)**
- Approximate Limits of RCRA Metal Arsenic impact in excess of Ecology Screening Levels to a depth of 2 fbg **(Area D)**
- Approximate Limits of RCRA Metals (Lead and/or Cadmium impact in excess of Ecology Screening Levels to a depth of 11 fbg **(Area E1)**
- Approximate Limits of RCRA Metals (Lead and/or Cadmium impact in excess of Ecology Screening Levels to a depth of 14 fbg **(Area E2)**
- Approximate Limits of RCRA Metals (Lead and/or Arsenic) impact in excess of Ecology Screening Levels to a depth of 5 fbg **(Area F1)**
- Approximate Limits of TPH DRO/ORO impact in excess of Ecology Screening Levels to a depth of 7 fbg **(Area F2)**
- Approximate Limits of RCRA Metal Cadmium impact in excess of Ecology Screening Levels to a depth of 2 fbg **(Area F3)**
- Former Greenhouse (as reported by others in 1993)
- Proposed Building Footprint
- Approximate Site Limits (as per Demo Plan provided to TGE and KIng CAD)
- Fence
- Existing Electrical Lines
- Proposed Electrical Lines
- Existing Water Lines
- Proposed Water Lines
- Existing Stormwater Lines
- Proposed Stormwater Lines
- Existing Sanitary Lines
- Proposed Sanitary Lines
- Existing Commercial Sump Discharge Line
- Soil Boring (Completed by TGE November 2019 & January 2020)
- Soil Boring (Completed by TGE in August 2017)
- Temporary Screened Borehole (Completed by TGE in August 2017)
- Temporary Vapor Monitor Point (Completed by TGE in August 2017)



Note:
- Site features estimated from March 2019 engineered drawings as provided to TGE on October 31, 2019.
- Aerial obtained from Google Earth dated 7/1/2018

Future Federal Way Hospital
29805 Pacific Highway South
Federal Way, King County, Washington
TGE Project No.: R13411.07/R13411.08

TGE RESOURCES, INC.
8048 Northcourt Road
Houston, Texas 77040

Delineation Map Exceeding Ecology Screening Limits (Revised February 11, 2020)

ATTACHMENT 1

Field Activity Daily Log

Project Number:				Equipment Operating On-Site:
Project Location:				
Date:				
Personnel:		Arrival Time		
		Departing Time		
Contractors Present:				
Climatic Conditions:				

Time	Observation

Note: Attach an activity related site drawing or include on back of this page.

Provide an activity related site drawing in the space provided below. If you prefer, you may attach a site map detailing current site conditions.

Map Scale: 1" = approximately _____ Feet

ATTACHMENT 2

Waste Inventory Form

Date:

Site Name/Location: ____________________ Project Number: ____________________ Personnel: ____________________

# of Loads	Contents	% Full	Date(s) Accumulated	Labled (Y/N)	Sampled (Y/N)	Comments

Location of Drums (sketch or describe)	PM Use Only	Date Removed:
	Waste Transporter:	
	Disposal/Treatment Locaiton:	

ATTACHMENT 3

Safety Data Sheet

In accordance with CFR 1910.1200 (OSHA HCS)

SDS No. 143 Date of review: July 7, 2017

1 Identification of substance and company

Product name: ***Arsenic metal***

Product code: 11173, 14178, 18516, 18828

Relevant use and restrictions on use: Research and product development

Manufacturer/Supplier: Noah Technologies Corporation
1 Noah Park
San Antonio, Texas 78249-3419
Phone: 210-691-2000
Fax: 210-691-2600
Web site: www.noahtech.com

Emergency information: CHEMTREC
800-424-9300

2 Hazards identification

Emergency Overview:

Signal word(s): Danger

Pictogram(s): Skull and crossbones
Health hazard
Environment

Hazard statements: H302 Harmful if swallowed
H331 Toxic if inhaled
H410 Very toxic to aquatic life with long lasting effects

Precautionary statements: P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray
P264 Wash skin thoroughly after handling
P270 Do not eat, drink or smoke when using this product
P271 Use only outdoors or in a well-ventilated area
P273 Avoid release to the environment
P280 Wear protective gloves/protective clothing/eye protection/face protection
P301+312+330 IF SWALLOWED: Call a PISON CENTER/doctor if you feel unwell. Rinse mouth.
P304+340+311 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P391 Collect spillage
P403+233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up
P501 Dispose of contents/ container to an approved waste disposal plant

Hazards not otherwise classified: None

GHS Classification: Acute toxicity, Oral - 4
Acute toxicity, Inhalation - 3
Acute aquatic toxicity - 1
Chronic aquatic toxicity - 1

HMIS ratings (scale 0-4):

Health hazard:	2*
Flammability:	0
Physical hazard:	0

3 Composition/Information on ingredients

Chemical name: Arsenic metal

Designation:

CAS number: 7440-38-2

EC number: 231-148-6

Formula: As

Synonyms: None known

4 First aid measures

After inhalation: Move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

After skin contact: Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

After eye contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician

After ingestion:	Rinse out mouth with water. Never give anything by mouth to an unconscious person. Consult a physician.
Information for doctor:	Show this safety data sheet to the doctor in attendance
Symptoms/effects; acute and delayed:	Ingestion may result in nausea, cold sweats, vomiting, diarrhea, bloody stools, collapse, and shock. chronic poisoning may manifest itself in a loss of appetite, cramps, jaundice, skin abnormalities. Gastrointestinal, nervous system, liver and kidney problems. After exposure have a urine test. Poison by subcutaneous, intramuscular and intraperitoneal routes. An experimental teratogen and tumorigen with mutagenic data. Human systemic skin and gastrointestinal effects by ingestion.
Immediate medical attention and special treatment needed:	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.

5 Fire-fighting measures

Suitable and unsuitable extinguishing agents:	Water spray, alcohol-resistant foam, dry chemical or carbon dioxide
Special hazards caused by the material, its products of combustion or resulting gases:	Arsenic fumes, oxides of arsenic
Special fire fighting procedures:	Wear self-contained breathing apparatus and fully protective fire fighting equipment/clothing
Unusual fire and explosion hazard:	Can be heated to burn in air with bluish flame, giving off an odor of garlic and dense white fumes of As_2O_3

6 Accidental release measures

Person-related safety precautions:	Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
Measures for environmental protection:	Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.
Measures for cleaning/collecting:	Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for proper disposal.
Additional information:	See Section 7 for information on safe handling See Section 8 for information on personal protective equipment See Section 13 for information on disposal See Section 15 for regulatory information

7 Handling and storage

Information for safe handling:	Avoid contact with skin and eyes. Avoid dust formation. Provide appropriate exhaust ventilation.
Information about protection against explosions and fires:	No data available
Storage requirements to be met by storerooms and containers:	Keep container tightly closed in a dry and well-ventilated place
Incompatibility (avoid contact with):	Strong acids and oxidizers. Halogens, bromine azide, dirubidium acetylide, zinc, nitrogen trichloride, nitrates, sodium peroxide, platinum oxide
Further information about storage conditions:	Heated arsenic in contact with acid or water vapor can produce highly toxic fumes

8 Exposure controls/personal protection

Ventilation requirements:	Local exhaust, chemical fume hood
Components with exposure limits that require monitoring:	OSHA PEL: TWA 0.01 mg(As)/m3 NIOSH REL: CL 0.002 mg/m3; Potential Occupational Carcinogen, 15 minute ceiling value ACGIH TLV: TWA 0.01 mg(As)/m3; Lung cancer, confirmed human carcinogen ACGIH BEI: 35 ug(As)/L in urine; End of the workweek (After four or five consecutive working days with exposure)
Additional information:	No additional data available
General protective and hygienic measures:	The usual precautionary measures for handling chemicals should be adhered to Keep away from foodstuffs, beverages and food Instantly remove any soiled and impregnated garments Wash hands during breaks and at the end of the work Avoid contact with the eyes and skin
Personal protective equipment:	
Respiratory protection: **(Use only NIOSH or CEN approved Equipment)**	Filter-dust, fume, mist; respirator equipped with HEPA
Hand protection:	Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique.
Eye protection:	Safety glasses, goggles
Skin protection:	Completely covering work attire with full length apron
Additional protective equipment:	Sufficient to prevent contact. Emergency eyewash and safety shower
Precautionary labeling:	Wash thoroughly after handling Do not get in eyes, on skin or on clothing Do not breathe dust, vapor, mist, gas Keep away from heat, sparks, and open flames Empty container may contain hazardous residues

9 Physical and chemical properties

Physical state:	Powder or pieces
Color:	Silver to gray-black
Odor:	Odorless
Odor threshold:	No data available
Molecular Weight (Calculated):	74.92
pH	No data available

Melting point/freezing point/range:	818 C at 36 atm
Boiling point/range:	No data available
Sublimation temperature/start:	615 C without melting. Vaporization becomes apparent at 100 C and is already rapid at 450 C.
Decomposition temperature:	No data available
Flammability (solid, gas):	Can be heated to burn in air with bluish flame, giving off an odor of garlic and dense white fumes of As_2O_3
Flash point:	No data available
Autoignition temperature:	No data available
Danger of explosion:	No data available
Flammable limits:	
Lower:	No data available
Upper:	No data available
Evaporation Rate:	No data available
Vapor pressure (mm Hg):	1 mmHg @ 372 C
Vapor density:	No data available
Specific gravity:	5.727
Bulk density:	No data available
Solubility in/Miscibility with water:	Insoluble
Partition coefficient n-octanol/water:	No data available
Viscosity:	No data available
Other information:	No additional data available

10 Stability and reactivity

Reactivity:	No data available
Chemical stability:	Stable under recommended storage conditions
Possibility of hazardous reactions:	Heated arsenic in contact with acid or water vapor can produce highly toxic fumes
Conditions to be avoided:	Heat, open flames, contact with incompatibles, moisture
Materials to be avoided:	Strong acids and oxidizers. Halogens, bromine azide, dirubidium acetylide, zinc, nitrogen trichloride, nitrates, sodium peroxide, platinum oxide
Dangerous reactions:	Violent reaction with zinc, platinum oxide, nitrogen trichloride, bromine azide
Hazardous decomposition products: (thermal and other)	Arsenic fumes, oxides of arsenic

11 Toxicological information

LD/LC50 values that are relevant for classification:	oral-rat LD_{50}: 763 mg/kg oral-mouse LD_{50}: 145 mg/kg
Irritation or corrosion of skin:	No data available
Irritation or corrosion of eyes:	No data available
Primary irritant or corrosive effect:	
on the skin:	No data available
on the eye:	No data available
Sensitization:	No data available
Potential health effects:	
Inhalation:	No data available
Ingestion:	Stomach irregularities based on human evidence
Skin:	No data available
Eyes:	No data available
Signs and symptoms of exposure:	Ingestion may result in nausea, cold sweats, vomiting, diarrhea, bloody stools, collapse, and shock. chronic poisoning may manifest itself in a loss of appetite, cramps, jaundice, skin abnormalities. Gastrointestinal, nervous system, liver and kidney problems. After exposure have a urine test. Poison by subcutaneous, intramuscular and intraperitoneal routes. An experimental teratogen and tumorigen with mutagenic data. Human systemic skin and gastrointestinal effects by ingestion. To the best of our knowledge the acute and chronic toxicity of this substance is not fully known
Carcinogenicity:	EPA-A: Human carcinogen: sufficient evidence from epidemiologic studies IARC-1: Carcinogenic to humans: sufficient evidence of carcinogenicity NTP-1: Known to be carcinogenic: sufficient evidence from human studies OSHA specifically regulated carcinogen ACGIH-A1: Confirmed human carcinogen: Agent is carcinogenic to humans based on epidemiologic studies
Additional information:	RTECS contains tumorigenic and/or carcinogenic and/or neoplastic data for components in this product

12 Ecotoxicological information

Toxicity:	
Toxicity to fish:	Fathead minnow LC_{50}: 9.9 mg/L:96H
Toxicity to daphnia and other aquatic invertebrates:	Daphnia magna EC_{50}: 3.8 mg/L:48H
Toxicity to algae:	No data available
Persistence and degradability:	
Biodegradability:	No data available
Bioaccumulative potential:	
Bioaccumulation:	No data available
Mobility in soil:	No data available
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

13 Disposal considerations

Recommendation: Consult state, local or national regulation for proper disposal
Allow professional disposal company to handle waste
Must be specially treated under adherence to official regulations

Unclean packagings recommendation: Disposal must be made according to official regulations

14 Transport information

Land transport DOT

Proper shipping name: Arsenic
DOT Hazard Class: 6.1
UN Identification number: UN1558
Label(s): Toxic & Marine Pollutant
Packing group: II
Reportable quantity (RQ): 0.454 kg
North American Emergency Response Guidebook No.: 152

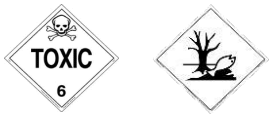
Air transport ICAO-TI and IATA-DGR:

Proper shipping name: Arsenic
DOT Hazard Class: 6.1
UN Identification number: UN1558
Label(s): Toxic & Marine Pollutant
Packing group: II
Reportable quantity (RQ): 0.454 kg
North American Emergency Response Guidebook No.: 152

UPS Ground / FedEx Ground

Proper shipping name: Arsenic
DOT Hazard Class: 6.1
UN Identification number: UN1558
Label(s): DOT-SP-8249 & Marine Pollutant
Packing group: II
Reportable quantity (RQ): 0.454 kg
North American Emergency Response Guidebook No.: 152

UPS Air



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UN Identification number: UN1558
Label(s): DOT-SP-8249 & Marine Pollutant
Packing group: II
Reportable quantity (RQ): 0.454 kg
North American Emergency Response Guidebook No.: 152

15 Regulatory information

SARA Section 302 Extremely Hazardous components and corresponding TPQs: Not subject
SARA Section 311 / 312 hazards: Acute Health Hazard, Chronic Health Hazard

SARA Section 313 components:	This product contains chemical(s) subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-to-know Act of 1986 and 40CFR372
California Proposition 65 components:	WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm
TSCA:	Product is listed on TSCA Inventory

16 Other information

The above information is accurate to the best of our knowledge. However, since data, safety standards and government regulation are subject to change and the conditions of handling and use, or misuse are beyond our control. NOAH MAKES NO WARRANTY, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO THE COMPLETENESS OR CONTINUING ACCURACY OF THE INFORMATION CONTAINED HEREIN AND DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON.
User should satisfy himself that he has all current data relevant to his particular use.

SAFETY DATA SHEET

1. Identification

Product identifier **Dieldrin**

Other means of identification

Item N-11688

CAS number 60-57-1

Synonyms (1a.alpha.,2.beta.,2a.alpha.,3.beta.,6.beta.,6a.alpha .,7.beta.,7a.alpha.)-3,4,5,6,9,9-Hexachloro-1a,2,2a,3 ,6,6a,7,7a-octahydro-2,7 : 3,6-dimethanonaphth[2,3-b]oxirene

Recommended use For Laboratory Use Only

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name Chem Service, Inc.

Address 660 Tower Lane
West Chester, PA 19380
United States

Telephone Toll Free 800-452-9994
Direct 610-692-3026

Website www.chemservice.com

E-mail info@chemservice.com

Emergency phone number Chemtrec US 800-424-9300
Chemtrec outside US +1 703-527-3887

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards

Acute toxicity, oral	Category 2
Acute toxicity, dermal	Category 1
Acute toxicity, inhalation	Category 1
Skin corrosion/irritation	Category 1B
Serious eye damage/eye irritation	Category 1
Carcinogenicity	Category 1B
Reproductive toxicity	Category 1
Specific target organ toxicity, repeated exposure	Category 1

Environmental hazards

Hazardous to the aquatic environment, acute hazard	Category 1
Hazardous to the aquatic environment, long-term hazard	Category 1

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Fatal if swallowed. Fatal in contact with skin. Causes severe skin burns and eye damage. Causes serious eye damage. Fatal if inhaled. May cause cancer. May damage fertility or the unborn child. Causes damage to organs through prolonged or repeated exposure. Very toxic to aquatic life. Very toxic to aquatic life with long lasting effects.

Precautionary statement

Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. Wear respiratory protection.
Response	If swallowed: Immediately call a poison center/doctor. If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor. Take off immediately all contaminated clothing and wash it before reuse. Collect spillage.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
Dieldrin	(1a.alpha.,2.beta.,2a.alpha.,3.beta.,6.beta.,6a.alpha.,7.beta.,7a.alpha.)-3,4,5,6,9,9-Hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-2,7 : 3,6-dimethanonaphth[2,3-b]oxirene	60-57-1	100

4. First-aid measures

Inhalation Remove victim to fresh air and keep at rest in a position comfortable for breathing. Oxygen or artificial respiration if needed. Do not use mouth-to-mouth method if victim inhaled the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Call a physician or poison control center immediately.

Skin contact Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact Do not rub eyes. Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately.

Ingestion Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Do not use mouth-to-mouth method if victim ingested the substance. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Most important symptoms/effects, acute and delayed Convulsions. Headache. Dizziness. Nausea, vomiting. Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Prolonged exposure may cause chronic effects.

Indication of immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

General information Take off immediately all contaminated clothing. IF exposed or concerned: Get medical advice/attention. If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Discard any shoes or clothing items that cannot be decontaminated.

5. Fire-fighting measures

Suitable extinguishing media Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Use water spray to cool unopened containers.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe dust. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk . Large Spills: Wet down with water and dike for later disposal. Absorb in vermiculite, dry sand or earth and place into containers. Shovel the material into waste container. Following product recovery, flush area with water. Small Spills: Sweep up or vacuum up spillage and collect in suitable container for disposal. Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. Put material in suitable, covered, labeled containers. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Minimize dust generation and accumulation. Do not breathe dust. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Avoid prolonged exposure. When using, do not eat, drink or smoke. Pregnant or breastfeeding women must not handle this product. Should be handled in closed systems, if possible. Use only outdoors or in a well-ventilated area. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Wash contaminated clothing before reuse. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store locked up. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Material	Type	Value
Dieldrin (CAS 60-57-1)	PEL	0.25 mg/m3

US. ACGIH Threshold Limit Values

Material	Type	Value	Form
Dieldrin (CAS 60-57-1)	TWA	0.1 mg/m3	Inhalable fraction and vapor.

US. NIOSH: Pocket Guide to Chemical Hazards

Material	Type	Value
Dieldrin (CAS 60-57-1)	TWA	0.25 mg/m3

Biological limit values No biological exposure limits noted for the ingredient(s).

Exposure guidelines

US - California OELs: Skin designation

Dieldrin (CAS 60-57-1) Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

Dieldrin (CAS 60-57-1)	Skin designation applies.

US - Tennessee OELs: Skin designation

Dieldrin (CAS 60-57-1)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Dieldrin (CAS 60-57-1)	Can be absorbed through the skin.

US NIOSH Pocket Guide to Chemical Hazards: Skin designation

Dieldrin (CAS 60-57-1)	Can be absorbed through the skin.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Dieldrin (CAS 60-57-1)	Can be absorbed through the skin.

Appropriate engineering controls Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles) and a face shield.

Skin protection

Hand protection Wear appropriate chemical resistant gloves.

Other Wear appropriate chemical resistant clothing. Use of an impervious apron is recommended.

Respiratory protection Wear positive pressure self-contained breathing apparatus (SCBA).

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Observe any medical surveillance requirements. Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Solid.
Form	Crystalline.
Color	Colorless to light tan
Odor	Not available.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	347.9 °F (175.5 °C)
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	0.000001 kPa (77 °F (25 °C))
Vapor density	13.2
Relative density	Not available.

Solubility(ies)

Solubility (water)	0.2 mg/l

Partition coefficient (n-octanol/water)	5.4
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	Not available.

Other information

Density	1.75 g/cm3
Explosive properties	Not explosive.
Molecular formula	C12-H8-Cl6-O
Molecular weight	380.91 g/mol
Oxidizing properties	Not oxidizing.
Specific gravity	1.75

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong acids. Strong oxidizing agents. Phenols.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Fatal if inhaled.
Skin contact	Fatal in contact with skin. Causes severe skin burns.
Eye contact	Causes serious eye damage.
Ingestion	Fatal if swallowed. Causes digestive tract burns.
Symptoms related to the physical, chemical and toxicological characteristics	Convulsions. Headache. Dizziness. Nausea, vomiting. Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

Information on toxicological effects

Acute toxicity	Fatal if inhaled. Fatal in contact with skin. Fatal if swallowed.
Skin corrosion/irritation	Causes severe skin burns and eye damage.
Serious eye damage/eye irritation	Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization	Not a respiratory sensitizer.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

Dieldrin (CAS 60-57-1) 3 Not classifiable as to carcinogenicity to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

Reproductive toxicity	May damage fertility or the unborn child.
Specific target organ toxicity - single exposure	Not classified.
Specific target organ toxicity - repeated exposure	Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard Not an aspiration hazard.

Chronic effects Causes damage to organs through prolonged or repeated exposure. Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity Very toxic to aquatic life with long lasting effects.

Product		Species	Test Results
Dieldrin (CAS 60-57-1)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	0.074 - 0.0854 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	0.001 - 0.0013 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability

Bioaccumulative potential

Partition coefficient n-octanol / water (log Kow)
5.4

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

US RCRA Hazardous Waste P List: Reference

Dieldrin (CAS 60-57-1) P037

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

UN number UN2811
UN proper shipping name Toxic solids, organic, n.o.s. (Dieldrin RQ = 1 LBS)
Transport hazard class(es)
Class 6.1(PGI, II)
Subsidiary risk -
Label(s) 6.1
Packing group II
Special precautions for user Read safety instructions, SDS and emergency procedures before handling.
Special provisions IB8, IP2, IP4, T3, TP33
Packaging exceptions 153
Packaging non bulk 212
Packaging bulk 242

IATA

UN number UN2811
UN proper shipping name Toxic solid, organic, n.o.s. (Dieldrin)
Transport hazard class(es)
Class 6.1(PGI, II)
Subsidiary risk -

Packing group	II
Environmental hazards	No.
ERG Code	6L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed with restrictions.
Cargo aircraft only	Allowed with restrictions.

IMDG

UN number	UN2811
UN proper shipping name	TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin)
Transport hazard class(es)	
Class	6.1(PGI, II)
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	No.
EmS	F-A, S-A
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

DOT

IATA; IMDG

General information IMDG Regulated Marine Pollutant.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Dieldrin (CAS 60-57-1) Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

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

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130)
Hazardous substance
Priority pollutant
Bioaccumulative chemical of concern
Toxic pollutant

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

Dieldrin (CAS 60-57-1) Listed: July 1, 1988

International Inventories

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

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 09-27-2014

Revision date 08-30-2019

Version # 02

NFPA ratings
Health: 4
Flammability: 0
Instability: 0

Disclaimer

Chem Service, Inc. cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

This product is furnished FOR LABORATORY USE ONLY.

Revision information

This document has undergone significant changes and should be reviewed in its entirety.

SAFETY DATA SHEET

Creation Date 22-Sep-2009 **Revision Date** 18-Jan-2018 **Revision Number** 4

1. Identification

Product Name **1,1,2,2-Tetrachloroethane**

Cat No. : **AC147940000; AC147940010; AC147940025; AC147940250; AC147941000**

CAS-No 79-34-5
Synonyms Acetosal; Bonoform; Cellon

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute dermal toxicity	Category 1
Acute Inhalation Toxicity - Vapors	Category 2
Carcinogenicity	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
Fatal in contact with skin
Fatal if inhaled
Suspected of causing cancer

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Do not get in eyes, on skin, or on clothing
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear respiratory protection
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Skin
Immediately call a POISON CENTER or doctor/physician
IF ON SKIN: Gently wash with plenty of soap and water
Remove/Take off immediately all contaminated clothing
Wash contaminated clothing before reuse
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Toxic to aquatic life with long lasting effects
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
1,1,2,2-Tetrachloroethane	79-34-5	98.5

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Immediate medical attention is required. Wash off immediately with plenty of water for at least 15 minutes.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Immediate medical attention is required. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms and effects Breathing difficulties. . Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Notes to Physician Treat symptomatically

5. Fire-fighting measures

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

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available

Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Non-combustible.

Hazardous Combustion Products
Hydrogen chloride gas Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.

Environmental Precautions Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up Keep in suitable, closed containers for disposal. Soak up with inert absorbent material.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment. Do not ingest. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
1,1,2,2-Tetrachloroethane	TWA: 1 ppm Skin	(Vacated) TWA: 1 ppm (Vacated) TWA: 7 mg/m³ Skin TWA: 5 ppm TWA: 35 mg/m³	IDLH: 100 ppm TWA: 1 ppm TWA: 7 mg/m³	TWA: 5 ppm TWA: 35 mg/m³ STEL: 10 ppm STEL: 70 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

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

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-43 °C / -45.4 °F
Boiling Point/Range	147 °C / 296.6 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	6.6 mbar @ 20 °C
Vapor Density	5.79
Specific Gravity	1.580
Solubility	moderately soluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	1.7 mPa s at 28 °C
Molecular Formula	C2 H2 Cl4
Molecular Weight	167.85

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat.

Incompatible Materials Strong oxidizing agents, Strong bases, nitrogen oxides (NOx), Metals, Powdered metals, Aluminium, copper

Hazardous Decomposition Products Hydrogen chloride gas, Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
1,1,2,2-Tetrachloroethane	LD50 = 200 mg/kg (Rat)	LD50 = 3990 mg/kg (Rabbit)	LC50 = 8.6 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity Possible cancer hazard. May cause cancer based on animal data. The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
1,1,2,2-Tetrachloroethane	79-34-5	Group 2B	Not listed	A3	X	Not listed

IARC: (International Agency for Research on Cancer)

ACGIH: (American Conference of Governmental Industrial Hygienists)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
1,1,2,2-Tetrachloroethane	EC50: 31.4 - 188 mg/L, 72h (Pseudokirchneriella subcapitata) EC50: = 47 mg/L, 96h static (Desmodesmus subspicatus) EC50: 40.7 - 344 mg/L, 96h (Pseudokirchneriella subcapitata)	LC50: 20 - 22 mg/L, 96h static (Lepomis macrochirus) LC50: 19.9 - 20.7 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 1.43 mg/L 24 h EC50 = 5.43 mg/L 5 min	EC50: 16 - 35 mg/L, 48h Static (Daphnia magna) EC50: 16 - 35 mg/L, 48h (Daphnia magna)

Persistence and Degradability No information available Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Will likely be mobile in the environment due to its water solubility.

Component	log Pow
1,1,2,2-Tetrachloroethane	2.39

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
1,1,2,2-Tetrachloroethane - 79-34-5	U209	-

14. Transport information

DOT

- **UN-No** UN1702
- **Proper Shipping Name** 1,1,2,2-TETRACHLOROETHANE
- **Hazard Class** 6.1
- **Packing Group** II

TDG

- **UN-No** UN1702
- **Proper Shipping Name** 1,1,2,2-TETRACHLOROETHANE
- **Hazard Class** 6.1
- **Packing Group** II

IATA

- **UN-No** UN1702
- **Proper Shipping Name** 1,1,2,2-TETRACHLOROETHANE
- **Hazard Class** 6.1
- **Packing Group** II

IMDG/IMO

- **UN-No** UN1702
- **Proper Shipping Name** 1,1,2,2-TETRACHLOROETHANE
- **Hazard Class** 6.1
- **Subsidiary Hazard Class** P
- **Packing Group** II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
1,1,2,2-Tetrachloroethane	X	X	-	201-197-8	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
1,1,2,2-Tetrachloroethane	79-34-5	98.5	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
1,1,2,2-Tetrachloroethane	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
1,1,2,2-Tetrachloroethane	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
1,1,2,2-Tetrachloroethane	100 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
1,1,2,2-Tetrachloroethane	79-34-5	Carcinogen	3 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
1,1,2,2-Tetrachloroethane	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	N
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

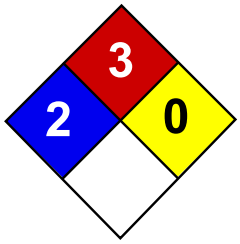
16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date	22-Sep-2009
Revision Date	18-Jan-2018
Print Date	18-Jan-2018
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

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

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

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

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

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powerful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Aromatic. Gasoline-like, rather pleasant. (Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

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

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia)) Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism,and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:35 PM

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

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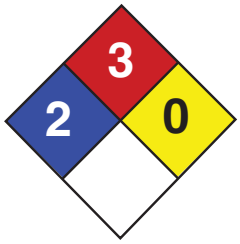

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C8H10

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

Toxicological Data on Ingredients: Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (irritant, sensitizer). CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

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

Serious Skin Contact: Not available.

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 432°C (809.6°F)

Flash Points:
CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001) CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001) CLOSED CUP: 21 C (70 F) (NFPA)

Flammable Limits: LOWER: 0.8% - 1.6%UPPER: 6.7% - 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

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

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Vapors may form explosive mixtures in air.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 100 STEL: 125 (ppm) from OSHA (PEL) [United States] TWA: 435 STEL: 545 from OSHA (PEL) [United States] TWA: 435 STEL: 545 (mg/m3) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States] TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)] TWA: 100 STEL: 125 (ppm) [Belgium] TWA: 100 STEL: 125 (ppm) [Finland] TWA: 50 (ppm) [Norway] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

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

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in diethyl ether. Very slightly soluble in cold water or practically insoluble in water. Soluble in all proportions in Ethyl alcohol. Soluble in Carbon tetrachloride, Benzene. Insoluble in Ammonia. Slightly soluble in Chloroform. Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ingnition sources (flames, sparks, static), incompatible materials, light

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

Toxicity to Animals: Acute oral toxicity (LD50): 3500 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lethal Dose/Conc 50% Kill: LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg Lowest Published Lethal Dose/Conc: LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC evidence of carcinogenicity in humans inadequate. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Can cause mild skin irritation. It can be absorbed through intact skin. Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm , it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS) Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include

headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and conciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987). Ingestion: Do not drink, pipet or siphon by mouth. May cause gastroinestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through)]. 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Ethylbenzene Illinois toxic substances disclosure to employee act: Ethylbenzene Illinois chemical safety act: Ethylbenzene New York release reporting list: Ethylbenzene Rhode Island RTK hazardous substances: Ethylbenzene Pennsylvania RTK: Ethylbenzene Minnesota: Ethylbenzene Massachusetts RTK: Ethylbenzene Massachusetts spill list: Ethylbenzene New Jersey: Ethylbenzene New Jersey spill list: Ethylbenzene Louisiana spill reporting: Ethylbenzene California Director's List of Hazardous Substances: Ethylbenzene TSCA 8(b) inventory: Ethylbenzene TSCA 4(a) proposed test rules: Ethylbenzene TSCA 8(d) H and S data reporting: Ethylbenzene: Effective Date: 6/19/87; Sunset Date: 6/19/97 SARA 313 toxic chemical notification and release reporting: Ethylbenzene

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASSE D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S29- Do not empty into drains.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References:
-Manufacturer's Material Safety Data Sheet. -Fire Protection Guide to Hazardous Materials, 13th ed., National Fire Protection Association (NFPA) -Registry of Toxic Effects of Chemical Substances (RTECS) -Chemical Hazard Response Information System (CHRIS) -Hazardous Substance Data Bank (HSDB) -New Jersey Hazardous Substance Fact Sheet -Ariel Global View -Reprotext System

Other Special Considerations: Not available.

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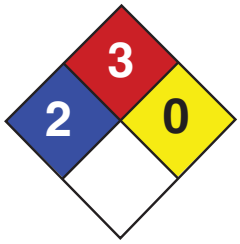

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C6-H5-CH3 or C7-H8

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

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

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

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

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

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

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

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

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:
Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N2O4; AgClO4; BrF3; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m3) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

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

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.7

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

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

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Cauess mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abraisons. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophostatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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

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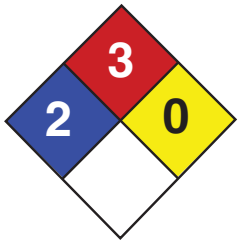

Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
p-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: p-Xylene

Catalog Codes: SLX1120

CAS#: 106-42-3

RTECS: ZE2625000

TSCA: TSCA 8(b) inventory: p-Xylene

CI#: Not applicable.

Synonym: p-Methyltoluene

Chemical Name: 1,4-Dimethylbenzene

Chemical Formula: C6H4(CH3)2

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{p-}Xylene	106-42-3	100

Toxicological Data on Ingredients: p-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 12400 mg/kg [Rabbit.]. VAPOR (LC50): Acute: 4550 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, the nervous system, liver. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

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

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:
Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

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

Exposure Limits:
TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) TWA: 434 STEL: 651 (mg/m3) from ACGIHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

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

Boiling Point: 138°C (280.4°F)

Melting Point: 12°C (53.6°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 9 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:
Easily soluble in methanol, diethyl ether. Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 5000 mg/kg [Rat.]. Acute dermal toxicity (LD50): 12400 mg/kg [Rabbit.]. Acute toxicity of the vapor (LC50): 4550 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier. 0900 Detected in maternal milk in human. Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: p-Xylene Florida: p-Xylene Massachusetts RTK: p-Xylene New Jersey: p-Xylene TSCA 8(b) inventory: p-Xylene SARA 313 toxic chemical notification and release reporting: p-Xylene CERCLA: Hazardous substances.: p-Xylene

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

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R10- Flammable. R38- Irritating to skin. R41- Risk of serious damage to eyes. R48/20- Harmful: danger of serious damage to health by prolonged exposure through inhalation.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

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

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du rÃ¨glement sur le transport des marchandises dangeureuses au canada. Centre de conformitÃ© internatinal LtÃ©e. 1986.

Other Special Considerations: Not available.

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ATTACHMENT 4

EMERGENCY RESPONSE CHECKLIST

In an Emergency

Confirm the reported incident	_____	_____
Evacuate and secure the area	_____	_____
Render first aid/emergency medical care	_____	_____
Notify promptly:		
Project Manager	_____	_____
Fire Department	_____	_____
Police Department	_____	_____
Nearest Hospital or Medical Care Facility	_____	_____
Start Documentation	_____	_____
If spill or leak occurs:		
Don the proper PPE	_____	_____
Stop the source	_____	_____
Contain the spill	_____	_____
Clean up the spill	_____	_____
Upon evacuating, take attendance at the assembly area	_____	_____
Authority given:		
Leave the site	_____	_____
Restart the operations	_____	_____
Debrief and document the incident	_____	_____
Submit a copy of the document to the Health and Safety Manager	_____	_____